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2012 Comprehensive Water System Plan

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Prepared for

City of Longview
1525 Broadway
Longview, Washington 98632

K/J Project No. 1197009*00

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List of Acronyms

Acronym	Description
AC	asbestos cement
ac-ft/yr	acre-feet per year
ADD	Average Day Demand
AL	Allowable Limit
AMCL	Alternative Maximum Contaminant Level
AMI	Advanced Metering Infrastructure
APWA	American Public Works Association
AWWA	American Water Works Association
bgs	below ground surface
BHWSD	Beacon Hill Water and Sewer District
Board	Water Operating Board
CCL3	Contaminant Candidate List
CCC	Cross Connection Control
CCR	Consumer Confidence Report
CDBG	Community Block Development Grant
CERB	Community Economic Revitalization Board
CEU	Continuing Education Unit
cf	cubic feet
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
City	City of Longview
CMP	Coliform Monitoring Plan
Cowlitz PUD	Cowlitz County Public Utility District #1
CWS	Community Water System
D/DBPR-1	Stage 1 Disinfectant/Disinfection By-Product Rule
D/DBPR-2	Stage 2 Disinfectant/Disinfection By-Product Rule
DBP	Disinfection By-Product
DOH	Washington State Department of Health
DS	Dead Storage

Acronym	Description
DSL	Distribution System Loss
DSRF	Drinking Water State Revolving Fund
DTWA	Davis Terrace Water Association
DWSRF	Drinking Water State Revolving Fund
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERU	Equivalent Residential Unit
ES	Equalizing Storage
fps	feet per second
FSS	Fire Suppression Storage
gpcd	gallon per capita per day
gpd	gallons per day
gpm	gallons per minute
GSI	GSI Water Solutions, Inc.
GWI	Groundwater Under the Influence of Surface Water
HAA5	haloacetic acids 5
HDPE	high-density polyethylene
HHS	Federal Department of Health and Human Services
HP	horsepower
IDSE	initial distribution system evaluation
IOC	inorganic compound
IFC	International Fire Code
Kelso	City of Kelso
LCR	Lead and Copper Rule
LF	linear feet
LMC	Longview Municipal Code
LRAA	Locational Running Annual Average
MCL	Maximum Contaminant Limit
MCLG	Maximum Contaminant Limit Goal
MDD	Maximum Day Demand
MG	million gallons

Acronym	Description
MGD	million gallons per day
mg/l	milligram per liter
MFRWTP	Mint Farm Regional Water Treatment Plant
MMM	multimedia mitigation
MRDL	Maximum Residual Disinfectant Level
µg/l	microgram per liter
µmho/cm	micromhos per centimeter
mrem/yr	millirems per year
MTBE	methyl tertiary butyl ether
NDMA	N-Nitrosodimethylamine
NRC	Net Reliable Capacity
O&M	operation and maintenance
OFM	Office of Financial Management
OH&P	overhead and profit
OS	Operational Storage
PAB	Planning Area Boundary
PCAs	potential contaminating activities
PCE	tetrachloroethylene
pCi/l	picocuries per liter
PDR	Preliminary Design Report
PHD	Peak Hour Demand
PLC	programmable logic controller
ppb	parts per billion
ppm	parts per million
PRV	pressure relief valve
psi	pounds per square inch
PVC	polyvinyl chloride
PWTF	Public Works Trust Fund
RC	Reliable Capacity
RWTP	Regional Water Treatment Plant
SB	Standby Storage

Acronym	Description
SCADA	Supervisory Control and Data Acquisition
SDC	System Development Charge
SDWA	Safe Drinking Water Act
sf	square feet
SMCL	Secondary Maximum Contaminant Level
TC	Total Capacity
TCE	Trichloroethylene
TCR	Total Coliform Rule
TOC	total organic carbon
TRRWTP	Three Rivers Regional Wastewater Treatment Plant
TTHM	total trihalomethane
UCMR	Unregulated Contaminant Monitoring Regulation
UCMR1	first round unregulated contaminant monitoring
UCMR2	second round unregulated contaminant monitoring
UCMR3	third round unregulated contaminant monitoring
ULID	Utility Local Improvement District
VOC	volatile organic compound
WAC	Washington Administrative Code
WHPP	Wellhead Protection Plan
WHPA	Wellhead Protection Area
WQMR	Water Quality Monitoring Report
WSP	Water System Plan
WSRB	Washington State Rating Bureau
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WUE	Water Use Efficiency

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Executive Summary

The Longview 2012 Water System Comprehensive Plan (WSP) provides the City of Longview (City) guidance for the 6- and 20-year planning periods to address long-term water supply, storage, transmission, and treatment needs for the City's service area. The WSP is a tool for the City to make decisions and implement programs that allow for the community's future water needs. The document has been prepared to meet the requirements of the Washington State Department of Health (DOH) as established in WAC 246-290.

This WSP is an update of the 2005 Longview-Kelso Urban Area Water System Comprehensive Plan (2005 WSP). The previous plan was developed for the Cities of Longview and Kelso, and Cowlitz County Public Utility District #1 (PUD). For the 2012 WSP update, DOH encouraged each of the purveyors to develop their own stand-alone Water System Plan Update. Therefore, the 2012 WSP is focused primarily on the City's system but also illustrates how the three systems are interconnected.

There are several notable events that have occurred since the previous 2005 Plan was prepared:

- Ownership of the PUD's water system was transferred to Beacon Hill Water and Sewer District in December of 2010.
- The City and Beacon Hill Water and Sewer District (BHWSD) are jointly developing a new groundwater source of supply and constructing a new regional water treatment facility in the Mint Farm Industrial Park.
- The primary water rights have been expanded to allow withdrawal from the Cowlitz River or from groundwater wells at the new Mint Farm Regional Water Treatment Plant (MFRWTP).
- The City will establish a new Wellhead Protection Zone based on the Wellhead Protection Plan developed as part of this WSP.

The City is the sole owner and operator for the Longview distribution system, but owns and operates the Regional Water Treatment Plant and the future MFRWTP in partnership with BHWSD. Because the new MFRWTP will be brought online in fall 2012, the WSP is written to reflect anticipated future MFRWTP operation.

The City currently serves 21,942 Equivalent Residential Units (ERUs) and is expected to serve 27,162 ERUs by the year 2032. The majority, approximately 90 percent, of the City's ERUs are served from the Main 244 Zone. The area growth rate has been stable over the past 6 years and is estimated to be 0.97 percent over the current 6- and 20-year planning window. The current Average Day Demand (ADD) and Maximum Day Demand (MDD) are 4.95 and 9.18 million gallons per day (MGD), respectively. ADD and MDD are expected to be 6.40 and 11.85, respectively, by 2032. As constructed, the MFRWTP plant capacity is 17.4 MGD with provisions for a future capacity of 25.3 MGD.

The City has an adequate source of supply, pumping, and distribution capacity to meet the anticipated 20-year planning requirements. A storage deficiency was identified in the Indian Creek service zone; all other service zones have adequate storage to meet the system's 20-year needs. The City meets all applicable water quality standards and distribution system losses are low (4.3 percent). To meet Water Use Efficiency (WUE) requirements, the City has adopted a conservation goal of 1 percent reduction in the ADD gallon/ERU usage.

The Capital Improvement Program (CIP) has identified 18 projects with a total capital cost of $27.6 million over the 6-year planning period. Financial projections completed for this WSP confirm the City is financially stable and has the ability to fund the CIP projects identified. The CIP projects will address the following issues:

- Aging infrastructure concerns
- Undersized mains to improve fire flow
- Pump station upgrades to improve reliability
- Improve metering and telemetry capability
- Identified storage deficiency
- Accommodate future growth and development in the Longview area.

Section 1: Water System Description

1.1 Introduction

The City of Longview (City) has prepared this 2012 Water System Plan (WSP) to update and replace the 2005 Longview-Kelso Urban Area Comprehensive Water System Plan (2005 Plan) developed for the Cities of Longview, Kelso, and Cowlitz County Public Utility District #1 (PUD). Since that time, ownership of the PUD's water system has been transferred to Beacon Hill Water and Sewer District (BHWSD). The Washington State Department of Health (DOH) encouraged each of the purveyors covered in the 2005 Plan to develop their own stand-alone Water System Plans in 2012. Therefore, this 2012 WSP will address primarily the City's system but will illustrate how the three systems are interconnected.

The purpose of this WSP is to assist the City in developing a long-term planning strategy for its water utility. The WSP evaluates the existing system and its ability to meet anticipated requirements for water source, quality, transmission, storage, and distribution over a 20-year planning horizon. The WSP recommends water system improvements to meet the changing demands of regulatory impacts, population growth, development, and repair/replacement needs. The WSP also estimates the costs of the recommended improvements and determines their impact on water utility rates for the City. This comprehensive WSP has been prepared in accordance with the requirements of Washington Administrative Code (WAC) 246-290-100 - Water System Plan and considers the requirements set forth in HB1338, the Municipal Water Law.

1.2 Ownership History

Longview is located in Cowlitz County in southwestern Washington. The City's water utility service area covers approximately 32.3 square miles with 25.7 square miles being within the city limits. Water service to the Longview-Kelso Urban Area is supplied by three major purveyors: the City, Kelso, and BHWSD. BHSWD took ownership of the PUD's water system on 1 January 2011. BHSWD also assumed partial ownership of the existing Regional Water Treatment Plant (RWTP) and the future Mint Farm Regional Water Treatment Plant (MFRWTP). The City (Water System ID #48100R) is the sole owner and operator for the Longview distribution system, and owns and operates the RWTP and future MFRWTP in partnership with BHWSD. Per the Participants Agreement, the RWTP and future MFRWTP are operated under the direction of the Water Operating Board (Board). The Board consists of two members from the City and one member from the BHWSD. Two small private independent water associations also operate in the urban area, the Carrolls Water Association and the Davis Terrace Water Association (DTWA). The Carrolls Water Association uses groundwater to serve an area southeast of Kelso. The DTWA, located adjacent to the Kelso city limits, receives its water from Kelso's distribution system.

The City began supplying water to customers in the early 1920s. The City originally obtained its water supply from groundwater. Eventually, a more reliable source was sought because of the age of the wells, high iron levels in the raw water, and rapid population growth. The RWTP, which treats water from the Cowlitz River, was constructed in 1945. In 1978, the City and the PUD agreed on the joint remodel and subsequent operation of the treatment plant. Prior to entering into the ownership agreement, PUD purchased water from the City and Kelso. Now,

due to concerns about changing water quality in the Cowlitz River and aging components and equipment at the RWTP, the MFRWTP is being developed as an alternative water source to replace the Cowlitz River. The new MFRWTP is due to be online near the end of 2012 with four new groundwater wells and the ability to drill two additional wells to supply future demands.

1.3 Related System Plans

System plans related to this Comprehensive WSP include:

- Longview-Kelso Urban Area Comprehensive Water Plan and Appendix (2005)
- City of Longview Comprehensive Plan (2006)
- Cowlitz County Comprehensive Plan (1981) (currently being updated)
- Beacon Hill Water and Sewer District Water System Plan (Draft 2011)
- City of Longview Mint Farm Water Supply Pre-Design Report (2010).

1.4 Service Area Description

Figure 1-1 illustrates a number of important planning features, including service area, pressure zones, and city limits. The pressure zones shown on Figure 1-1 for the City are distributed as follows:

- Main Area (244)
- Indian Creek (318, 463)
- North 50th (395,531)
- Niemi (415)
- Hillcrest (286, 481)
- Columbia View (488, 506, 660)
- Trella (502, 653)

The existing and future service area boundaries are shown on Figure 1-1. At this time, the City has elected not to identify future service areas beyond the identified retail service area. Therefore, the existing and future service areas coincide with the City's retail service areas.

1.4.1 Topography

The service area topography varies from steep slopes to gently rolling terrain, sloping south and west to the generally flat areas along the Cowlitz and Columbia rivers. The Columbia River borders the service area to the south. The area near the confluence of the Cowlitz, Coweeman, and Columbia rivers is flat. Hilly uplands surround the urban area to the north and west.

1.4.2 Land Use

The approximate existing land uses for the City are shown on Figure 1-2, Land Use and Zoning. Land use information was obtained from both the City and County's GIS systems. The land use classifications in the unincorporated county areas are not the same as those used within the City limits. To better compare the land uses both within and outside of the City limits some assumptions were made to establish a corresponding City designation for the county parcels. The approximate areas of major land use categories for the existing and future service area are

summarized in Table 1-1. Land use is expected to remain the same over the 6- and 20-year planning periods.

Table 1-1: Land Use in Service Area[(a)]

Service Area	Residential	Commercial	Industrial	Public/Quasi Public	Total
Longview City Limits	9,380	559	5,315	1,198	16,452
Unincorporated Cowlitz County	3,968	4	-	254	4,227
Total within Service Area	13,348	564	5,315	1,452	20,679

Note:

(a) Units in acres.

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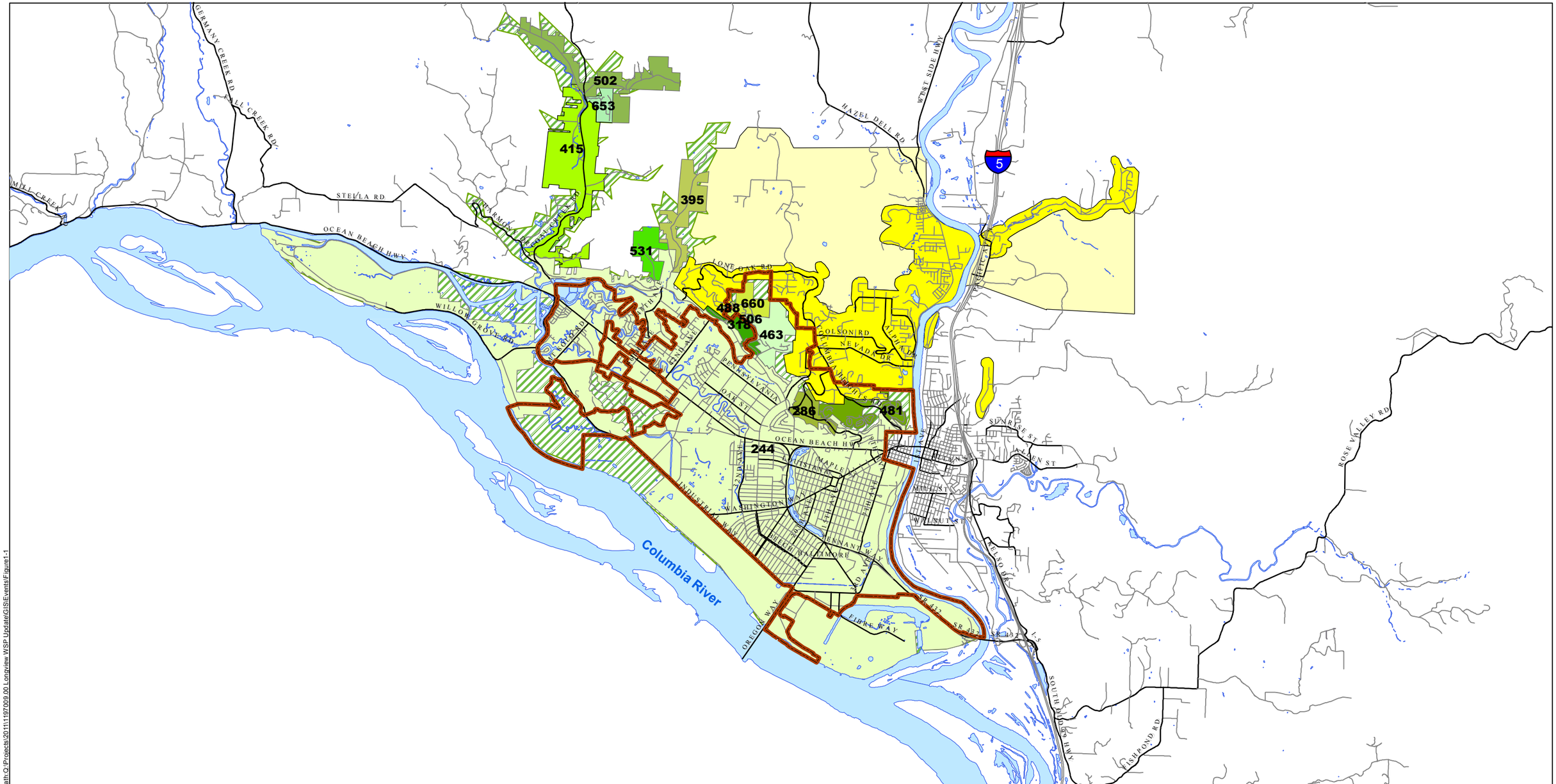

Legend

- Longview City Limits
- Street Centerline
- Longview Future and Retail Service Area
- Beacon Hill Existing and Retail Service Area
- Beacon Hill Future and Retail Service Area
- Rivers and Lakes

Longview Existing and Retail Service Area Pressure Zones

244, 286, 318, 395, 415, 463, 481, 488, 502, 506, 531, 653, 660

This map is for information purposes only. Data was compiled from multiple sources. The data sources do not guarantee this data is accurate or complete. There may have been updates to the data since the publication of this map. All locations are approximate.

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Comprehensive System Plan Update
Longview, Washington

Longview Service Area Overview
Existing, Future, and Retail

K/J 1197009*00
August 2012

Figure 1-1

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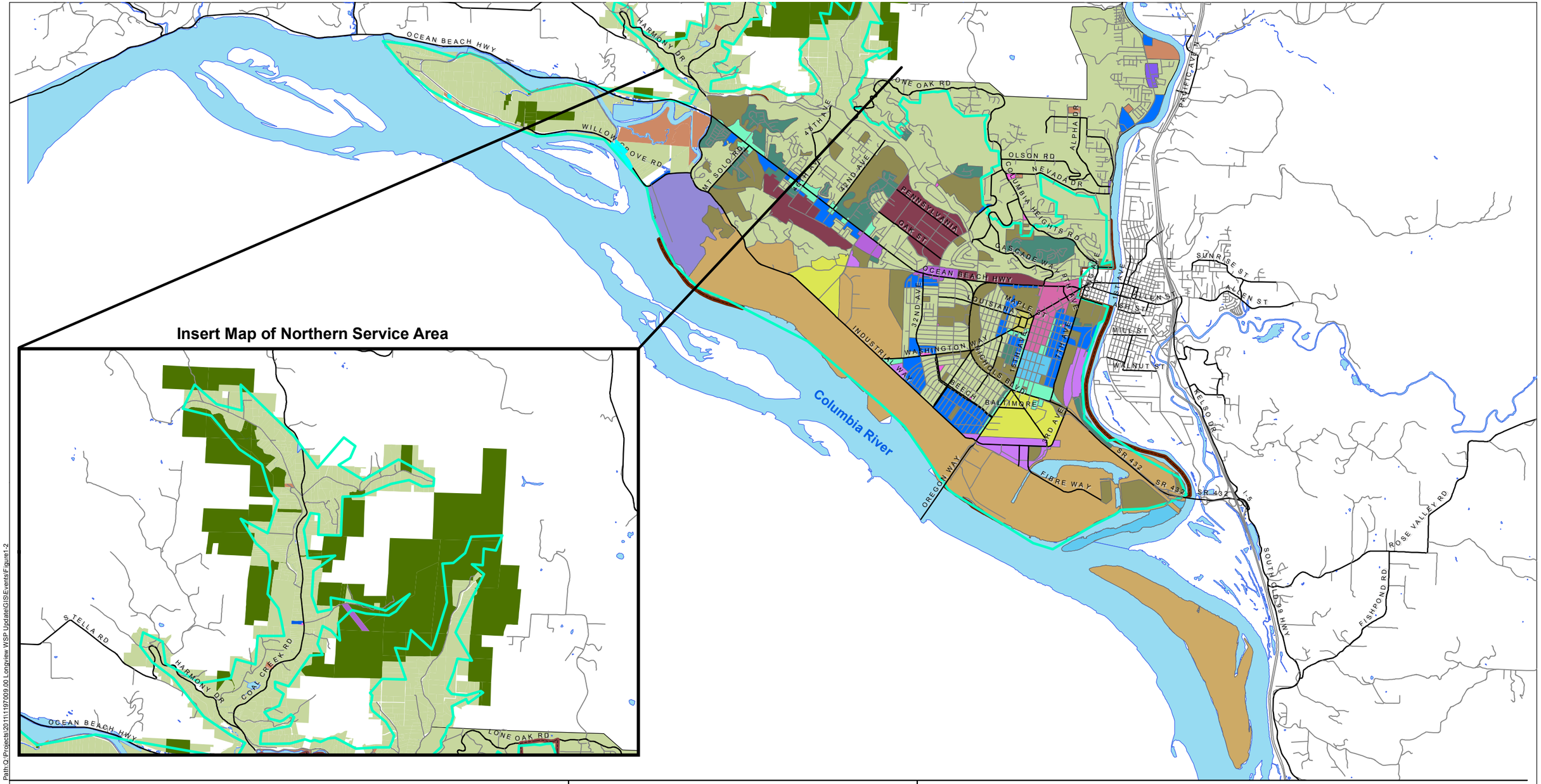

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Legend

- Longview City Limits
- Street Centerline
- Longview Existing and Future Service Area

Longview Landuse

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Traditional Neighborhood Residential
- Civic Center
- Neighborhood/Convenience Commercial
- Central Business District
- Community Commercial
- Mixed Use Commercial/Industrial
- Mixed Use Office/Commercial
- Mixed Use Residential/Commercial
- Regional Commercial
- Light Industrial
- Heavy Industrial
- Public/Quasi-Public/Institutional
- Rivers and Lakes

This map is for information purposes only. Data was compiled from multiple sources. The data sources do not guarantee this data is accurate or complete. There may have been updates to the data since the publication of this map. All locations are approximate.

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Comprehensive Water System Plan
Longview, Washington

Longview Landuse and Zoning

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Figure 1-2

1.5 Service Area and Water Wheeling Agreements

This section summarizes service area and water wheeling agreements for the three purveyors. Copies of the agreements are included in Appendix B. BHWSD assumed responsibility for maintaining the following agreements with the transfer of ownership from PUD on 1 January 2011.

- Water Services Area Agreement - March 1977: The City, Kelso, and PUD entered into an agreement to provide water to the urban area, to plan orderly system improvements to meet growth, and to provide a basis for decision-making on how to serve new customers without costly duplication of facilities. The following emergency agreements are in place in the event that normal water service is interrupted by an unforeseen event:
  - Water Utilities' Mutual Assistance Plan - 1971: This is a plan among the cities of Kelso, Longview, Castle Rock, and Woodland; and Cowlitz PUD, Carrolls Water Association, and Cloverdale Water Users' Association. The plan includes the exchange of assistance, emergency aid, equipment charges, labor charges, and equipment damage or loss between the water utilities.
  - Weyerhaeuser Company and Longview Emergency Aid Agreement – 1 July 1988: An agreement between Weyerhaeuser and the City for Weyerhaeuser to supply non-potable water to Longview during an emergency.
- RWTP Participants Agreement – 18 December 1978: The City and PUD agreed on the joint construction and subsequent operation of the Longview RWTP (amended February 2002). PUD's interest in the RWTP was assigned to BHWSD 1 January 2011. The revised participants' agreement is included in the appendices.
- Water Wheeling Agreements: The three purveyors established long-term wheeling agreements that allow the utilities to use each other's facilities to move water from the treatment facilities to the service area point of delivery; without duplication of facilities. Water wheeling agreements include:
  - Reciprocal Agreement, Kelso and PUD – 17 May 1978: Provides for wheeling service by Kelso for the PUD to deliver water to Haussler Road, Cowlitz Gardens, and William-Finney, and provides for wheeling service by PUD for Kelso to deliver water to Aldercrest No. 3. (The Haussler Road area was turned over to Kelso in July 1997).
  - Agreement between the City and PUD – 9 May 1980: Wheeling service by the City for PUD to deliver water between the Longview Treatment Plant and the Hillside Reservoir and to Lexington.
  - Amendment to the City and PUD Wheeling Agreement – 1 July 1992: Provides for wheeling service to PUD's Maplewood Drive service area in North Longview.
  - The City is currently considering joining the Washington Water/Wastewater Agency response Network (WARN) that allows water and wastewater systems to receive rapid mutual aid and assistance from other systems during an emergency. Utilities sign the WARN standard agreement, which allows them to share resources with other Washington systems that have signed the agreement.

1.6 Service Area Policies

The City's Comprehensive Plan, adopted January 2007, contains general overarching policies pertaining to annexation, joint planning, public facilities, and utility issues applicable for water system planning that serve as the guide for the development of the City's detailed service policies. The Longview Municipal Code (LMC), Title 15, Article II describes the City's detailed water service policies and is included in Appendix F. The table of contents for the LMC Title 15, Article II and a brief description of each section is shown below:

- **15.40 Administration:** This section establishes the City's water department, structure, and authority.
- **15.44 Service Connections:** Identifies the application process, installation, and connection procedures for service connections adjacent and not adjacent to City water, as well as associated fees and customer maintenance responsibilities.
- **15.48 Water Meters:** Establishes meter size based on customer class, meter protection, and responsibility in the event of damage by hot water as well as preventive measures.
- **15.52 Shutoffs – Turn-ons:** Address changes, interruption and discontinuance of service, as well as meter removal due to non-payment.
- **15.56 Billing Procedures:** Identifies billing procedures and policies as well as City and customer obligations and responsibilities.
- **15.60 Prohibited Acts:** Describes unlawful acts such as unauthorized connections to mains and hydrants, damage to waterworks property, and fire hydrant obstruction.
- **15.64 Miscellaneous Provisions:** Establishes policies such as City exemption for water damage, right to regulate sprinkling and irrigation activities, ownership of mains, fluoridation, and fire protection service.
- **15.68 Cross Connections:** Defines cross connection, back flow prevention requirements, and the City's cross connection control program. Ordinance 3208, adopted 28 June 2012, updates this section to comply with State law. A copy of the ordinance is included in Appendix F.
- **15.72 Extensions – Additions:** Establishes procedures and guidelines to insure orderly growth of the water system. Addresses service extensions both within and outside the City's limits.
- **15.74 Water Shortage Response Plan**: Establish procedures, guidelines, and authority in the event of water shortage emergencies.

1.7 Inventory of Existing Facilities

This section presents an inventory of the existing facilities (as of approximately July 2011) for the City.

1.7.1 Interties

Three existing interties are located between the City and BHWSD to deliver water under the water wheeling agreement, and one new intertie is proposed. One additional two-way intertie connects the City, BHWSD, and Kelso. One emergency connection can be established between the City and Weyerhaeuser to provide water to the City in an emergency situation. The interties and emergency connection are described in Table 1-2.

Table 1-2: Intertie and Water Service Agreements

Carrier [(a)]	Receiver	Agreement Date	Connection Location	Description of Service
Longview	Kelso and BHWSD	March 1977	101 Fishers Lane	• Two-way intertie between the three service providers. Kelso to Longview connection would only work if Longview's system experiences very low pressure. • 6-inch service through a 6-inch meter [approx. capacity of 1,000 gallons per minute (gpm)].
Longview	BHWSD: Hillside Reservoir	May 1980	Hillside Reservoir off Cedar Street, just above lower intersection with Cascade Way	• Continuous use as a point of delivery for either wholesale purchase or wheeling of water. • 12-inch main metered through two 4-inch turbine meters: #1 Meter (1,350 max gpm), #2 Meter (1,250 max gpm). Pump station is capable of approx. 1,000 gpm.
Longview	BHWSD: Lexington	May 1980	Immediately west of 101 Fishers Lane	• Continuous use as a point of delivery for either wholesale purchase or wheeling of water. • 8-inch service through a 6-inch meter (approximate capacity of 2,000 gpm) and 8-inch service through an 8-inch meter (approx. capacity of 3,500 gpm).
Longview	BHWSD: Maplewood	July 1992	Intersection of Maplewood Drive and Cedar Lane in Longview	• Continuous use as a point of delivery for either wholesale purchase or wheeling of water. • 4-inch main through a 4-inch meter (approx. capacity of 500 gpm).
Weyerhaeuser	Longview	July 1988	Industrial Way at Weyerhaeuser #5 Treatment Plant	• Emergency supply of non-potable water in case Longview experiences a significant supply disruption. Pipe spool is removed to eliminate physical connection. Can be re-installed to restore non-potable water supply in emergency situation.
Longview/ BHWSD *(Proposed)*	BHWSD/ Longview	TBD	Curtis Drive near Sunset Drive	• BHWSD and Longview are negotiating the development of a two-way intertie on Curtis Drive.

Note:

(a) Carrier is defined as supplier of water.

The Curtis Drive intertie is being considered to provide an additional point of supply between Longview and BHWSD. This intertie would potentially allow Longview to better utilize the storage available in the Columbia View Reservoir and provide an alternate source of supply for the areas currently served by BHWSD's Lone Oak reservoir. BHWSD anticipates operating the new Curtis Drive intertie on a full-time basis.

1.7.2 Facilities

A description of the City's facilities is provided as below. Because the new source of supply and MFRWTP will go online near the end of 2102, this WSP is written as if the new MFRWTP is already online. A schematic of the City's water system is presented on Figure 1-3, Water System Hydraulic Profile. A map of the existing water system is presented on Figure 1-4, Existing Water System Longview.

- **Mint Farm Regional Water Treatment Plant**: The MFRWTP supplies water to both the City and BHWSD. The facility treats groundwater from a deep aquifer and has current design capacity of 17.4 with a build out capacity of 25.3 million gallons per day (MGD). The treatment process consists of granular media filtration and disinfection using liquid sodium hypochlorite. The facility is further described in Section 3.

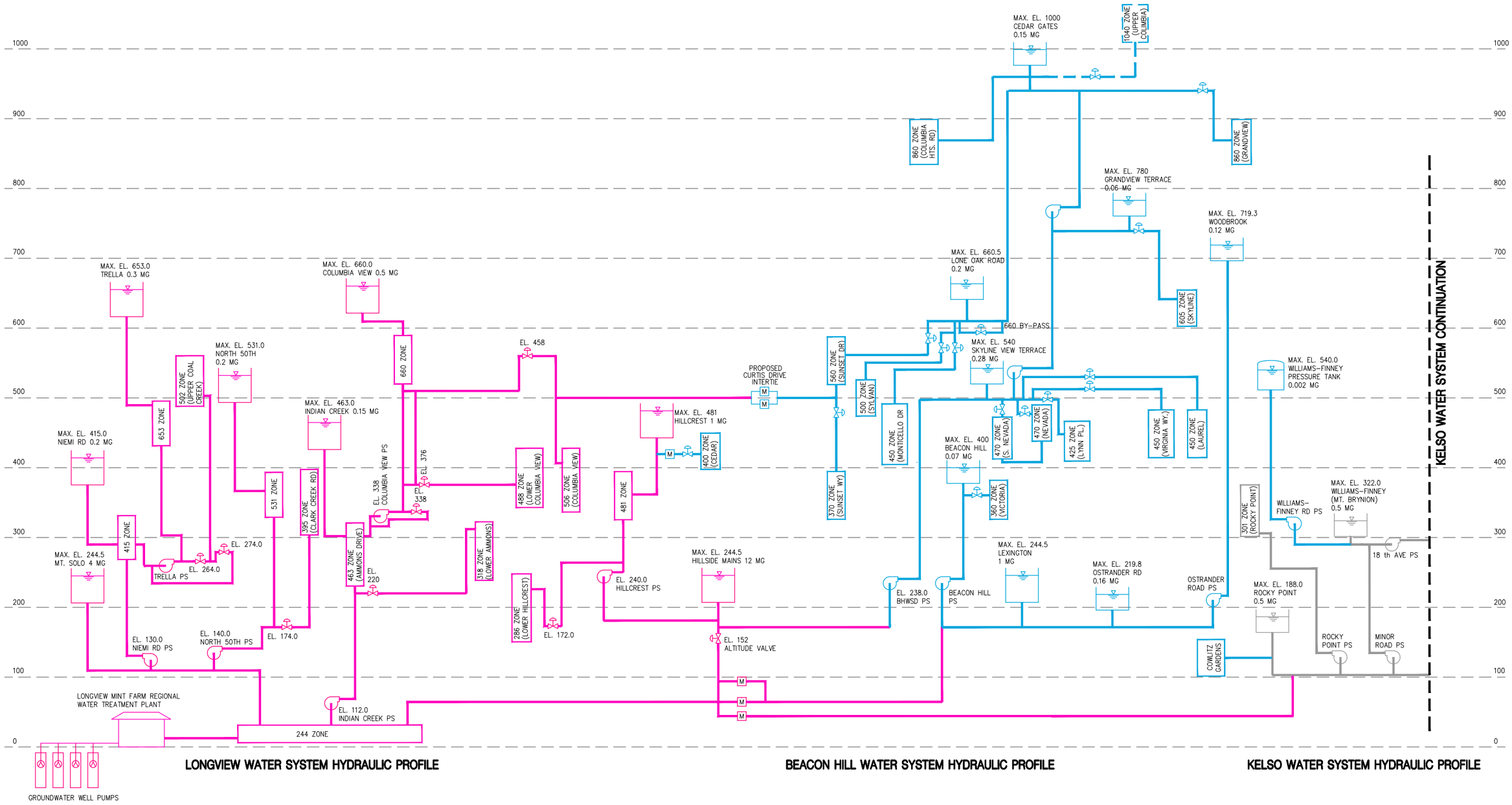
- **Longview RWTP**: The City's former source was the Cowlitz River at the Longview RWTP on Fishers Lane. The City and BHWSD decided to switch water sources and construct a new treatment facility for many reasons including aging systems and source water quality issues. This facility will be decommissioned at a later date.

- **Booster Pump Stations**: The City operates six booster pump stations, all of which pump to reservoirs. In addition, four groundwater wells at the MFRWTP pump through the treatment plant to the distribution system to fill reservoirs. Characteristics of the pump stations are summarized in Table 1-3. All pump stations are controlled by reservoir level sensing, which initiates pump operation.

- **Storage**: The City has eight water storage facility sites. Characteristics of the water storage facilities are summarized in Table 1-4. Capacities of the facilities range from 150,000 gallons to 12.0 million gallons. All facilities are covered. The City strives to maintain reservoir levels within 1 to 2 feet of overflow during periods of peak demand.

- **Pipe**: An inventory of the piping material of the water mains is presented in Table 1-5. Longview has 240 miles of pipeline. The majority of the system is cast iron (163 miles) and ductile iron (64 miles) with smaller lengths of asbestos cement (AC), steel, polyvinyl chloride (PVC), and high-density polyethylene (HDPE) pipe.

- **Pressure Reducing Stations**: The City's pressure reducing stations are summarized in Table 1-6.



NOTE: For Graphical Clarity, Actual Ranges Of Ground Elevations Served By Each Pressure Zone Are Not Accurately Illustrated.

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Water System Hydraulic Profile

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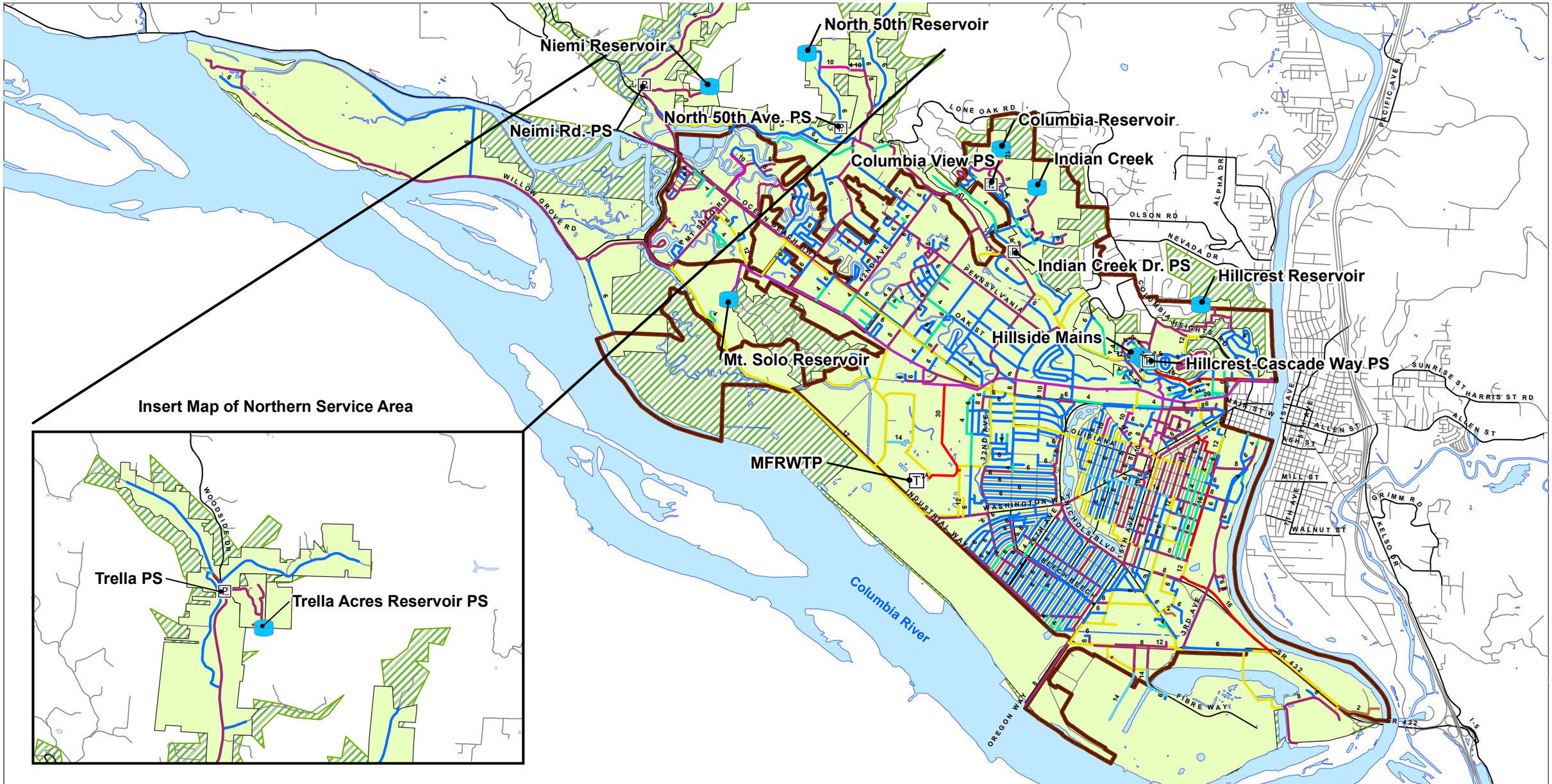
Figure 1-3



Legend

- Longview Water Reservoir
- Longview Pump Station
- Mint Farm Regional Water Treatment Plant (MFRWTP)
- Longview City Limits
- Street Centerline
- Longview Existing and Retail Service Area
- Longview Future and Retail Service Area
- Rivers and Lakes

Pipe Size (inch): 2, 3, 4, 6, 8, 10, 12, 14, 16, 20, 24, 30

This map is for information purposes only. Data was compiled from multiple sources. The data sources do not guarantee this data is accurate or complete. There may have been updates to the data since the publication of this map. All locations are approximate.

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Longview, Washington

Longview Existing Water System Overview

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Figure 1-4

Table 1-3: Booster Pump Stations [a, b]

Pump Station Name and Location	Pumps From	Pumps To	Horsepower (HP) and Estimated Capacity[c]
Hillcrest Located at main reservoir site (Hillside Reservoir)	Main (Hillside) Reservoir system (Pressure Zone El. 244.5 feet)	Hillcrest Reservoir and distribution area (Pressure Zone El. 481 feet)	Two Pumps No. 1 30 HP 260 gpm No. 2 30 HP 260 gpm
Indian Creek Sunset Way and Indian Hills Drive	Main (Hillside) Reservoir system (Pressure Zone El. 244.5 feet)	Indian Creek Reservoir and distribution area (Pressure Zone El. 463 feet)	Two Pumps No. 1 60 HP 350 gpm No. 2 30 HP 270 gpm
North 50th [c] Located on N.50th Ave.	Main (Hillside) Reservoir system (Pressure Zone El. 244.5 feet)	No. 50th Reservoir and distribution area (Pressure Zone El. 531 feet)	Two Pumps No. 1 30 HP 160 gpm No. 2 30 HP 160 gpm
Niemi Located on Niemi Road	Main (Hillside) Reservoir system (Pressure Zone El. 244.5 feet)	Niemi Reservoir and Lower Coal Creek distribution area (Pressure Zone El. 415 feet)	Two Pumps No. 1 25 HP 400 gpm No. 2 25 HP 340 gpm
Trella Coal Creek and Ragland Road	Coal Creek System (Niemi Reservoir - Pressure Zone El. 415 feet)	Trella Reservoir and Upper Coal Creek Road distribution area (Pressure Zone El. 653 feet)	Two Pumps No. 1 30 HP 190 gpm No. 2 30 HP 190 gpm
Columbia View Ammons Drive within Columbia View Addition	Indian Creek System (Pressure Zone El. 463 feet)	Columbia View Reservoir and distribution area (Pressure Zone El. 660 feet)	Two Pumps No. 1 15 HP 100 gpm No. 2 15 HP 100 gpm

Notes:

(a) Does not include pumps at the treatment plant that supply the Hillside and Mt. Solo reservoirs.
(b) All pump stations are controlled by reservoir level sensing.
(c) North 50th pump station uses a roto-phase to create 3-phase power. Only one pump can be run at a time.

Table 1-4: Water Storage Facilities

Storage Location	Tank Capacity (MG)	Type of Construction	Maximum Water Surface Elevation (feet)	Floor of Tank Elevation (feet)	Year Constructed	Date of Last Inspection
Hillside Mains[a]						
No. 1	0.5	Concrete	244.5	234.6	1924	12/17/2008
No. 2	0.5	Concrete	244.5	234.6	1928	12/18/2008
No. 3	1.0	Concrete	244.5	224.5	1948	1/6/2009
No. 4	5.0	Concrete	244.5	224.5	1950	1/14/2009
No. 5	5.0	Concrete	244.5	223.75	1962	1/21/2009
Total	12.0					
Mt. Solo[b]	5.0	Concrete	244.5	230	Unknown	12/10/2008
Hillcrest	1.0	Concrete	492	480	Unknown	12/15/2008
Indian Creek	0.15	Concrete	463	451	Unknown	12/3/2008
Columbia View	0.50	Welded Steel	660	640	1983	12/5/2008
Niemi	0.20	Concrete	415	401	1984	12/3/2008
Trella	0.30	Bolted Steel	653	631	1990	12/4/2008
North 50th	0.20	Bolted Steel	531	505	1989	12/4/2008

Notes:

(a) Effective (useable) storage is less than stated capacity due to Longview and BHWSD pump suction elevations which inhibits ability to draw the Hillside Main reservoirs down below elevation 235.0 feet.

(b) Effective storage is approximately 4.0 MG due to high reservoir elevation which inhibits ability to fill Mt. Solo to full capacity. Reservoir was constructed at wrong elevation and cannot be filled above elevation 244.5 feet which is approximately 4.5 feet below the top of overflow.

MG=million gallons

Table 1-5: Inventory of Water Mains

Diameter (inches)	Cast Iron	Ductile Iron	AC	Steel	PVC/HDPE	Total (feet)	Total (miles)
4	74,200	8,368	5,087	3,178[(a)]	0	90,833	17.2
6	395,031	93,700	13,838	10,274[(a)]	0	512,843	97.1
8	273,698	113,598	10,380	4,438[(a)]	0	402,114	76.2
10	3,972	6,031	0	0	0	10,003	1.9
12	104,691	63,532	1,098	0	280	169,601	32.1
14	4,531	8,339	0	0	0	12,870	2.4
16	1,076	13,551	5,762	0	0	20,389	3.9
20	1,303	22,432	6,940	7,216[(b)]	0	37,891	7.2
24	3,083	300	0	0	0	3,383	0.6
30	0	6,740	0	0	0	6,740	1.3
36	0	280	0	0	0	280	0.1
Total Feet	861,585	336,871	43,105	25,106	280	1,266,947	
Total Miles	163	64	8.2	4.8	0.1		240

Notes:

Data are approximate in some cases; lengths shown are in feet unless otherwise noted.
(a) Galvanized Steel.
(b) Steel Dipped and Wrapped; and Steel Coal Tar Dipped.

Source: City of Longview GIS Department 2011 Water Main Mapping.

Table 1-6: Pressure Reducing Stations

Name	Location	Service Zones[a]		Pressure Setting (psi)	
		From[b]	To[c]	High	Low
City View	City View Blvd. and Judith Place	Hillcrest (Pressure Zone El. 481 feet)	Pressure Zone El. 286 feet	135	65
Lower Ammons	Ammons 2900 Block	Ammons Drive (Pressure Zone El. 463 feet)	Pressure Zone El. 318 feet	100	43
Lower Columbia View	Curtis Lane	Columbia (Pressure Zone El. 660 feet)	Pressure Zone El. 488 feet	130	50
North Ammons	East End of Curtis Lane	Columbia (Pressure Zone El. 660 feet)	North Ammons El. 506 feet. Closed zone provide pressure and fire flow for North Ammons Drive	90	30
Upper Ammons[d]	Columbia View Pump Station	Columbia (Pressure Zone El. 660 feet)	Pressure Zone El. 463 feet [e]	130	45
Clark Creek Road	Clark Creek Lane	N. 50th Avenue (Pressure Zone El. 531 feet)	Clark Creek Road (Pressure Zone El. 395 feet)	154	89
Carlon Loop	Carlon Loop and Upper Coal Creek	Upper Coal Creek and Ragland Road (Pressure Zone El. 502 feet)	Lower Coal Creek (Pressure Zone El. 415 feet) [f]	110	55
Upper Coal Creek	Tanglewood Drive and Coal Creek Road	Tanglewood Drive (Pressure Zone El. 653 feet)	Upper Coal Creek and Ragland Road (Pressure Zone El. 502 feet)	175	110

Notes:

(a) The pressure zones correspond to the zones shown on Figures 1-1 and 1-3.
(b) Maximum overflow elevation of the reservoir from which the Pressure Relief Valve (PRV) is served.
(c) Pressure of the PRV on the reduced-pressure side, in feet. (The effective elevation of the PRV.)
(d) Backfeeds from the Columbia View Reservoir when the Indian Creek Reservoir is running low.
(e) Provides additional fire flow for Zone 463.
(f) Provides supplemental pressure and fire flow for Zone 415.

1.8 Conditions of Service

The City's water distribution system consists of all facilities used in the transmission of potable water. The water distribution system terminates at the customer's connection to the City's water meter. The City intends to maintain responsibility for the water supply only from the water distribution system to the point of connection at the meter. Thereafter, the customer is responsible for the water supplied. If all of the City's service area policies are met the City will provide water service within the identified service boundaries

Section 2: Basic Planning Data

2.1 Introduction

Water demand projections are necessary to plan for capital improvements and evaluate water resource needs. This section summarizes current water demands for the City's water system and presents the methodology and results of water demand projections. The basic planning information provided in this section forms the foundation of the WSP and will be utilized in subsequent sections to assess the current state and anticipated future needs of the water system relative to existing and proposed regulations and requirements. The section is organized into five areas: existing water demands, existing and forecast populations, existing per capita water demand, future water demand, and fire flow demand.

2.2 Existing Water Demands

Establishing the existing water demand for the City is the basis for forecasting future demand. Water demand data for 2006 to 2010 was obtained from the City and BHWSD and is summarized in Table 2-1. Demand reported in Table 2-1 for the RWTP is the combined total for the City of Longview and BHWSD and will serve as the demand for the MFRWTP. Negative values are reported for "Other Authorized Uses" because of inconsistencies with metering of water sold to Longview and BHWSD and Authorized Consumption. Table 2-1 shows a decreasing trend in distribution system losses (DSL) over the last 5 years. Water use efficiency will be discussed further in Section 4.

Table 2-1: RWTP–Annual Water Production and Demand for 2006 - 2010 (MG)

Component	2006	2007	2008	2009	2010
Treatment Plant Raw Water[(a)]	2,421	2,346	2,270	2,157	1,954
Treatment Plant Finished Water[(a)]	2,149	2,046	2,015	1,921	1,778
Production Operations Water[(b)]	272	300	255	236	176
Authorized Consumption[(c)]	N/A	1,834	1,926	1,787	1,702
Water Sold to Longview	1,805	1,727	1,698	1,608	1,492
Water Billed to Longview Customers	1,601	1,582	1,375	1,528	1,354
Other Authorized Uses[(d)]	N/A	-67	234	-54	62
Water Sold to BHWSD	343	319	317	313	286
Percent of Finished Water to BHWSD	16.0%	15.4%	15.6%	16.3%	16.1%
Distribution System Losses[(e)]	205	212	89	134	76
Distribution System Losses (DSL)	9.5%	10.4%	4.3%	7.0%	4.3%

Notes:

(a) From treatment plant records.
(b) Water used for treatment plant operations.
(c) From Water Use Efficiency (WUE) reports. Reporting started in 2007.
(d) Adjusted for inconsistencies in billing, includes un-metered uses.
(e) Primarily distribution system leakage.

Table 2-2 lists the Average Day Demand (ADD) and Maximum Day Demand (MDD) for the RWTP, reflecting service to both the City and BHWSD. ADD was calculated by converting the provided annual demands into an average daily demand; MDD for both raw and finished water was provided by the City from RWTP production records. From 2006 to 2010, finished water ADD decreased from 5.89 to 4.87 MGD and finished water MDD ranged from 9.04 to 10.64 MGD. MDD occurred in July and August as expected. The maximum MDD:ADD ratio was 2.03 for the system.

Table 2-2: RWTP – Average and MDD 2006-2010

	Year	2006	2007	2008	2009	2010
Average Day Demand (ADD, MGD)	*Raw ADD*	6.64	6.43	6.22	5.91	5.35
	Finished ADD	5.89	5.61	5.52	5.26	4.87
Maximum Day Demand [(a)] (MDD, MGD)	*Raw MDD*	10.89	11.87	11.14	11.55	10.06
	Finished MDD	9.94	10.64	10.17	10.66	9.04
Production Operations Water (MGD)		0.75	0.82	0.70	0.65	0.48
Month when MDD Occurred		July	July	August	July	August
Treated MDD:ADD Ratio		1.69	1.90	1.84	2.03	1.86

Note:

(a) Maximum Day Demand information obtained from RWTP production records.

Table 2-3 shows the estimated demands by service area for the City. Demands by area are estimates only because the City's upper distribution zones are not currently metered separately and the City's billing system is not set up to easily gather this information. The demands shown in Table 2-3 were obtained from distribution area pump station records. Data for 2010, considered to represent the best available data, was used as the basis year for analysis. Table 2-3 also illustrates that more than 90 percent comes from the Main (Zone 244) service area.

Table 2-3: Longview – Water Demand by Distribution Area

Pump Station For Upper Zones	Pressure Zones Served	Demand (MG per year)				
		2006	2007	2008	2009	2010
Niemi (Lower Coal Creek)	415	16	16	14	14	13
Trella (Upper Coal Creek)	653, 502	23	21	20	18	19
North 50th	531, 395	10	10	9	8	8
Indian Creek (Ammons)	463, 318	25	24	25	22	20
Columbia View	660, 488, 506	22	22	20	19	20
Hillcrest	286, 481	54	50	52	51	47
Main Zone Only Demand	244	1655	1584	1558	1476	1365
Total Pumped by Stations to Upper Service Zones		150	143	140	132	127
Percentage Pumped to Upper Pressure Zones		8.3%	8.3%	8.2%	8.2%	8.5%

Annual demands by customer connection category for the City are summarized in Table 2-4. These categories include single-family, multi-family, commercial, medical care, school, church, city usage, other, and losses. The main pressure area serves the full range of customers, while the upper pressure zones primarily serve single-family residences. Average demands per connection are also listed in Table 2-4. Single-family, church, and school customers generally have one unit per connection.

Equivalent Residential Units (ERUs) are used to express water usage by type of service connection. One ERU is defined as one average day of water consumption by a single-family residence, measured in gallons per day (gpd). Information by customer class for the year 2010 is also shown in Table 2-4. The 2010 average demand per single-family residential unit for Longview is 166.4 gpd, not including distribution system losses. Including the distribution system losses, the demand is 186.5 gpd. The ERU for each customer class is calculated by dividing the annual demand for each customer class by the average demand per single-family residence to obtain the number of ERUs for each customer class based on usage in that class. The ERUs for each customer class are listed in Table 2-4.

Approximately 61 percent of the yearly water demand is from residential customers (48.4 percent single-family and 13.3 percent multi-family). Commercial demand accounts for approximately 19 percent of the total annual demand.

Table 2-4: Residential Equivalence by Customer Class for 2010

Customer Class	Annual Demand Per Customer Class (MG)	Number of Connections	Percent of Total Demand (%)	Equivalent Residential Units
Single-family	723	11,903	48.4%	11903
Multifamily	198	403	13.3%	3260
Commercial	290	836	19.4%	4775
Medical Care[(a)]	52.8	17	3.5%	870
School	17.9	24	1.2%	295
Church	6.2	47	0.4%	103
City Usage	20.3	55	1.4%	335
Other[(b)]	24.3	219	1.6%	401
Losses	160		10.7%	
Totals	**1,492.5**	**13,504**	**100%**	**21,942**

Average Demand Per Single-Family Residence = 166.4 gpd

Average Demand per Single-Family Residence with Distribution System Losses = 186.5 gpd

Notes:

(a) Includes nursing homes.
(b) Includes estimated Fire Protection, "Water Only" billing accounts and Operation Usage for flushing.

Source: Longview 2011.

The southern side of the service area is heavily industrialized. Most of the existing industries obtain process water from their own sources but receive potable water from the City. All industrial connections are metered and include a backflow device as required by the City's cross connection control program. The highest industrial water demands are summarized in Table 2-5.

Table 2-5: Longview – Industrial Water Demands

Industry	2010 Demand	Source
Weyerhaeuser Company	139,000 gpd	Domestic water is supplied by the City. Process water is supplied from the Columbia River.

2.3 Existing and Forecast Population

Development of future water demand projections, assessment of the water system's ability to fulfill those demands, and development and planning of future water system improvements all depend on accurate growth estimates. Growth forecasting was performed using the mathematical equation for exponential growth shown in Equation 2-1 below:

Equation 2-1 $P = P_O * \exp(r * t)$

Where P = Population at time (*t*) in years
P_o = Initial population
r = Annual Growth Rate
t = Years elapsed from basis year

Population growth rates are currently being analyzed using the most recent census data (2010) for Cowlitz County. Forecast growth rates were calculated from population projections from the Office of Financial Management (OFM). OFM offers projections of high, medium, and low growth rates, as shown in Table 2-6. For forecasting purposes, a growth rate of 0.97 percent was used for population forecasts in this WSP; the City's Comprehensive Plan projected a 1 percent annual growth rate. For projection purposes, the unincorporated service area is assumed to grow at the same rate as the City.

Table 2-6: Projected Growth Rates for Cowlitz County

Cowlitz County	Actual Annual Growth Rate 2000-2010	Projected Annual Growth Rate	
		2010-2015	2010-2030
HIGH	0.97%	2.26%	2.07%
MEDIUM	0.97%	1.61%	1.46%
LOW	0.97%	1.06%	0.88%

Source: US Census Bureau and Office of Financial Management

Table 2-7 presents the existing and future population forecast for the City. The 2010 census population for the City was used as the starting population. The future projections were then calculated using the respective growth rate appearing in Table 2-6 and the population growth formula from above Equation (2-1). DOH requires water system plans use 6- and 20-year planning periods for analysis. For this 2012 WSP, forecasts and analysis will be made for years 2018 and 2032 in accordance with planning periods.

Table 2-7: Population Forecast for the City of Longview

Level of Forecast	2010 Census[(a)]	2018	2032
HIGH	36,648	43,914	57,850
MEDIUM	36,648	41,701	50,508
LOW	36,648	39,883	44,437
Actual 2000-2010 Growth Rate	36,648	39,603	45,360

Note:

(a) Source: http://data.spokesman.com/census/2010/washington/cities/longview-wa/

2.4 Existing Per Capita Water Demand

Per capita water demand for the City is listed in Table 2-8. In order to establish the per capita demand for the City's water service area, the population of the service area was estimated using the average number of people per household based on 2010 Census data. The estimated 2010 water service area population is based on the weighted average of 2.7 persons per ERU multiplied total single and multi-family ERUs. Per capita demands are presented for informational purposes only.

Table 2-8: Longview Per Capita Water Demands

2010 Population [(a)]	2010 Demand (Annual MG)	2010 Demand (gpd)	2010 Per Capita Demand (gpcd)[(b)]
40,288	1,492	4,087,671	101.5

Notes:

(a) Water Service Area Population. Estimated based on 2010 per household census data. Per 2010 Census 2.9 people per household for families (59.5% of the total households) and 2.3 people per household for non-families (40.5% of the total households). The weighted average is 2.7 people per residential and multi family connection.

(b) gpcd = gallons per capita per day

2.5 Future Water Demands

Evaluation of future water source, storage, transmission, and distribution system needs requires an estimate of anticipated future water demands. Future water demand projections for the City are best estimated from population projections and recent demand trends. Review of 5 years of RWTP records allowed determination of an ADD:MDD ratio for the system. The ratio for the

RWTP and the established ADD value for the City were used to establish MDD values for the City. ADD and MDD values were escalated using Equation 2-1 and the actual growth rate appearing in Table 2-6. The 2010 values are used for projections because they represent the most current water demands of the system. Future water demands for BHWSD were gathered from their water system plan update (Draft 2011).

2.5.1 Average Daily Demand (ADD) and Maximum Daily Demand (MDD)

Future water demand forecasts, including ADD and MDD for the City, are summarized in Table 2-9. The demands are based on water sold to each utility, a percentage of distribution system losses, and major industrial facilities planned for the future. The ADD and MDD for the City, BHWSD, and the total for the MFRWTP are presented graphically on Figure 2-1 without conservation effects. Conservation effects are discussed in Section 4 of this document.

Table 2-9: Future Water Demands (MGD)

	2010		2018		2032	
	ADD	MDD	ADD	MDD	ADD	MDD
Longview	4.09	7.61	4.42	8.23	5.07	9.42
BHWSD[(a)]	0.86	1.57	0.97	1.78	1.33	2.43
Total	4.95	9.18	5.39	10.01	6.40	11.85

Note:

(a) From BHWSD Water System Plan (Draft 2011), Projection years 2009, 2015, and 2030.

Figure 2-1: Longview Projected Water Demands

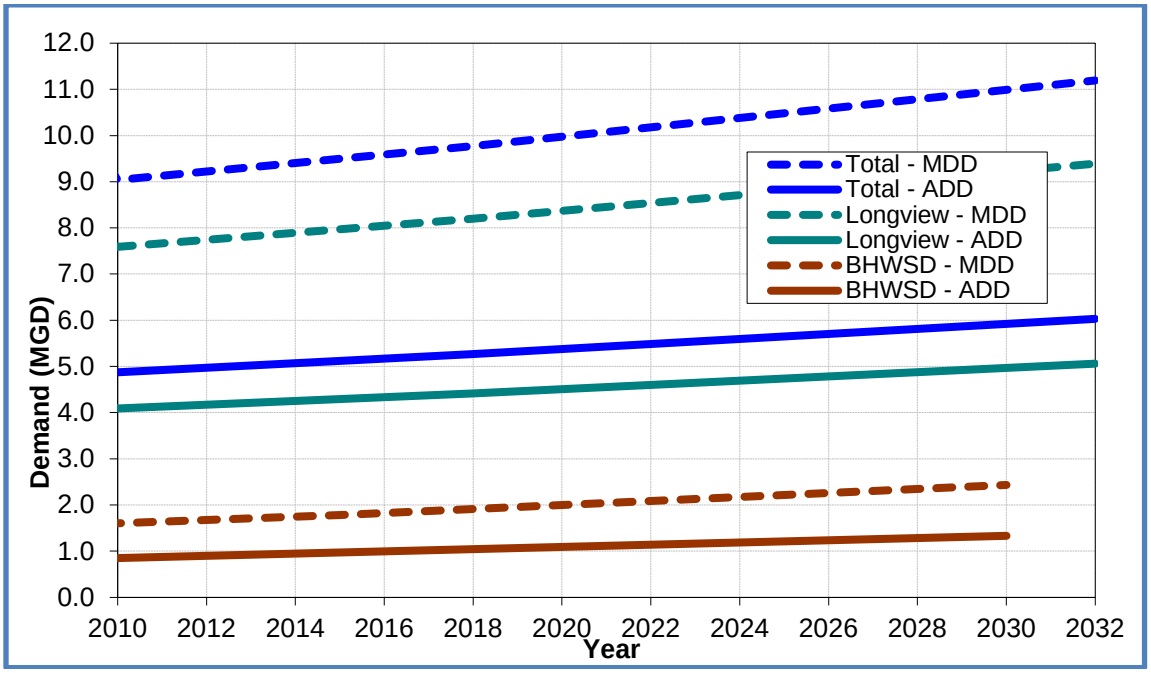

Table 2-10 summarizes the projected ERUs for the City, which are used to analyze present and future system requirements and summarizes the projected demand per ERU based on 2010 ERU water demand calculations. ERUs are projected by customer classes for the 6- and 20-year planning periods. The growth rate for individual customer classes has historically paced the area residential growth. Therefore the growth rate by customer class was assumed to be the same as the general residential forecasted growth rate.

Table 2-10: Projected ERUs and Demand Per ERU

Customer Class	Estimated % Growth Rate by Customer Class[(a)]	2010	2018	2032
Single-family	0.97%	11,903	12,863	14,733
Multifamily	0.97%	3,260	3,523	4,035
Commercial	0.97%	4,775	5,161	5,911
Medical Care	0.97%	870	941	1,077
School	0.97%	295	319	366
Church	0.97%	103	112	128
City Usage	0.97%	335	363	415
Other	0.97%	401	434	497
Totals		**21,942**	**23,716**	**27,162**
Demand per ERU (gpd/ERU)[(a)]				
ADD		**186.5**	**-**	**-**
MDD		**346.9**	**-**	**-**

Note:

(a) Demand per ERU will remain the same throughout the 6- and 20-year planning period because ERUs and water demands are forecast using the same method.

Table 2-11 provides ERU projections by zone. The values shown in the tables are used to perform the source, treatment capacity, pump station capacity, and storage analyses discussed in Section 3. Calculations to obtain ERUs (in gpd) are explained in Section 2.2.1. The actual number of ERUs by zone was calculated by taking the corresponding percentage of water demand for each zone. The City is experiencing relatively uniform growth rates throughout its service areas; therefore, ERUs by zone were forecast using the calculated actual historic growth rate for the City shown in Table 2-6.

The potential demands resulting from the proposed Curtis Road intertie are not included in the projections by zone because the exact nature of the intertie operation has yet to be determined. Based on information contained the BHWSD WSP (Draft 2011), the Lone Oak Reservoir currently serves 262 ERUs and is estimated to serve 406 ERUs by the year 2030.

Table 2-11: ERU Projection by Zone

Pump Station and Zones Served	Estimated % Growth Rate by Zone[(a)]	Metered Demand 2010 (MG)	Percentage of Water Demand	ERU by Zone 2010	2018	2032
Niemi (415)	0.97%	13.0	0.87%	191	207	237
Trella (502, 653)	0.97%	19.0	1.27%	279	302	346
North 50th (395, 531)	0.97%	8.0	0.54%	118	127	146
Indian Creek (318, 463)	0.97%	20.0	1.34%	294	318	364
Columbia View (488, 506, 660)	0.97%	20.0	1.34%	294	318	364
Hillcrest (286, 481)	0.97%	47.0	3.15%	691	747	856
Main Zone (244)	0.97%	1365	91.49%	20,074	21,697	24,850
Totals		**1,492**		**21,942**	**23,716**	**27,162**

Notes:

(a) Growth rates assumed uniform among zones.
(b) BHWSD demand projections not included.

2.5.2 Peak Hour Demand (PHD)

Peak Hour Demand (PHD) is the maximum rate of water use, excluding fire flow, that can be expected to occur within a defined service area over a continuous 60-minute time period. Typically, the peak hour occurs during the evening and is approximately 170 percent of the maximum demand for that day. The following Equation 5-1 from the DOH Water System Design Manual was used to calculate PHD for the years shown. Future PHD was forecast using the peak hour demand Equation 5-1, the value obtained for 2010, and the growth rate appearing in Table 2-6.

Equation 5-1 $$PHD = \frac{MDD}{1440} * (C * N + F) + 18$$

Where: PHD = Peak Hourly Demand (gpm)
C = Coefficient associated with ranges of ERUs (C=1.6)
N = Number of service connections in ERUs
F = Factor associated with ranges of ERUs (F=225)
MDD = MDD (gpd/ERU)

Further discussion of this formula appears in Section 3. Projected MDDs are located in Table 2-9, and PHD projections through 2059 are provided in Table 2-12. PHD projections are based on projected ERUs and MDD using the growth rate appearing in Table 2-6 and Equation 5-1 above.

Table 2-12: Peak Hourly Demand Projections (MGD)

Component	2010	PHD:MDD Ratio 2010	2018	PHD:MDD Ratio 2010	2032	PHD:MDD Ratio 2010
Longview	12.3	1.61	13.3	1.61	15.2	1.61
BHWSD[(a)]	2.6	1.66	2.9	1.63	4.0	1.65
Total	14.9	-	16.2	-	19.2	-

Note:

(a) From Beacon Hill Water and Sewer District Water System Plan (Draft 2011), Projection years are 2009, 2015, and 2029.

2.6 Fire Flow Demand

Fire flow demand refers to the rate of water flow necessary to control major fires within the service areas. The water transmission and distribution system should be designed to maintain a minimum pressure of 20 pounds per square inch (psi) at the point of fire flow delivery as well as throughout the rest of the system under maximum day conditions as required by WAC 246-290-230(6).

2.6.1 Fire Flow Standards

Several standards are available for establishing fire flow:

- International Fire Code (IFC)
- Cowlitz County Building Code, Article 16.05
- Washington Survey and Rating Bureau Standard.

The City has established its own Fire Marshal jurisdiction, and an interlocal agreement between the City and Cowlitz 2 Fire and Rescue (Mutual Aid Agreement 19 January 1995) enhanced emergency response. The agreement is included in Appendix B.

2.6.2 Fire Flow Requirements

Actual fire flow requirements for specified projects depend on several circumstances:

- Size of the structure(s)
- Location of the structure/project
- Type of construction material (wood versus concrete/brick, etc.)
- Number of stories
- Building fire protection systems (sprinklers, automatic fire doors, etc.)
- Proximity of adjacent structures
- Type of occupancy/building use (storage of flammable chemicals, etc.).

Fire flow demand requirements and standards for land use classification and structural type are summarized in Table 2-13. The standards require fire flows to be delivered at a minimum of 20 psi during MDD. The design fire flows shown in Table 2-13 will be used in the hydraulic analysis of the distribution systems computer model. Results of the computer modeling will identify areas that require improvement in order to meet fire flow demands.

In general, the City's policy is to follow the IFC or Cowlitz County Building Code, Article 16.05, depending on the jurisdictional location of the pressure zone. In cases where a City-operated zone falls into both the city and county, the City fire flow standards will apply. Fire flows for the main zone (244) will comply with the Washington State Rating Bureau (WSRB).

Table 2-13: Fire Flow Demand Requirements

Class	Longview Pressure Zones Inside City Limits	Longview Pressure Zones Outside City Limits
Residential/ Single-Family	244, 481, 286, 318, 463, 506, 660, 488	481, 318, 488, 531, 395, 415, 502, 653
Residential/Multi-Family	244, 481, 286, 318, 463, 488	481, 318, 488
Commercial	244	244, 415, 502
Schools	244	244
Industrial	244	244

Class	Jurisdiction	Fire Flow (gpm)/ Duration (hrs)
Residential/Single Family (Less than 3,500 sf)	County	500 gpm for 0.5 hr[(a)]
Residential/Single Family (Less than 3,600 sf)	City	1,000 gpm for 1 hr[(b)]
Residential/Multi-Family	City/County	1,500 gpm for 2 hrs[(b)]
Commercial	County	1,500 gpm for 2 hrs
Commercial	City	5,000 gpm for 4 hrs[(b)]
Schools	City	5,000 gpm for 4 hrs[(b)]
Industrial	City	5,000 gpm for 4 hrs[(b)]

Notes:

(a) County Ordinance. Refer to full ordinance and 2009 IFC, Table B105.1 for larger dwellings and other building classes.

(b) IFC estimated minimum required fire flow based on typical construction type and size for each building class and including sprinkler system deductions. Actual fire flow requirements are determined based on the 2009 IFC, Table B105.1.

sf = square feet

Section 3: System Analysis

3.1 Introduction

A water utility's ability to meet current and anticipated demands is the principal consideration in water system planning. In addition to demand considerations, water quality, facilities planning, and regulatory requirements all influence how a water system must be analyzed. To address these influences, the following components are examined in this section:

- General Facility Standards
- Water Quality Regulations and Standards
- Analysis of Water Quality and Treatment
- System Analysis
- Summary of System Deficiencies.

Water quality and facility analyses evaluate existing facilities according to pre-identified design standards. The results of these analyses provide a summary of water system deficiencies and basis for recommended improvements.

3.2 General Facility Standards

Performance and design criteria typically address sizing and reliability requirements for source, storage, distribution, fire flow, and water quality. The DOH relies on various publications, agencies, and the utility itself to establish appropriate design criteria. WAC 246-290-200 - Design Standards, details the various criteria recognized by the DOH. The following are brief descriptions of the two most widely recognized performance and design standards: Water Systems Design Manual and the Recommended Standards for Water Works. Developer design requirements, including materials, sizing, and construction standards, are presented in Section 7: Distribution Facilities Design and Construction Standards. Table 3-1, General Facilities Requirements, summarizes the minimum allowable design standards.

- **Water System Design Manual, DOH (August 2009)**. These standards serve as a guideline for preparing plans and specifications for Group A public water systems in accordance with WAC 246-290 and build and expand on the current standards published in DOH's *Sizing Guidelines for Public Water Supplies.* Where these documents specify standards different from the Ten States Standards, provisions of the DOH Standards will govern. The design manual also includes procedures for establishing system capacity based upon ERUs.

- **Recommended Standards for Water Works, A Committee Report of the Great Lakes – Upper Mississippi River Board of State Public Health and Environmental Manager (2007).** Commonly known as the "Ten States Standards" this document formalizes the design standards recommended by a water supply committee representing 10 Midwestern and Upper Great Lake states and the Province of Ontario. First published in 1953, the Water Supply Committee report has been revised and reissued numerous times, most recently in 2007. The report presents recommendations

for both design and construction standards; however, the construction standards are somewhat general in nature, with minor emphasis on materials specifications. Because surface water treatment is common in the Midwest and Upper Great Lakes, the committee report tends to concentrate on water treatment plant (WTP) design and operation.

Table 3-1: DOH - General Facility Requirements

Standard	DOH Requirements	Comments
ADD and MDD	ADD determined by historical water use data generated by accurate production and consumption meters. MDD is estimated by the use of historical data.	
PHD is in gpm MDD is in gpd/ERU C = Coefficient associated with the no. of ERUs N = Number of ERUs F = Factor associated with the no. of ERUs	$PHD = \frac{MDD}{1440}[(C)(N)+F]+18$ If ERUs > 500, C = 1.6, F = 225 If ERUs >250 and < 500; C = 1.8, F = 125 If ERUs >100 and < 250; C = 2.0 and F = 75 If ERUs > 50 and < 100; C = 2.5, F = 25 If ERUs > 15 and < 50; C = 3.0, F = 0	
Water Quality and Treatment	As established in WAC 246-290, effective 27 April 2003, last updated August 2011.	Modification of the lead and copper rule.
Storage Requirements	The sum of: <u>Operational Storage</u> (OS, gallons) OS depends on reservoir settings <u>Equalizing Storage</u> (ES, gallons) ES = (PHD-Qs)*150, where Qs = sum of all non-emergency sources of supply in gpm <u>Standby Storage</u> (SB, gallons) SB = (2)(ADD) or 200 gallons/ERU minimum and /or the larger of: <u>Fire Suppression Storage (FSS, gallons)</u> FSS is calculated based on the required fire flow for each zone. <u>Dead Storage (DS, gallons)</u> DS is the volume corresponding to the water level in a reservoir when 20 psi cannot be maintained in the system	Nest fire storage and standby storage. Choose larger of two for storage requirement. Standby storage to be based on 200 gallons/ERU.
Source of Supply	Water system source, treatment, and storage facilities must be designed so that together they meet MDD (WAC 246-290-222). DOH recommends source alone be able to meet MDD.	Treatment plant unit processes will meet MDD. Unit Process capacity is based on reliable capacity. Reliable capacity is the capacity of a treatment plant with the largest unit out of service.
Minimum System Pressure	The system should be designed to maintain a minimum of 30 psi in the distribution system under PHD and 20 psi throughout the system under fire flow conditions.	

Standard	DOH Requirements	Comments
Minimum Pipe Sizes	The minimum size for a transmission line should be determined by hydraulic analysis. The smallest distribution system line shall not be less than 6 inches in diameter. Distribution mains must deliver PHD with 30 psi residual pressure, and fire flow at MDD with 20 psi system wide. Pipe must be sized so the maximum velocity of 8 feet per second (fps) is not exceeded under PHD conditions.	Minimum pipe diameter as established in the City's Design and Construction Standards. The City's standards meet or exceed DOH requirements for 6" minimum pipeline requirement.
Backup Power Requirements	Onsite back-up power equipment or gravity standby storage shall be provided unless the power grid meets the minimum reliability criteria established in Section 7.7, "Water System Design Manual."	In cases where gravity standby storage is unavailable or insufficient, onsite backup power generator will be provided.
Booster Pump Requirements	Per WAC 246-290-230, open system booster pumps must meet MDD for the system at a minimum pressure of 30 psi. Open systems are defined as systems pumping to reservoirs where water levels are allowed to fluctuate based on changing demands. The recommended reliability standard is MDD with the largest pump out of service. Closed system booster pumps must meet PHD with a minimum pressure of 30 psi.	For this WSP, booster pump capacity will be analyzed with the largest booster pump out of service, as known as reliable capacity (as defined above).
Water System Physical Capacity	Determine the water system physical capacity of each system component in terms of ERUs, as required by WAC 246-290-222.	City will adopt DOH criteria for determining ERUs as established in the Recommended Standards for Waterworks Manual.

3.3 Water Quality Regulations and Standards

This section discusses the following:

- Regulatory Framework
- Applicable Drinking Water Regulations
- Existing Drinking Water Quality Standards
- Water Quality Monitoring Requirements
- Potential Future Drinking Water Regulations.

3.3.1 Regulatory Framework

In the state of Washington, the United States Environmental Protection Agency (EPA) and the DOH establish drinking water standards in accordance with EPA requirements. In general, water quality standards can be separated into primary and secondary standards. Primary standards are established for the protection of public health, while secondary standards cover aesthetic considerations. Current drinking water regulations attempt to manage two distinct kinds of risk: microbial and chemical.

The City has historically used surface water as its source of supply and thus, has been subject to increasingly stringent surface water regulations. With completion of the new MFRWTP and groundwater source, the existing RWTP and surface water source will no longer be used or maintained as a backup source of drinking water supply; however, it will likely be maintained as a source of flushing water for Lake Sacajawea. The regulations governing groundwater are very different from those concerning surface water. In surface water treatment, turbidity is used as a surrogate for pathogens and is closely tracked throughout treatment. Because groundwater is much safer with respect to microbial contamination, there is no emphasis on tracking turbidity and sampling requirements are generally reduced.

In general, water quality standards can be separated into source water/water treatment and distribution system requirements. The regulatory requirements applicable to each category will be discussed below.

3.3.2 Applicable Regulations

The Safe Drinking Water Act (SDWA) is the foundation for all state and local government water quality standards. Present regulatory approaches and health effect assessment methodologies largely focus on individual contaminants. Therefore, the utilities must maintain a broad perspective to manage overall risks and formulate plans to address known and emerging contaminants. The State Drinking Water Regulations are revised regularly to incorporate new EPA rules. Compliance with the ever-changing rules related to water quality and treatment is very challenging.

The basic regulatory requirements for drinking water quality in the State of Washington are published in the Drinking Water Regulations (WAC 246-290) and administered and enforced by DOH. The City of Longview Group A Public Water System is regulated under WAC 246-290, which was last updated August 2011. In most cases, the regulations adopted by DOH are the minimum requirements established by the EPA. However, DOH has the option to adopt and enforce standards that are more stringent than the federal regulation. These regulations provide oversight for the design, construction, and operation of public water systems in Washington. Existing regulations cover bacteriological contaminants, inorganic compounds (IOCs), physical characteristics, lead and copper, disinfection by-products (DBPs), volatile organic chemicals (VOCs), synthetic organic chemicals (SOCs), and radionuclides.

3.3.3 Water Quality Standards

Historically, the City's source has been the Cowlitz River, thus the Surface Water Regulations applied. Beginning in late 2012, the City will commission its new groundwater source and treatment facility, the MFRWTP. The previous surface water treatment plant will be decommissioned sometime after the transition to the new groundwater source. Therefore, this section will focus on the regulations and standards that are applicable to groundwater.

This section discusses applicable drinking water regulations and the impacts on the City. The regulations discussed include the following:

- Groundwater Rule
- Arsenic Rule

- Radionuclides
- Inorganic and Organic Compound Monitoring
- Stage 1 Disinfectant/Disinfection By-Product Rule (D/DBPR-1)
- Stage 2 D/DBPR (D/DBPR-2)
- Total Coliform Rule
- Lead and Copper Rule
- Consumer Confidence Reports.

3.3.3.1 Groundwater Rule

Rule Summary: Pathogenic viruses and bacteria can occur in public water systems that use groundwater if the source water becomes contaminated.

The rule addresses these risks through a risk-targeting approach that relies on four major components:

1. Periodic sanitary surveys of groundwater systems require the evaluation of eight critical elements and the identification of significant deficiencies (e.g., a well located near a leaking septic system).
2. Source water monitoring to test for the presence of *E. coli*, *enterococci*, or *coliphage*, as follows:
   a. Triggered monitoring for systems that do not already provide treatment that achieves at least 4-log inactivation or removal of viruses and have a positive total coliform in their routine distribution system sampling.
   b. Assessment monitoring at the option of the State to require systems, at any time, to conduct source water assessment monitoring to help identify high risk systems.
3. Corrective actions required as follows for any system with a significant deficiency or source water fecal contamination:
   a. Correct all significant deficiencies
   b. Eliminate the source of contamination
   c. Provide an alternate source of water
   d. Provide treatment which reliably achieves 4-log inactivation or removal of viruses.
4. Compliance monitoring to ensure the installed treatment technology reliably achieves 4-log inactivation or removal of viruses.

Anticipated Impacts: Free chlorine will be used at the MFRWTP to oxidize iron and manganese and facilitate their removal in greensand filters. Because a free chlorine residual will be maintained throughout the treatment process, a disinfection credit can be claimed. This disinfection credit has been shown to provide the required 4-log virus inactivation; therefore, microbial monitoring under the Groundwater Rule will not be required.

3.3.3.2 Arsenic Rule

Rule Summary: Arsenic is most often present as a naturally occurring element in rocks, soil, water, air, plants, and animals. Volcanic activity, the erosion of rocks and minerals, and forest fires are natural sources that can release arsenic into the environment. Arsenic is also used by

industry in the United States for wood preservative purposes as well as in paints, drugs, dyes, soaps, metals, and semi-conductors. Agricultural applications, mining, and smelting also contribute to arsenic releases. Studies link inorganic arsenic ingestion to a number of health effects. These health effects include:

- Cancerous Effects: skin, bladder, lung, kidney, nasal passages, and liver and prostate cancer
- Non-cancerous effects: cardiovascular, pulmonary, immunological, neurological and endocrine (e.g., diabetes) effects.

Anticipated Impacts: On 22 January 2001, the EPA adopted a standard for arsenic in drinking water at 10 parts per billion (ppb), replacing the old standard of 50 ppb. The rule became effective on 22 February 2002. The rule was adopted by the DOH in 2006.

Arsenic is sampled as part of the IOC group of chemicals. An initial arsenic sample at the entry point to the distribution system, downstream of treatment, is required within the first 3 years of operation of the MFRWTP. Subsequent sampling is performed every 3 years. The MFRWTP has been designed to meet the City's goal of less than 5 ppb for arsenic, with feasibility testing which indicates the source water, prior to treatment, is slightly above this level.

3.3.3.3 Radionuclides

Rule Summary: The DOH has adopted the standards for radionuclides under WAC 246-290-310 (7) presented in Table 3-2.

Table 3-2: Radionuclide Standards

Radionuclide	MCL (5 pCi/L)
Combined Radium – 226 and 228	5 picocuries per liter (pCi/l)
Gross Alpha (excludes radon and uranium)	15 pCi/l
Beta Particles and Photo Emitters	4 millirems/year (mrem/yr)
Uranium	0.030 milligrams per liter (mg/l)

Anticipated Impacts: Currently, the DOH requires monitoring for gross alpha activity every four years. Compliance is based on analysis of an annual composite of four consecutive quarterly samples, or the average of the analyses of four quarterly samples. If the gross alpha activity exceeds 5 pCi/L, the same or equivalent sample must be analyzed for Radium-226 and Radium-228. If the results of the initial analysis are less than half the Maximum Contaminant Limit (MCL), as anticipated, the DOH may allow monitoring requirements based on analysis of a single sample collected every 48 months. Results of the analyses must be reported to the DOH after the monitoring period. The DOH must be notified within 48 hours of a violation of the primary MCL.

3.3.3.4 Inorganic and Organic Compound Monitoring Requirements

Rule Summary: WAC 246-290-300 establishes the inorganic and organic monitoring regulations. The contaminant groups included are IOCs, VOCs, and SOCs, as well as the individual contaminants asbestos, nitrate, and nitrite.

Anticipated Impacts: Table 3-3 presents typical monitoring requirements for organic and inorganic compounds for systems serving a population greater than 3,300. Repeat monitoring is based on initial results and vulnerability. If a contaminant is not detected (or is detected at very low levels), the frequency of monitoring is reduced. However, if a contaminant is found above the "trigger," the purveyors may be required to temporarily perform quarterly sampling. Feasibility testing for the MFRWTP indicates that IOCs, VOCs, and the individual contaminants noted should not be detected at levels triggering increased sampling.

The vulnerability assessment must demonstrate that the water system is not vulnerable to a particular contaminant, either by showing the contaminant was never used in the source area, or that susceptibility to the contaminant does not exist (due to source water production programs, prior test results, wellhead protection programs, etc.).

Results of the analyses must be reported to the DOH within 10 days after the end of the required monitoring period, unless the results exceed the MCL. In that case, the results must be reported to the DOH within 24 hours, or by the next business day after the results are reported to the utility.

3.3.3.1 Stage 1 Disinfectant/Disinfection By-Product Rule (D/DBPR-1)

Rule Summary: The D/DBPR-1 applies to all community water systems and non-transient, non-community water systems that add a disinfectant during any part of the treatment process. Major features of the D/DBPR-1 include: limits and monitoring requirements for DBPs and Maximum Residual Disinfectant Levels (MRDLs); and total organic carbon (TOC) removal requirements. Large surface water systems (i.e., serving a population of 10,000 or more) were required to comply by December 2001. Smaller surface water systems and all groundwater systems were required to comply with the D/DBPR-1 by December 2003. MCLs and MRDLs are listed in Table 3-4.

TOC Removal Requirements: TOC removal requirements for control of DBP precursors apply to all systems using surface water [including Groundwater Under the Influence of Surface Water (GWI)] and thus do not apply to groundwater systems.

Anticipated Impacts: Routine monitoring requirements under the D/DBPR-1 and WAC 246-290-300 are summarized in Table 3-5. Purveyors must submit a D/DBP Monitoring Plan to the DOH for review and approval. If a MCL is exceeded, the City must take follow up action as directed by the DOH. Actions may include re-sampling and/or public notification.

Table 3-3: Inorganic and Organic Compound Monitoring Requirements for Groundwater Systems

Contaminant	Sampling Frequency[a]	Trigger that Increases Sampling	Requirements for Waivers
Asbestos	1 sample every 9 years, not required for source approval	> MCL	Based on vulnerability assessment.
Nitrate	Annual	≥ 50% MCL	No waivers allowed.
Nitrite	1 sample every 3 years	≥ 50% MCL	No waivers allowed.
Inorganic Compounds (IOCs)	1 sample every 3 years	> MCL	Includes arsenic standard of 10 ppb.
Volatile Organic Compounds (VOCs)[b]	Quarterly sampling required for first 3 years of operation, then 1 sample every 3 years	Detection	If first sample is non-detect additional samples in first 3 years may be waived
Synthetic Organic Compounds (SOCs)[b] - Dioxin - Endothal - EDB - Diquat - Glyphosphate	Quarterly sampling required for first 3 years of operation, then 1 sample every 3 years	Detection	If first sample is non-detect additional samples in first 3 years may be waived
Synthetic Organic Compounds (SOCs) - Herbicides - Pesticides - Insecticides	Quarterly sampling required for first 3 years of operation, then 1 sample every 3 years	Detection	If first sample is non-detect additional samples in first 3 years may be waived

Notes:

(a) Sampling location is source water after treatment for all analytes.
(b) Well casing must be > 200 feet. Sampling frequency assumes low rating in the Susceptibility Assessment.

Table 3-4: Stage 1 Disinfectants/Disinfection By-Products Rule MCLs and MRDLs

Disinfectant/Disinfection By-Products	Stage 1 MCL
Disinfectant By-Products (MCL):	
Total trihalomethanes (TTHM)	80 μg/l [(a)]
Haloacetic acids 5 (HAA5)	60 μg/l
Bromate[(b)]	10 μg/l
Chlorite[(c)]	1 mg/l
Disinfectants (MRDL):	
Chlorine	4 mg/l
Chloramines	4 mg/l
Chlorine dioxide[(c)]	0.8 mg/l

Notes:

(a) μg/l = microgram per liter.
(b) Required only for systems using ozone.
(c) Required only for systems using chlorine dioxide.

Table 3-5: D/DBP Routine Monitoring Requirements[(a)]

Analyte[(b)]	Location	Frequency
TTHM and HAA5	Per initial distribution system evaluation	1 sample every 3 months for systems serving >10,000 persons
Chlorine	Same locations as coliform sampling	Sampling at same time as coliform sample collection

Notes:

(a) Reduced monitoring frequencies are possible.
(b) Monitoring requirements are not included for systems using ozone or chlorine dioxide.

3.3.3.2 Stage 2 Disinfectant/Disinfection By-Product Rule (D/DBPR-2)

Rule Summary: The D/DBPR-2 is designed to reduce DBP occurrence peaks in the distribution system based on changes to compliance monitoring provisions. Compliance monitoring is preceded by an initial distribution system evaluation (IDSE) study to select site-specific optimal sample points for capturing peaks. The effective date for this rule was June 2006.

Anticipated Impacts:
TTHM/HAA5: Compliance with each MCL will be determined based on a Locational Running Annual Average (LRAA) calculated at each sample location. Systems will comply with the DBPR-2 MCL in two phases:

- Stage 1: Three years after rule promulgation (with an additional 2-year extension available for systems requiring capital improvements), all systems must comply with a 120 TTHM and 100 µg/l HAA5 LRAA based on Stage 1 monitoring sites and also continue to comply with Stage 1 80 TTHM and 60 µg/l HAA5 LRAA limits.

- Stage 2: Six years after rule promulgation (with an additional 2-year extension available for systems requiring capital improvements) systems must comply with an 80 µg/l TTHM and 60 µg/l HAA5 LRAA based on new sampling sites identified under the IDSE. The City will need to comply with the monitoring requirements for groundwater system based on the 10,000 - 99,999 population size category.

- For Stage 2 DPB compliance, it is anticipated that the City will be required to complete four dual sample sets for paired TTHM and HAA5 at four sites on a quarterly basis. The locations will be specified in the City's coliform monitoring plan. The City has until the fourth quarter of 2013 to comply with Phase 2 monitoring requirements. The Stage 2 DBP Monitoring Plan will be completed after the new MFRWTP has been brought online in fall 2012.

Initial Distribution System Evaluation: IDSE studies conducted by systems are intended to select new compliance monitoring sites that more accurately represent high TTHM and HAA5 levels. The studies are based on either system-specific monitoring or other system-specific data that provides equivalent or better information for site selection. Systems recommend new or revised monitoring sites to the DOH based on their IDSE study. IDSE results will not be used for compliance purposes.

Systems conducting IDSE monitoring shall monitor for 1 year on a schedule determined by source water type and system size. As part of the monitoring schedule, all systems conducting IDSE monitoring must monitor during the peak historical month for DBP levels or water temperature. All IDSE samples will be paired (i.e., a TTHM and HAA5 sample will be obtained at each site).

In lieu of the IDSE monitoring, systems may perform an IDSE study based on other system-specific monitoring or system-specific data that will provide comparable or superior selection of new monitoring sites that target high DBP levels. Systems that can certify to the DOH that all samples obtained in the last 2 years contained less than 40 µg/l TTHM and 30 µg/l HAA5 are not required to conduct the IDSE. The City submitted an IDSE which has been approved by DOH per a letter dated 7 December 2011. However, the City still needs prepare a Stage 2 DBP Monitoring Compliance Plan for approval prior to the start date for required Stage 2 Monitoring. The Stage 2 DBP Moniitoriing Plan will be completed after the new MFRWTP has been brought online in fall of 2012.

3.3.3.3 Total Coliform Rule (TCR)

Rule Summary: The TCR, which became effective on 31 December 1990, prescribes monitoring and compliance protocols for assuring the bacteriological quality of water in distribution systems. It applies to all types of systems and establishes an MCL goal of zero for total coliform, fecal coliform, and *E. coli.* The key monitoring elements of the rule are summarized below. The DOH adopted the TCR requirements in WAC 246-290-300.

In 2010, proposed revisions to the TCR were published. The EPA expects to publish the final revisions to the TCR in the summer of 2012. The proposed revisions to the TCR include:

- Require public water systems that are vulnerable to microbial contamination to identify and fix problems

- Establish criteria for systems to qualify for and stay on reduced monitoring, thereby providing incentives for improved water system operation.

The proposed rule links monitoring frequency to water quality and system performance as follows:

- Provides criteria that well-operated small systems must meet to qualify and stay on reduced monitoring
- Requires increased monitoring for high-risk small systems with unacceptable compliance history
- Requires some new monitoring requirements for seasonal systems such as state and national parks.

The proposed rule establishes a maximum contaminant level goal (MCLG) and an MCL of zero for *E. coli*, a more specific indicator of fecal contamination and potential harmful pathogens than total coliform. This rule eliminates the current MCLG and MCL of zero for total coliform. A system that exceeds a specified frequency of total coliform occurrence must conduct an assessment to determine if any sanitary defects exist and, if found, correct them. In addition, under the proposed treatment technique requirements, a system that incurs an *E. coli* MCL violation must conduct an assessment and correct any sanitary defects found.

Anticipated Impacts: Revisions to the TCR are not expected to impact Longview's current monitoring requirement. If there are impacts it will likely come in the form of reduced monitoring requirements. The TCR requires the system to maintain and carry out a Coliform Monitoring Plan (CMP), which includes the following:

- System Map or diagram showing:
  - Water sources
  - Storage, treatment, and pressure regulation facilities
  - Distribution systems
  - Pressure zones
  - Interconnections
  - Coliform sample collection sites.
- Narrative that includes:
  - Public water system identification number
  - Population served and services
  - Water sources
  - System facilities and processes for storage, treatment, and pressure regulation
  - Coliform sample collection sites
  - Sampling schedule.

A copy of the City's current CMP is included in Appendix D of this WSP.

3.3.3.4 Lead and Copper Rule

Rule Summary: Published in June 1991, the Lead and Copper Rule (LCR) sets treatment technique requirements for lead and copper. The LCR calls for monitoring to establish compliance with action levels of 0.015 mg/l for lead and 1.3 mg/l for copper. If either action level is exceeded, the water system must assess corrosion control alternatives and implement an "optimal" corrosion control program and/or treat the source water. Systems that remain in noncompliance after implementing 'optimal' corrosion-control strategies are required to locate and replace lead service lines according to a prescribed schedule.

Anticipated Impacts: Since the water source is changing, Longview will need to collect 60 samples for two 6-month sampling periods. If a system meets lead and copper action levels during each of two consecutive monitoring periods, the system may request the DOH to reduce the required monitoring frequency to once per year. A water system (between 3,300 to 50,000 persons) that meets the lead and copper action levels during 3 consecutive years of monitoring may reduce the frequency of monitoring from annually to once every 3 years.

3.3.3.5 Consumer Confidence Reports (CCR)

Rule Summary: This rule requires community water systems to prepare and provide annual CCRs to their customers reporting the quality of the water delivered by the systems. CCRs are intended to provide information to the public regarding the quality of the water delivered by Community Water Systems (CWSs) and characterize the risks (if any) from exposure to contaminants in the drinking water. The CCR must be written in plain English and shall present the results of sampling programs conducted by the CWS, as well as any MCL violations, variances, or exemptions granted to the system. The CCR must also provide the name of a utility contact person.

Anticipated Impacts: Each system must mail a copy of the CCR to every customer. The City currently prepares annual CCRs, mails a copy of the CCR to every customer, and posts the report online on the City's Water Operations Division website.

3.3.4 Summary of Monitoring Requirements

The most pertinent monitoring plans are summarized below:

- **Water Quality Monitoring Report (WQMR):** Issued annually by the DOH to the City, the WQMR describes the water quality parameters that must be collected and sampled.

- **Coliform Monitoring Plan (CMP):** A plan developed by the City that stipulates the number of monthly bacteriological samples to be collected and the location where the sampling shall be conducted. Chlorine residuals at sampling points are to be reported too. The City must maintain a copy of the CMP for DOH review, if requested. A copy of the City's CMP is included in Appendix D of this WSP.

- **DBP Monitoring Plan**: A plan developed by the City that stipulates the number of DBP samples to be collected and the location where the sampling shall be conducted. The plan must be approved by the DOH prior to implementation. A copy of the City's DBP Monitoring Plan is included in Appendix D of this WSP.

- **Groundwater Treatment Plant Report**: A monthly form that includes water production, chlorine solution used, fluoride solution used, and treated water quality (chlorine residuals at the entry point to and within the distribution system). This form is much simpler than the water treatment plant monitoring previously required for the RWTP and surface water source.

Table 3-6 summarizes the most significant water quality rules applicable to the City.

3.3.4.1 Unregulated Contaminant Monitoring

Rule Summary: EPA proposed a third round of unregulated contaminant monitoring (UCMR3) in February 2011. For UCMR3, all systems serving more than 10,000 people and 800 representative systems serving 10,000 or fewer people will monitor for 28 "List 1" Assessment Monitoring chemicals during a 12-month period from January 2013 through December 2015. A Screening Survey was required for the first and second rounds of UCMR (UCMR1 and UCMR2); however, no such monitoring is proposed for UCMR3. Pre-screen testing relies on newer analytical methods not as commonly used by drinking water laboratories. As proposed for UCMR3, EPA will select 800 representative systems serving 10,000 or fewer people. These systems will monitor for two “List 3” viruses twice during their designated 12-month period from January 2013 through December 2015.

Anticipated Impacts: The City is coordinating with DOH and will perform UCMR3 monitoring on the new groundwater source of supply, as opposed to the existing Cowlitz River supply.

Table 3-6: Summary of Significant DOH Monitoring Requirements

Required Monitored Parameter	Monitoring Frequency and Location	Summary of Existing Results[(a)]	Anticipated Mint Farm Results
D/DBPR-1	Established in D/DBP Monitoring Plan.	TTHM = 42 µg/L HAA5 = 27 µg/L	TTHM = 31.1 µg/L HAA5 = 19.4 µg/L
Total Coliform Rule (TCR)	Representative points throughout distribution system, established in CMP.	In compliance with CMP	In compliance with CMP
Lead and Copper Rule (LCR)	Established in WQMR. Initially 60 samples every 6 months, then reduced based upon results[(b)]	Copper = 0.166 mg/L Lead = 0.3 µg/L	Not Available – To Be Sampled
Chemical Monitoring (see Table 3-7)	Source after treatment, prior to entrance to distribution system. Established in WQMR.	IOCs < MCLs VOCs, SOCs not detected	IOCs < MCLs VOCs, SOCs not detected and < MCLs
Radionuclides (see Table 3-7)	Source after treatment, prior to entrance to distribution system. Established in WQMR.	Alpha emitters = - 0.87 pCi/L Beta emitters = 0.21 pCi/L Radium 228 = 0.12 µg/L Radium 226 not detected	Alpha emitters not detected Beta emitters = 1.2 pCi/L Radium 228 = 0.04 pCi/L Radium 226 =1.0 pCi/L

Notes:

(a) From 2010 Consumer Confidence Report. (Cowlitz River Source).
(b) Sampling frequency reduced to 30 samples every 6 months, if 90th percentile copper is greater than 0.65 mg/L but less than the allowable limit (AL) (1.3 mg/L) and 90th percentile lead is greater than 0.005 mg/L but less than the AL (0.05 mg/L). Sampling frequency reduced to 30 samples every 3 years, if 90th percentiles for copper and lead are less than 0.65 mg/L and 0.005 mg/L, respectively.

3.3.5 Future or Potential Regulations

The following future potential regulations will be briefly discussed:

- Fluoride
- Radon
- Perchlorate
- Methyl tertiary butyl ether (MTBE)
- N-Nitrosodimethylamine (NDMA)
- 1,4- Dioxane
- Contaminant Groups.

3.3.5.1 Fluoride

Rule Summary: The primary MCL for fluoride is 4.0 parts per million (ppm) and EPA has set an MCL of 4.0 ppm. The EPA has also set a secondary maximum contaminant level (SMCL) for fluoride at 2.0 ppm based on aesthetics. In September 2010, the Federal Department of Health and Human Services (HHS) convened a panel of scientists from the across the U.S. government to review new information related to fluoride intake and to develop new recommendations for community water fluoridation. This new information led HHS to propose changing the recommended level for community water systems to 0.7 ppm. The current recommended level is a range of 0.7 to 1.2 ppm. An announcement about the proposed change was published in the Federal Register. This optimal level recommendation is voluntary and not an enforceable regulation.

Anticipated Impacts: Some water systems have begun lowering fluoride levels in light of the new recommendation, although the EPA has not changed its regulatory levels for fluoride. The MFRWTP is designed to add an average dose of 0.8 mg/L and there is approximately 0.2 mg/L of naturally occurring fluoride in the groundwater. The City may consider reducing fluoride dosing in anticipation of a reduction in the fluoride dose requirements of the EPA.

3.3.5.2 Radon

Rule Summary: In 1997, the EPA withdrew the proposed MCL for radon previously recommended in 1991. In November 1999, the EPA released the currently proposed Radon Rule separate from the overall radionuclides rule. During the late 1990s and early 2000, the EPA held several regional facilitated workshops with representatives of state drinking water and radon programs to gather information and to discuss implementation issues. In 2003, the EPA held additional information gathering meetings with select state drinking water and radon program officials regarding consideration of a single MCL. No additional action by the EPA has taken place since those sessions were held.

Anticipated Impacts: The proposed MCLG for radon in drinking water is zero. This is a non-enforceable goal. The proposed regulation provides two options for the maximum level of radon that is allowable in community water supplies. The proposed MCL is 300 pCi/L and the proposed Alternative Maximum Contaminant Level (AMCL) is 4,000 pCi/L. The drinking water

standard that would apply for a system depends on whether or not the state or system develops a multimedia mitigation (MMM) program.

3.3.5.3 Perchlorate

Rule Summary: Perchlorate is both a naturally occurring and man-made chemical that is used to produce rocket fuel, fireworks, flares, and explosives. Perchlorate may have adverse health effects and can disrupt the thyroid's ability to produce hormones needed for normal growth and development. Two states have established regulatory standards for perchlorate in drinking water. In July 2006, Massachusetts promulgated a drinking water standard of 2 µg/L for perchlorate, and California established an MCL of 6 µg/L in October 2007. The EPA has developed an interim health advisory level of 15 µg/L and is moving forward with development of a federal MCL. The final MCL is anticipated within several years.

Anticipated Impacts: Perchlorate was not detected in groundwater water quality monitoring performed to date at the MFRWTP. It is important to note, however, that perchlorate can form in liquid hypochlorite (bleach) solutions, along with bromate and chlorate, and could thus be inadvertently added during treatment at the MFRWTP. Guidance is available to minimize the formation of perchlorate in hypochlorite storage tanks at drinking water treatment plants and will be followed at the MFRWTP.

3.3.5.4 Metyl Tertiary Butyl Ether (MTBE)

Rule Summary: MTBE is a member of a group of chemicals commonly known as fuel oxygenates. MTBE has been added to gasoline throughout the United States to reduce carbon monoxide and ozone levels caused by auto emissions. MTBE replaced the use of lead as an octane enhancer in 1979. MTBE causes a strong kerosene odor in drinking water. In December 1997, the EPA issued a Drinking Water Advisory that advised MTBE in the range of 20 to 40 ppb or below will probably not cause unpleasant taste and odor for most people.

Anticipated Impacts: The EPA determined that MTBE needs more health effects research and occurrence data before a regulatory determination can be made. Research to date has shown that at high levels, MTBE is a potential human carcinogen but the health effects at low levels are not known. As such, MTBE has been included in the Contaminant Candidate List (CCL3). In addition, MTBE was included in the Unregulated Contaminant Monitoring Regulation (UCMR) in 2001.

3.3.5.5 N-Nitrosodimetylamine (NDMA)

Rule Summary: NDMA has been used in the production of rocket fuels, is used as an industrial solvent, in rubber manufacturing, as an anti-oxidant, and it is also a disinfection byproduct, especially in chloraminated systems and in wastewater disinfection. It was included in the UCMR2. Exposure to high levels of NDMA may cause liver damage in humans. Symptoms of overexposure include headache, fever, nausea, jaundice, vomiting, and dizziness. NDMA is classified as reasonably anticipated to be a human carcinogen.

Anticipated Impacts: Although NDMA is listed as a priority pollutant in the Code of Federal Regulations (CFR) (40 CFR 136.36), no federal MCL has been established for drinking water.

3.3.5.6 1,4-Dioxane

Rule Summary: 1,4-Dioxane is primarily used as a stabilizer for 1,1,1-trichloroethane for storage and transport in aluminum containers and is also used as a solvent in the manufacture and processing of paper, cotton, textiles, cosmetics, and shampoos. It has recently been detected in products marketed as 'organic' or 'natural'. It is a probable human carcinogen. It has been detected in some groundwater, although low-level detection methods are still being developed.

Anticipated Impacts: It has been included on the CCL3 and has been short-listed for further regulatory study.

3.3.5.7 Regulating Contaminant Groups

Rule Summary: The EPA is in the early stages of developing regulations for groups of contaminants, as opposed to establishing MCLs for individual chemicals, as has been the standard practice. The EPA has decided to address as a group up to 16 VOCs that may cause cancer. This group will include trichloroethylene (TCE) and tetrachloroethylene (PCE). The EPA determined in March 2010 that the drinking water standards for these two currently regulated contaminants need to be revised. By addressing these VOCs as a group, the new rule is intended to help reduce exposure to these contaminants. Promulgation of this new rule is expected to take two to three years.

3.4 Analysis of Water Quality and Treatment

The existing RWTP will be replaced by the MFRWTP, situated on an approximate 10-acre site located in the south-central portion of the Mint Farm Industrial Park in Longview.

Pilot studies were performed in 2009 and 2010 to evaluate treatment requirements. Chlorination of the raw water followed by filtration using greensand media was the preferred alternative to remove iron, manganese, and arsenic in the raw water. Table 3-7 presents a summary of raw and treated water quality, based upon the pilot study results.

Table 3-7: Anticipated Raw and Treated Water Quality

Parameter	Average Raw Mint Farm Groundwater Quality	Estimated MFRWTP Finished Water[(a)]
pH	7.2	7.6
Alkalinity (mg/l as $CaCO_3$)	110	120
Temperature (degree Celsius)	12	12
Total Hardness (mg/l as $CaCO_3$)	90	90
Iron (mg/l)	0.66	< 0.05
Manganese (mg/l)	0.53	< 0.02
Arsenic (µg/l)	4.9	< 5
Calcium (mg/L as $CaCO_3$)	66	66
Dissolved Inorganic Carbon (mg/l)	254	254
Total Dissolved Solids (mg/l)	160	160
Conductivity (µmho/cm)	280	280
Total Silica (mg/l)	51.5	51.5
Fluoride (mg/l)	< 0.2	1.0
Chloride (mg/l)	6.0	6.0
Sulfate (mg/l)	0.6	0.6
Phosphate (mg/l)	0.4	0.4

Note:

(a) Estimated MFRWTP finished water quality reflects the following chemical dosages: 3 mg/l hypochlorite, 0.8 mg/l hydrofluosilicic acid, 8 mg/l caustic soda.
µmho/cm = micromhos per centimeter

The water supply and treatment process selected for the MFRWTP includes four groundwater wells, six greensand filters, and chemical feed systems (hypochlorite, sodium hydroxide, and fluorosilicic acid) with metering pumps and storage tanks. Ancillary processes include a blowoff/ plant drain pump station, two air scour blowers, two backwash storage tanks, three backwash return pumps, three geotextile bags for solids dewatering, a bladder surge tank, a standby generator, a new transformer, and all other mechanical, electrical and instrumentation required to make a complete and operable facility. Other details concerning the treatment plant process are included in the Basis of Design Report (2010). The MFRWTP is currently under construction and will be commissioned in late 2012.

A new transmission main will connect the MFRWTP to the existing distribution system. Approximately 6,000 feet of 30-inch ductile iron pipe has been constructed for the transmission main. Additionally, new 12-inch distribution mains from the 30-inch water main will connect with water mains in Weber Avenue and the Columbia & Cowlitz Railroad right-of-way.

The City will be switching from its existing surface water supply to the groundwater in late 2012. During the transition and without proactive preparation there is a chance for regulatory and aesthetic water quality excursions as the MFRWTP begins operation and treated groundwater enters the distribution system. Potential problems include:

- Sediment scouring due to water flowing in different directions and changes in pressures within the distribution system
- Dislodging and release of existing scales
- Taste and odor complaints resulting from the slightly different taste of the new source and disturbance of pipeline environments.

To mitigate the potential problems associated with the source transition, the City has prepared a Distribution System Water Quality Plan, which provides recommendations for the transition from surface to groundwater, distribution flushing, and monitoring during the transition. The City has already begun targeted flushing in advance of commissioning the MFRWTP to minimize potential water quality problems. Corrosion control for compliance with the LCR is also of concern and is addressed in the MFRWTP Corrosion Control Plan.

3.5 System Analysis

The objective of this section is to determine whether the existing system facilities can meet the current and projected demands identified in Section 2: Basic Planning Data. The following water system components will be analyzed: source capacity, treatment plant capacity, booster pump station capacity, and storage capacity.

Current and projected average and peak demands for the City (developed in Section 2: Basic Planning Data) are summarized in Table 3-8. These projections were used for system analysis. BHWSD water demands are added when considering source and treatment capacity.

Table 3-8: Summary of Longview Water Demands

Year	ADD (MGD)	MDD (MGD)	PHD (MGD)	ERUs	ADD ERU Demand (gpd/ERU)	MDD ERU Demand (gpd/ERU)
2010	4.09	7.61	12.28	21,942	186.5	346.9
2018	4.42	8.23	13.27	23,716	186.5	346.9
2032	5.07	9.42	15.18	27,162	186.5	346.9

3.5.1 Source

The MFRWTP has four groundwater wells that pump water from a deep aquifer to the surface. There is room and aquifer capacity for two additional wells to be constructed when needed. Table 3-9 summarizes maximum instantaneous withdrawal rates and sustainable withdrawal rates for the MFRWTP as shown on their new water right permit.

Table 3-9: Summary of Available Groundwater Rights

Annual Source (acre-ft/yr)	Annual Source (MGD)	Instantaneous Maximum Source (gpm)	Instantaneous Maximum Source (MGD)
13,500	12.05	28,250	40.68

The available source capacity was compared to current and projected demands to determine source adequacy for ADD and MDD. Projected demands and source capacity were converted to ERUs. The results of the analyses are shown in Tables 3-10 and 3-11. Because the MFRWTP serves both the City and BHWSD, the analysis was performed on their cumulative demands. An ERU demand of 186.5 and 346.9 gpd/ERU was used for both the City and BHWSD ADD and MDD demands, respectively.

Table 3-10: Allowable ERUs for Raw Water Maximum Source Capacity (ADD Approach)

Year	Projected Raw Water Demand (MGD)[(a)]	Annual Source Water Right (MGD)	Projected ERUs[(a)]	Available Source ERUs[(b)]	Remaining Source ERUS
2010	5.35	12.05	26,418	64,611	38,193
2018	5.79	12.05	28,785	64,611	35,826
2032	6.63	12.05	34,082	64,611	30,529

Notes:

(a) Projected ERUs include both Longview and BHWSD projected figures.
(b) Available ERUs = Annual Source / ADD ERU demand

Table 3-11: Allowable ERUs for Raw Water Instantaneous Maximum Source Capacity (MDD Approach)

Year	Projected Raw Water Demand (MGD)	Instantaneous Maximum Source Water Right (MGD)	Projected ERUs[(a)]	Available Source ERUs[(b)]	Remaining Source ERUS
2010	10.06	40.68	26,418	117,267	90,849
2018	10.87	40.68	28,785	117,267	88,482
2032	12.45	40.68	34,082	117,267	83,185

Notes:

(a) Projected ERUs include both the City and BHWSD projected figures.
(b) Available ERUs = Instantaneous Maximum Source / MDD ERU demand

3.5.2 Treatment Capacity

Treatment capacity is a function of maximum day capacity expressed as ERUs. Table 3-12 illustrates the estimated allowable ERUs based on treatment capacity. The MFRWTP is designed to allow expansion and addition of two wells and two pressure filters. The staged maximum capacity is shown in Table 3-12. The current excess capacity and future addition of two wells and pressure filters will provide the City with the ability to attract potential industrial customers to support the City's economic stability.

Table 3-12: MFRWTP Capacity (MDD Approach)

Year	Maximum Daily Demand (MGD)[(a)]	Projected ERUs	MFRWTP Reliable Capacity (MGD)[(b)]	Available Treatment ERUs[(c)(d)]	Remaining Treatment ERUs
2010	9.18	26,418	17.4	50,245	23,827
2018	10.01	28,785	17.4	50,245	21,460
2032	11.85	34,082	17.4	50,245	16,163

Notes:

(a) MFRWTP includes both the City and BHWSD.
(b) MFRWTP reliable capacity based on Basis of Design.
(c) Available ERUs = Treatment Capacity / MDD ERU demand
(d) Ultimate plant capacity is 25.3 MGD; future capacity will be added as demand increases.

3.5.3 Pressure Zone and Storage Analysis

Storage requirements were calculated in each pressure zone for 2010 (average), 2018 (6-year planning period), and 2032 (20-year planning period) demands. Pressure zones were grouped according to the pump station that serves that zone. As such, a lower zone served through a PRV was grouped with the upper pressure zone serving the PRV.

Review of Pumping Criteria

3.5.3.1 Allocation of Source by Zone

It has already been established that the supply source for the City is adequate. The next step in the planning process is water allocation by zone. This allocation is an important consideration when determining the required storage volume for each zone. As defined below, total capacity, reliable capacity, and net reliable capacity must be evaluated to determine storage requirements. A discussion of the determination of required storage volumes follows.

- Total Capacity (TC): total pump station production with all pumps in service.
- Reliable Capacity (RC): total pump station production with the largest pump out of service. RC is used for pump station capacity analysis.
- Net Reliable Capacity (NRC): an adjustment to RC that accounts for withdrawals by a higher zone (e.g., a lower pump zone supplies an upper zone pump station). NRC is used in the storage capacity analysis to determine the amount of ES that a pressure zone requires.

Review of Storage Criteria

The criteria for storage requirements used in this analysis are outlined in the DOH Design Manual (August 2001) for Group A Public Water Systems. A storage reservoir consists of five component volumes:

- Operational storage (OS)
- Equalizing storage (ES)
- Standby storage (SB)
- Fire suppression storage (FSS)
- Dead storage (DS).

3.5.3.2 Operational Storage (OS)

OS is the volume of water devoted to supplying the water system when the pump facility is at rest. The OS volume, which varies by system, must be sufficient to prevent excessive pump cycling. The OS requirement is additional to the equalizing and standby/fire storage requirements. Currently, the City strives to maintain its reservoirs within 1 foot of the overflow level, except Mt. Solo and Columbia View. OS volume may change when the MFRWTP comes online in order to enhance tank turnover.

3.5.3.3 Equalizing Storage (ES)

ES is provided to meet seasonal and/or daily variations in demand that exceed the source pumping capacity. Diurnal peaks, which vary significantly from the average daily flow, typically occur during the morning and early evening. ES volume depends on PHD, source production capacity, and mode of operation (i.e., continuous pumping or call-on-demand).

If actual water records are unavailable, the DOH recommends the following equation to estimate the required ES volume. Therefore, the ES for each pressure zone was calculated as follows:

ES (gallons) = (PHD – Qs)(150 min), where:

PHD = PHD (gpm)

Qs = Source Production Rate (gpm)

3.5.3.4 Standby Storage (SB)

The main purpose of SB is to provide a measure of reliability for the system in case of unusual operating conditions (e.g., source production interruption or power failure). The volume of SB recommended varies depending upon whether the system is considered a single or multiple source system. However, when excessive water is stored, quality degradation may occur as the water ages. The City is considered to be a single-source system for this analysis. The recommended single-source SB volume is twice the ADD, as shown in the following equation (DOH 2001):

SB (gallons) = (2 days) (ADD)(N), where:

ADD is measured in gpd/ERU

N = Number of ERUs

or:

SB (gallons) = N * 200 gal/ERU

SB is to be provided to all service connections at 20 psi, and in no case can it be less than 200 gallons/ERU. The storage analysis was performed using the 200 gallons/ERU minimum to calculated SB.

3.5.3.5 Fire Suppression Storage (FSS)

The water delivery system (pumps, pipes, and reservoirs) must deliver the minimum fire suppression flows in accordance with established requirements while maintaining 20 psi throughout the distribution system [WAC 246-290-211(5)]. FSS is the product of the required fire flow (gpm) and duration (hrs). For example, per Cowlitz County Building Code, Article 16.05 for residential multi-family and commercial areas in the county, the required FSS is 1,500 gpm for 120 minutes, or 180,000 gallons. The recommended design fire flow requirements were summarized in Section 2: Basic Planning Data.

3.5.3.6 Dead Storage (DS)

DS is the volume of stored water that is not available to all consumers at the minimum design pressure. DS is excluded from the volumes provided to meet OS, ES, SB, and FSS. The total storage capacity of a reservoir minus the DS is the volume of effective storage.

3.5.3.7 Required Storage Volume

The total required storage volume for each pressure zone is equal to the sum of the OS, ES, and the larger of either SB or FSS. The required storage volume is based on effective storage and does not include DS.

3.5.4 Storage and Pump Station Analysis

For the purposes of this analysis, the MFRWTP's treated water production was allocated as per historical records of water demand between the City and BHWSD. As shown in Table 2-1, BHWSD currently receives approximately 16 percent of the MFRWTP's water production on a yearly basis. Available source volume was then allocated to each zone as described in Table 3-13. A summary of demand by pressure zone is presented in Table 3-14. ADDs by pressure zone are calculated based on information provided in Table 2- 3. MDD by pressure was calculated by multiplying the MDD:ADD ratio for the City in Table 2-2 by the ADD by pressure zone.

Table 3-13: Available Supply Allocated by Zone

Storage Analysis Zones	Total Capacity (gpm)	Reliable Capacity (gpm)
Main Zone (244)	16,000[(a)]	12,000
Niemi (415)	740	340
Trella (502, 653)	380	190
N. 50th Ave. (395, 531)	160	160
Indian Creek (318, 463)	620	270
Columbia View (488, 506, 660)	200	100
Hillcrest (286, 481)	520	260

Note:

(a) Main Zone pumping capacity is the pumping capacity of the wells at the Mint Farm.

Table 3-14: Summary of Demands by Area

	2010			2018			2032		
Reservoir Zone	ADD (MGD)	MDD (MGD)	PHD (gpm)	ADD (MGD)	MDD (MGD)	PHD (gpm)	ADD (MGD)	MDD (MGD)	PHD (gpm)
Niemi (415)	0.04	0.07	134	0.04	0.08	142	0.04	0.09	158
Trella (502, 653)	0.05	0.10	169	0.06	0.10	179	0.06	0.12	198
North 50th (395, 531)	0.02	0.04	93	0.02	0.04	97	0.03	0.05	106
Indian Creek (318, 463)	0.05	0.10	176	0.06	0.11	186	0.07	0.13	206
Columbia View (488, 506, 660)	0.05	0.10	176	0.06	0.11	186	0.07	0.13	206
Hillcrest (286, 481)	0.13	0.24	339	0.14	0.26	360	0.16	0.30	402
Main Zone (244)[(a)]	4.60	8.53	9,545	5.02	9.30	10,402	5.96	11.04	12,338
Total	4.95	9.18	NA	5.39	10.00	NA	6.40	11.85	NA

Note:

(a) Total BHWSD demand included in Main Zone demand only.

Pump Station Analysis

Pump station capacity was assessed to determine each pump station's ability to meet ADD and MDD over the planning period. For the re-pump zones, cumulative ADD and MDD values were used to determine whether the lower pump station could meet the instantaneous demand from the combined lower and upper zones. Niemi Road is an example of a re-pump zone (refer to Figure 1-3, Hydraulic Profile). The results of this analysis, summarized in Table 3-15, show that all pump stations have sufficient capacity to meet demand through 2032. The Main Zone's pumping capacity is the capacity of the well pumps at the Mint Farm. The Main Zone's pumps are able to meet both the City's demands and BHWSD's demands through 2032.

Currently, pump intake elevations at the Hillside reservoirs pose operation issues for BHWSD and the City as BHWSD's pump station intake elevation is located such that it does not allow the City full use of the Hillside Reservoirs' capacity. However; this does not impact City's ability to provide the expected level of service. The City and BHWSD are currently studying the issue. A Capital Improvements Program (CIP) project has been included in Section 8 of this WSP that will address both the City's and BHWSD's needs. A project has been included that will rebuild both the City and BHWSD's pump stations, lowering the suction elevation to allow the City to more fully utilize the storage in the Hillside Reservoirs. The proposed project that will remove storage tanks No 1 and No 2 from service to make room for a the combined pump station. The Hillside reservoirs No. 1 and No. 2 are the oldest tanks constructed in 1924 and 1928, respectively. They have a combined capacity of approximately 1 MG. As is illustrate in the storage analysis in this section, the City has more than adequate storage at the Main reservoirs; the proposed revisions will not impact the City's ability to provide adequate fire flow and standby storage.

Table 3-15: Pump Station MDD Capacity Analysis for Current Condition

Current Condition (2010)							
Pumping Zone	**ERUs**	**ADD (gpm)**	**MDD (gpm)**	**Pump Station Capacity (gpm)[a]**	**ADD Excess Capacity (gpm)**	**MDD Excess Capacity (gpm)**	**MDD Pump Station Capacity in ERUs**
Niemi (415)[b]	191	25	49	340	315	291	1,411
Trella (502, 653)	279	36	67	190	154	123	789
North 50th (395, 531)	118	15	28	160	145	132	664
Indian Creek (318, 463) [b]	294	38	71	270	232	199	1,121
Columbia View (488, 506, 660)	294	38	71	100	62	29	415
Hillcrest (286, 481)	691	90	167	260	170	93	1,079
Main Zone (244)[c]	24,550	3,197	5,921	12,000	8,803	6,079	49,813
2018							
Pumping Zone	**ERUs**	**ADD (gpm)**	**MDD (gpm)**	**Pump Station Capacity (gpm)[a]**	**ADD Excess Capacity (gpm)**	**MDD Excess Capacity (gpm)**	**MDD Pump Station Capacity in ERUs**
Niemi (415) [b]	207	27	56	340	313	284	1,411
Trella (502, 653)	302	39	73	190	151	117	789
North 50th (395, 531)	127	16	31	160	144	129	664
Indian Creek (318, 463) [b]	318	41	77	270	229	193	1,121
Columbia View (488, 506, 660)	318	41	77	100	59	23	415
Hillcrest (286, 481)	747	97	180	260	163	80	1,079
Main Zone (244)	26,766	3,483	6,456	12,000	8,517	5,544	49,813
2032							
Pumping Zone	**ERUs**	**ADD (gpm)**	**MDD (gpm)**	**Pump Station Capacity (gpm)[a]**	**ADD Excess Capacity (gpm)**	**MDD Excess Capacity (gpm)**	**MDD Pump Station Capacity in ERUs**
Niemi (415) [b]	237	31	60	340	309	280	1,411
Trella (502, 653)	346	45	83	190	145	107	789
North 50th (395, 531)	146	19	35	160	141	125	664
Indian Creek (318, 463) [b]	364	47	88	270	223	182	1,121
Columbia View (488, 506, 660)	364	47	88	100	53	12	415
Hillcrest (286, 481)	856	111	206	260	149	54	1,079
Main Zone (244)	31,770	4,142	7,666	12,000	7,858	4,334	49,813

Notes:

(a) Pump station capacity is based on RC.
(b) Niemi demands include Trella; Indian Creek demands include Columbia View.
(c) Main Zone demand and ERUs include total BHWSD demand.

Longview Storage Capacity Analysis

The results of the storage capacity analysis are presented in Table 3-16. The analysis includes the current condition and the projected storage needs for the 6-year (2018) and 20-year (2032) planning periods.

As shown in Table 3-16, the City needs additional storage in the Indian Creek Zone. FSS is the dominant requirement for the Indian Creek zone. The City uses the IFC requirement for residential/multi-family in the Indian Creek Zones (318 and 463), which is 1,500 gpm for 2 hours. Based on the storage analysis, the Indian Creek service zone requires an additional 39,000 gallons of storage to meet fire flow storage needs. However, there are other operational considerations for the Indian Creek zone. The Longview Country Club and golf course has a high peak demand during periods when they are irrigating and can rapidly deplete the storage supply in the Indian Creek zone. During periods of irrigation, the City and golf course need to coordinate operations so the City is able to provide the necessary level of service to this zone. It is estimated that golf course irrigation demands occur over a 4-hour period with an overall demand volume of approximately 84,000 gallons. Based on conversations with City staff and operational observations, the additional golf course demand was added to the required standby storage for analysis purposes. Analysis shows that even with the additional 84,000 gallons added to the standby storage requirement; the fire flow demand is still the greater demand. It is recommended that the City provide a minimum of 50,000 of additional gallons for storage for the Indian Creek zone.

As was previously discussed in the pump station analysis, the BHWSD and Hillcrest pump station intake elevations do not allow the City to fully utilize the storage capacity of the Hillside Reservoirs. This situation is reflected in the amount of effective storage used in the current condition storage evaluation. The 2018 and 2032 storage analysis reflects the completion of two planned capital improvement projects to address the identified storage deficiencies, Projects ST-01, ST-04, and PS-02 described in Section 8. The completion of ST-01 addresses the storage deficiency identified in the Indian Creek service zone; and the completion of ST-04 in conjunction with PS-02 addresses the suction inlet elevation issue identified previously. ST-01 is scheduled for completion in 2017 and will add an additional 50,000 gallons of standby storage at the Indian Creek reservoir; thus, rectifying the identified storage deficiency in the Indian Creek service zone. Therefore, the 2018 and 2032 analysis for this zone includes the anticipated additional storage.

ST-04, Hillside Reservoirs will be completed in conjunction with PS-02; these projects are scheduled for completion in 2013. ST-01 and PS-02 will demolish the two oldest reservoirs (No. 1 and No. 2) to create room for the new, combined City/BHWSD pump station and redesign of the pump station suction piping. While ST-04 will remove 1.0 MG of storage from the system, the net result will be an increase of effective storage as the City will be able to more fully utilize the available storage in Hillside Reservoirs Nos. 3, 4, and 5.

Table 3-16: Summary of Available Storage

Current Condition (2010)

Reservoir Zone	Zone Demand as ERUs	FSS (gal)	SB Storage (gal)[a]	ES (gal)	OS (gal)	Total Required Storage (gal)	Effective Storage (gal)	Existing Storage as ERUs[b]	Add'l ERUs Required	Additional Required Storage (gal)
Niemi (415)	191	180,000	38,237	-	10,000	190,000	200,000	1,000	-	-
Trella (502, 653)	279	180,000	55,884	-	12,000	192,000	300,000	1,500	-	-
North 50th (395, 531)	118	15,000	23,530	-	7,000	30,530	200,000	1,000	-	-
Indian Creek (318, 463)	294	180,000	58,826	-	9,000	189,000	150,000	750	-	39,000
Columbia View (488, 506, 660)	294	180,000	58,826	11,347	19,000	210,347	500,000	2,500	-	-
Hillcrest (286, 481)	691	180,000	138,240	11,792	45,000	236,792	1,000,000	5,000	-	-
Main Zone (244)[c]	24,550	1,200,000	4,014,857	-	873,000	4,887,857	12,379,994[d]	61,900	-	-

2018

Reservoir Zone	Zone Demand as ERUs	FSS (gal)	SB Storage (gal)[a]	ES (gal)	OS (gal)	Total Required Storage (gal)	Effective Storage (gal)	Existing Storage as ERUs[b]	Add'l ERUs Required	Additional Required Storage (gal)
Niemi (415)	207	180,000	41,328	-	10,000	190,000	200,000	1,000	-	-
Trella (502, 653)	302	180,000	60,403	-	12,000	192,000	300,000	1,500	-	-
North 50th (395, 531)	127	15,000	25,433	-	7,000	32,433	200,000	1,000	-	-
Indian Creek (318, 463)	318	180,000	63,582	-	9,000	189,000	200,000[e]	1,000	-	-
Columbia View (488, 506, 660)	318	180,000	63,582	12,889	19,000	211,889	500,000	2,500	-	-
Hillcrest (286, 481)	747	180,000	149,417	15,013	45,000	240,013	1,000,000	5,000	-	-
Main Zone (244)[c]	26,766	1,200,000	4,339,456	-	873,000	5,212,456	13,622,932[f]	68,115	-	-

Table 3-16: Summary of Available Storage (Continued)

	2032									
Reservoir Zone	**Zone Demand as ERUs**	**FSS (gal)**	**SB Storage (gal)[a]**	**ES (gal)**	**OS (gal)**	**Total Required Storage (gal)**	**Effective Storage (gal)**	**Existing Storage as ERUs[b]**	**Add'l ERUs Required**	**Additional Required Storage (gal)**
Niemi (415)	237	180,000	47,333	-	10,000	190,000	200,000	1,000	-	-
Trella (502, 653)	346	180,000	69,179	1,211	12,000	193,211	300,000	1,500	-	-
North 50th (395, 531)	146	15,000	29,128	-	7,000	36,128	200,000	1,000	-	-
Indian Creek (318, 463)	364	180,000	72,820	-	9,000	189,000	200,000	1,000	-	-
Columbia View (488, 506, 660)	364	180,000	72,820	15,895	19,000	214,895	500,000	2,500	-	-
Hillcrest (286, 481)	856	180,000	171,128	21,291	45,000	246,291	1,000,000	5,000	-	-
Main Zone (244)[c]	31,770	1,200,000	4,969,991	50,760	873,000	5,893,751	13,622,932[f]	68,115	-	-

Notes:

(a) Existing ERU demand for each zone shown in Section 2, Table 2-11.
(b) Existing Storage as ERUs = Effective storage / 200gal/ERU
(c) Includes Mt. Solo and Hillside Reservoirs, Effective storage for the Mt. Solo reservoir is 4MG.
(d) Dead storage calculated based on existing highest suction piping elevation (230.3).
(e) Reflects completion of CIP project for additional storage in the Indian Creek zone.
(f) Reflects the removal of 1.0 MG of storage and adjustments to the pump station suction elevation to increase effective storage.
`

The four main elements of the water system (water rights, treatment, pumping, and storage) have been analyzed for their ability to meet future demands. Table 3-17 shows the capacity of each element as ERUs. Currently, treatment is the limiting element of the system but is still exceedingly sufficient to meet demand beyond 2032. The MFRWTP will be able to expand capacity in the future if demand increases past current capacity. The other elements also adequately meet future demands over the planning periods of 6 and 20 years. ERUs for both the City and BHWSD are shown in Table 3-17 to provide comparison of demands and demonstrate the City's ability to amply meet its the combined demand.

Table 3-17: Determination of Limiting Criteria for System Elements

	2010			2018			2032		
Criteria	**Capacity (ERUs)**	**Longview ERUs**	**BHWSD ERUs[a]**	**Capacity (ERUs)**	**Longview ERUs**	**BHWSD ERUs**	**Capacity (ERUs)**	**Longview ERUs**	**BHWSD ERUs**
Source Capacity[b]									
Maximum Water Right Capacity	64,611	21,942	4,476	64,611	23,716	5,069	64,611	27,162	6,920
Instantaneous Water Right Capacity	117,267	21,942	4,476	117,267	23,716	5,069	117,267	27,162	6,920
Treatment Capacity[b]	50,245	21,942	4,476	50,245	23,716	5,069	50,245	27,162	6,920
Reliable Pump Capacity	55,292	21,942	-	55,292	23,716	-	55,292	27,162	-
Storage Capacity	91,750	21,942	-	91,750	23,716	-	91,750	27,162	-
Water System Physical Capacity: 50,405 ERUs									

Notes:

(a) From BHWSD Water System Plan (Draft 2011), Projection years are 2009, 2015, and 2029.
(b) Includes both the City and BHWSD. Capacity is based on current design capacity of MFRWTP and does not include future capacity provisions.

3.5.5 New Proposed Curtis Drive Intertie with BHWSD

A new intertie on Curtis Drive is being proposed to supply BHWSD's Lone Oak zone with water from the Columbia View Reservoir. BHWSD plans to operate the proposed intertie on a full time basis. If the intertie is constructed, BHWSD's Lone Oak service zone will primarily be served by Longview's Columbia View zone. A separate analysis was completed to illustrate the potential impacts to Longview's Columbia View Pump Station and Reservoir. BHWSD projected water demands and ERUs were obtained from the BHWSD Water Master Plan (Draft 2011).

Table 3-18 illustrates the potential impacts of the Curtis Drive intertie on the Longview's Columbia View pump station. The analysis shows that the Columbia View Pump Station will potentially be deficient by 35 gpm immediately and by 86 gpm in 2032 at the 20-year planning interval. Based on the analysis shown in Table 3-18, increased pumping capacity will be needed in the Columbia View Pump Station if the Curtis Drive intertie is installed. The analysis assumes that all the demand in BHWSD Lone Oak service area will be supplied through the

new Curtis Drive intertie and as such is based on the worst case scenario. In reality, not all of the demand for the Lone Oak service area will provided through the Curtis Drive intertie. A more detailed analysis will need to be completed as part of the design effort for this project.

Table 3-18: Proposed Curtis Drive Intertie Impacts on Columbia View Pump Station

Current Condition (2010)							
Pumping Zone	**ERUs**	**ADD (gpm)**	**MDD (gpm)**	**Pump Station Capacity (gpm)**	**ADD Excess Capacity (gpm)**	**MDD Excess Capacity (gpm)**	**MDD Pump Station Capacity in ERUs**
Columbia View (488, 506, 660)	294	38	71				
Lone Oak (370, 450, 560, 660)	262	34	64				
Total Demand	**556**	**72**	**135**	**100**	**28**	**(35)**	**415**
2018							
Pumping Zone	**ERUs**	**ADD (gpm)**	**MDD (gpm)**	**Pump Station Capacity (gpm)**	**ADD Excess Capacity (gpm)**	**MDD Excess Capacity (gpm)**	**MDD Pump Station Capacity in ERUs**
Columbia View (488, 506, 660)	318	41	77				
Lone Oak (370, 450, 560, 660)	297	38	64				
Total Demand	**615**	**79**	**140**	**100**	**21**	**(40)**	**415**
2032							
Pumping Zone	**ERUs**	**ADD (gpm)**	**MDD (gpm)**	**Pump Station Capacity (gpm)**	**ADD Excess Capacity (gpm)**	**MDD Excess Capacity (gpm)**	**MDD Pump Station Capacity in ERUs**
Columbia View (488, 506, 660)	364	47	88				
Lone Oak (370, 450, 560, 660)	406	52	99				
Total Demand	**770**	**99**	**186**	**100**	**1**	**(86)**	**415**

Table 3-19 shows the Storage Capacity analysis with demands from both the Columbia View and Lone Oak zones. The analysis shows that the Columbia View zone will have sufficient storage to meet the demands of both the Columbia View and Lone Oak zones when the intertie is constructed.

Table 3-19: Proposed Curtis Drive Intertie Impacts on Columbia View Storage

Current Condition (2010)										
Reservoir Zone	**Zone Demand as ERUs**	FSS (gal)	SB Storage (gal)	ES (gal)	**OS (gal)**	**Total Required Storage (gal)**	**Effective Storage (gal)**	**Existing Storage as ERUs**	**Additional ERUs Required**	**Additional Required Storage (gal)**
Columbia View (488, 506, 660)	294		58,826		19,000					
Lone Oak (370, 450, 560, 660)	262		52,400		12,000					
Total Demand	**556**	**180,000**	**111,226**	**35,797**	**31,000**	**246,797**	**500,000**	**2,500**	**-**	**-**
2018										
Reservoir Zone	**ERUs**	**FSS (gal)**	**SB Storage (gal)**	**ES (gal)**	**OS (gal)**	**Total Required Storage (gal)**	**Effective Storage (gal)**	**Existing Storage as ERUs**	**Additional ERUs Required**	**Additional Required Storage (gal)**
Columbia View (488, 506, 660)	318		63,582		19,000					
Lone Oak (370, 450, 560, 660)	297		59,400		12,000					
Total Demand	**615**	**180,000**	**122,982**	**39,589**	**31,000**	**250,589**	**500,000**	**2,500**	**-**	**-**
2032										
Reservoir Zone	**ERUs**	**FSS (gal)**	**SB Storage (gal)**	**ES (gal)**	**OS (gal)**	**Total Required Storage (gal)**	**Effective Storage (gal)**	**Existing Storage as ERUs**	**Additional ERUs Required**	**Additional Required Storage (gal)**
Columbia View (488, 506, 660)	364		72,820		19,000					
Lone Oak (370, 450, 560, 660)	406		81,200		12,000					
Total Demand	**770**	**180,000**	**154,020**	**49,795**	**31,000**	**260,795**	**500,000**	**2,500**	**-**	**-**

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3.6 Telemetry and Controls

The water distribution supervisory control and data acquisition (SCADA) system is currently being designed, with construction planned to begin in late 2012. The SCADA system will be composed of programmable logic controllers (PLCs) with a Wonderware InTouch interface and licensed radio telemetry. The new SCADA system servers will be housed in the City's Data Center at City Hall, with back up servers at the MFRWTP and remote access capability from the Utilities Operations Center and from the homes of authorized personnel. The SCADA system will serve all eight reservoirs sites and six pump stations and allow the City to monitor and control each facility.

Currently, the distribution system has limited monitoring and control capabilities. Three communication methods are used: leased telephone lines, direct buried cables, and licensed radio. Most of the reservoirs in higher pressure zones are linked to pump stations through buried cables or radio. All reservoirs provide continuous signals. The communication system for most remote sites needs to be replaced because the hardwire system is failing.

3.7 Distribution System Hydraulic Modeling

The City's water distribution system was analyzed using MWSoft's H2ONET modeling software. This package offers the integration of water system hydraulic analysis and water quality platforms, as well as other maintenance and security modules, with GIS mapping. H2ONET offers graphical capabilities to display node and junction input information (pipe lengths and diameters, elevations, demands, etc.) and results (velocities, fire flows, hydraulic grades, pressure contours, etc.) on top of the mapping layers.

3.7.1 Model Development

The City provided its existing water distribution system computer model. Before the distribution systems were analyzed, four sequential steps were performed to update the models to a level that accurately depicts current system conditions:

1. Facilities Update*:* The City's model is continuously updated as facilities are constructed and as-builts become available, only minor updates were required to perform the system analysis. Examples of facilities added since the last update include:

   - New distribution system water lines/transmission mains
   - New or revised pumps/pump curves within existing pump stations
   - Changed PRV settings
   - Changed operational control parameters, including valve settings and reservoir set points
   - New MFRWTP.

2. Demand Dispersal: Existing and future demand projections for the City, as discussed in Section 2: Basic Planning Data, were distributed among specific service areas correlating to pressure zones. These data were obtained through recorded yearly source of supply production data for facilities serving those areas.

   These data were used to create demand files for system nodes for existing demands and for projected year 2018 and 2032 demands. When accurate demand data was unavailable within the specified service areas of the City for the different customer/land use classes, demand was dispersed evenly across the nodes within each area, with the exception of identifiable industrial, school, and hospital large water users whose demands were established in Section 2: Basic Planning Data.

3. Calibration: Water system model calibration involves recording actual field hydrant flow test data within specific pressure zones. The field-recorded data ideally include measured static and residual pressures at the hydrant before and during flooding, as well as the measured flow rate from the hydrant. Obtaining simultaneous test pressures at other locations within the zone is preferred, with an optimal targeted pressure drop of at least 10 psi at the hydrant. Zone boundary conditions that must also be established and recorded during testing periods include:

   - Reservoir levels
   - Settings and flow rates through all system PRVs within the pressure zone being tested
   - Pumping rates for well or booster pumps in operation during testing that either contribute water to or take water from the pressure zone being tested.

   Recorded field testing conditions are replicated within the computer model, with the zone demand condition estimated according to the season and time of day when testing was performed. The objective is to iteratively adjust model conditions until the field-measured static and residual pressures at recorded locations match those calculated by the model. This is typically achieved by adjusting individual pipe friction, or “C,” factors. However, other modeling conditions could be at fault, so caution should be taken not to over-adjust C factors in order to match pressures. Other model characteristics that are frequently discovered to be inaccurate during calibration are:

   - Node elevations that have been incorrectly entered or are based on conflicting data
   - Incorrect PRV settings within the model
   - Inaccurate pump curves that cause abnormal pumping flow rates within the model
   - Inaccurate field measurement equipment, including uncalibrated or sensitive flow measurement and pressure gauges
   - Discovery of a partially or fully-closed distribution system valve.

   Typically, if the static pressures between model and field data are markedly different, but the pressure drop is similar, other modeling conditions such as those listed above should

be checked and evaluated. Calibration is typically considered successful when pressures match to within 3 or 4 psi.

The City measures and collects hydrant flow and pressure data during its ongoing flushing program and uses these data to continuously calibrate the model. Therefore, no additional calibration was performed for the City; however, some node elevation inaccuracies were discovered and corrected during model verification. The City's distribution system piping C factors are between 100 and 150, with the exception of a few consolidated areas of older pipe where tuberculation has been field verified. A pipe replacement program is ongoing to help address this problem.

4. Scenario Creation: The modeling software program allows for the creation and easy manipulation of varying databases representing physical, control, and demand input data. In order to more efficiently analyze the system under specified design criteria used to determine deficiencies, the following datasets and scenarios were created for the City's system:

   - Existing, 2018, and 2032 PHD scenarios with reservoirs set at the base of equalizing volume and pumps in service to represent operation under peak conditions.

   - Existing, 2018, and 2032 MDD scenarios with reservoirs set at the base of fire volume and pumps in service to represent operation under peak day conditions and at the conclusion of a fire flow event.

3.7.2 Hydraulic Evaluation Design Criteria

The design criteria utilized to evaluate the distribution system are based on maintaining ranges of system pressures and velocities as defined in the DOH WAC 246-290-230 and in the August 2009 DOH Water System Design. The models were run with varying conditions to adhere to these criteria for distribution system design, including:

- Maintain a minimum pressure of 30 psi at all service connections within the distribution system during PHD conditions.
- Maintain a minimum pressure of 20 psi at all service connections in the distribution system during fire flows under system MDD conditions.
- Limit pipe velocities to approximately 8 fps under PHD conditions.
- Limit pressure within the distribution system to 100 psi.
- Reservoir levels were assumed to be at the minimum water elevation as shown in the summary tables for each purveyor in Section 1.

The City established the required fire flow rates and durations for different customer classes established in accordance with the Fire Marshal's requirements (see Section 2: Basic Planning Data).

3.7.3 Modeling Results

The system model was run in the static mode under appropriate scenarios to compare pressure, velocity, and available fire flow results against the design criteria. The results and deficiencies discussed below are independent of ongoing programs that may exist for the City for annual replacement of undersized (4-inch and smaller) water lines, as well as for waterlines made of unsuitable materials (AC, unlined cast iron and steel, and others).

The City has completed some of the recommended transmission and distribution system water line construction projects listed in its 2005 Comprehensive Plan Capital Improvement Program, resulting in the strengthening of transmission capabilities to deliver adequate pressures and flows. On the whole, the core of the distribution system within the Main 244 zone is strong, but perimeter service areas within the 244 Zone and boosted pressure zones that currently have long sections of unlooped water lines still remain as deficiencies.

Pressure Deficiencies

Due to the extensive looping of most of the City's distribution system and a moderate 20-year growth projection with demands evenly dispersed throughout the system, the pressure deficiencies between existing conditions and projected Years 2018 and 2032 are the same.

The Main 244 zone of the City operates largely within a pressure range of 100 to 105 psi in the downtown grid. These high pressures are handled by the building department through the plumbing code. Fluctuating elevations within certain areas of the distribution system create pressure pockets that greatly exceed 100 psi, but the high pressures have been historically reported and observed with no adverse effects.

Pressures greater than 30 psi can be found throughout the distribution system under all conditions with the following exceptions:

- Homes adjacent reservoirs (Hillside Mains, Hillcrest, Trella, and Neimi). Only a handful of connections are impacted in each location.
- Under certain fire flow conditions, which are discussed under Flow Deficiencies.

Velocity Deficiencies

Velocity deficiencies are limited to a small number of isolated cases where velocities exceed 10 fps under peak day conditions.

Flow Deficiencies

The City has continued to make improvements to the distribution system since completion of the 2005 WSP. The conversion from an older version of WaterCad to a GIS-based version of the MWSoft H2ONET hydraulic model has given the City an excellent diagnostic tool to evaluate distribution system deficiencies. In conjunction with information available from the model, the City has dedicated $200,000 or more annually toward replacing undersized distribution mains (mostly 2-, 4-, and some 6-inch lines). The City intends to budget a similar amount of money annually for the foreseeable in order to continue replacing undersized or failing mains.

Replacement of undersized distribution and transmission mains within potentially high growth portions of the service area may be delayed until the growth actually occurs. This delay will allow cost associated with the required improvements to be shared with the project proponents and thus represents better planning. Implementing improvements before future needs are known precisely may result in undersized utilities.

In any case, the analysis of the City's transmission and distribution system reveals the following deficiencies (2- and 4-inch mains were not considered in the analysis). The City is aware of the fire flow deficiencies in the 4-inch or smaller mains and their replacement is a priority. Other fire flow deficient mains/areas are identified below:

- The farthest extent of the long, unlooped 6-inch waterline traveling north along Coal Creek Road and Ragland Road within the 502 zone, where the required 500 gpm fire flow rate cannot be met at adequate pressures.
- The area within the 50th Street 531 zone immediately to the upstream side of the PRV station to Coal Creek Road, where the 6-inch water line cannot meet the 500 gpm fire flow requirement.
- The area at the end of Clark Creek Road in the 395 zone, where the required 500 gpm fire flow rate cannot be met at adequate pressures.
- The Barlow Point and Willow Grove area within the Main 244 zone, where long, unlooped 6- and 8-inch waterlines cannot meet the required 1,500 gpm fire flow requirements.

Effects from MFRWTP

The City's water system model was updated during the design of the MFRWTP, as outlined in the PDR. There were very few changes with the MFRWTP online in the model. Pressures along Fisher's Lane near the RWTP had been a concern in the 2005 WSP, but will no longer be of concern with the MFRWTP online. Additionally, the MFRWTP's location will help to uniformly distribute water throughout the main zone. Extensive modeling was performed during the predesign and design of the MFRWTP. Once the MFRWTP is brought online, some areas near the MFRWTP will experience increased pressure, in some case above 100 psi, as well as system flow reversal in some areas throughout the City. The City is taking the necessary steps to regulate these pressures on a case by case basis. To address flow reversal concerns that City has proactively been conducting additional system flushing in the impacted areas to minimize impacts upon plant startup. A startup and flushing plan has been prepared by Kennedy/Jenks Consultants to assist the City in this process; a draft is included in the Appendices. Other changes are minimal and are described in the PDR.

3.8 Summary of System Deficiencies and Recommendations

Table 3-20 summarizes the deficiencies and recommendations for the City developed throughout this section. These recommendations will be further explored in Section 8 – Capital Improvement Program.

Table 3-20: Summary of System Deficiencies and Recommendations

Location	Deficiency	Planning Period	Recommendation
Treatment:			
	None Identified	6 and 20 Years	
Distribution/ Transmission:			
2-, 4-, and 6-inch transmission mains	Required fire flow cannot be met in portions of the distribution system	6 and 20 Years	Continue annual pipe replacement program to address deteriorating and undersized mains.
Storage:			
	Indian Creek Reservoir	6 and 20 Years	Refer to storage analysis in this section for recommendations.
Pumping:			
	None Identified by model	6 and 20 Years	Refer to pump analysis in this section for recommendations.

Section 4: Water Conservation Plan

4.1 Introduction

Concerns regarding the long-term reliability and the cost of operating and treating the Cowlitz River sole source of supply for the City have resulted in the development of the Mint Farm Wellfield groundwater supply. Based on the hydrogeologic studies completed prior to the City committing to the new wellfield, it was determined that the deep aquifer supplying the wellfield is more than adequate to meet the long term needs of both the City and the BHWSD. The number of actual wells and associated treatment required to meet the projected combined future demands are directly dependent on the various authorized and unauthorized uses of water within the systems of both purveyors. Efficient management of the water system not only promotes good stewardship of the groundwater resource but also reduces the need for development of additional sources and the costs of producing and treating the water. The City has implemented several supply and demand side measures over the years and continues to refine their water use efficiency program. The following water use efficiency elements will be discussed in this section:

- Metering Program
- WUE Program
- Distribution System Leakage
- Source of Supply and Water Shortage Response Plan
- Water Rights Self-Assessment
- Reclaimed and Water Reuse Opportunities.

4.2 Metering Program

The existing RWTP has a finished water source meter, and the new MFRWTP will also have a finished water meter to measure all of the water leaving the plant.

The City has service meters on all service connections (100 percent metered). The meters are read by a private contractor and reported to the City's Finance Department for billing. The City relies on historical water use at each connection to validate the accuracy of the meter readings. In the event that a reading appears to differ from the norm, the finance department notifies the Water Division. The Water Division then promptly investigates and repairs or replaces suspect meters as necessary.

The City is currently evaluating the feasibility of converting the City's meters to an Advanced Metering Infrastructure (AMI) system. A pilot study will be completed summer 2012 that will include 1,100 meters. The results of the pilot study will provide the City with the necessary information to determine if it is feasible for the City to convert all the City's meters to an AMI system. If the pilot study results are favorable, it will eliminate the need to have a private meter reading contractor.

The commercial, industrial, and trailer courts/apartment meters are read monthly, while most residential meters are read every two months. The meters to BHWSD are also read monthly. Currently, the City does not have a formal meter testing program for meters less than 3 inches as the City is replacing all service meters with touch read, and is considering upgrading to radio read meters. The goal is to replace 600 meters per year. Individual meters are tested upon a customer's complaint regarding their water bill. Meters 3 inches and larger are tested annually. $100,000 per year is budgeted for large meter replacements. The City plans on having all booster pump stations metered by the end of 2013. Only the Trella booster pump station is currently metered.

The emergency intertie to Kelso is metered, but the emergency connection from Weyerhaeuser is not. There are no plans to install a meter on the Weyerhaeuser connection because it will be used only during an extreme water supply emergency.

4.3 WUE Program

An urban area conservation plan was adopted by the Cities of Longview and Kelso and the Cowliltz County PUD in 1999, and was updated in the 2005 Water System Comprehensive Plan. Since that time, ownership of the PUD's water system has been transferred to BHWSD. BHWSD and the Cities of Longview and Kelso are discussing working together to jointly produce and distribute WUE-related public information and to enhance their other various outreach programs.

The 2005 objectives for the City were to:

- Reduce ADD and MDD by 3 percent over the next 6 years.
- Promote water conservation by distributing brochures during peak usage months.
- Continue leak detection program and meter replacement program.
- Improve data collection system with implementation of a SCADA system.
- Record upper zone pump station usage more accurately.

The following is a discussion of steps the City has taken to meet the objectives established in the 2005 WSP. As can be seen from Table 4-1, there has been a 4.2 percent reduction in ADD and a 17.4 percent reduction in MDD from 2003 to 2010. Table 4-2 shows a summary of the water demands on a per capita and per ERU basis.

Table 4-1: ADD and MDD Reduction 2005-2010

2005		2010		Percent Change	
ADD (gpd/ERU)	MDD (gpd/ERU)	ADD (gpd/ERU)	MDD (gpd/ERU)	ADD (gpd/ERU)	MDD (gpd/ERU)
194.4	407.1	186.5	346.9	(4.2%)	(17.4%)

Table 4-2: Summary of Per Capita Water Demands and ERUs

2010 Water Service Area Population	ADD (MGD)	ERUs	Per Capita Demand (gpcd)	Per ERU Demand (gpd/ERU)
40,288	4.09	21,942	101.5	186.5

The City has utilized the DOH *Water Conservation Guidelines to being Waterwise* (Guidelines) even though those publications are no longer available from the DOH. The Guidelines are available at the Utilities Operations office, the Finance Department office at City Hall, and are mailed to individual customers when they call regarding their water bill or conservation. Conservation tips have been included in the annual CCRs for the last few years as well as in the City's various City Info newsletters. City staff are also available to speak to service groups and at school programs.

Although the City retains the services of private leak detection companies when needed, leaks are usually detected by citizens and various City divisions (water, sewer, stormwater, street), and fixed as soon as possible. The City is currently under contract with Harris Group, Inc. to design and install a city-wide SCADA system for all utilities to provide better water demand data by zone. The planning and pre-design has been completed, and the environmental documents are being prepared at this time.

In addition to these activities, the City has been routinely raising the water rates during the past 7 years as shown in Table 4-3, to pay for needed capital improvements. Figure 4-1 shows the decline in the average daily demand that corresponds with the annual rate increases. A comparison of the 2004 and 2011 water rates inside the City limits are presented in Table 4-4.

Table 4-3: Water Rates

Year	Water Rate [(a)]	Average Daily Demand (mgd)
2006	$14.59	5.89
2007	$15.24	5.61
2008	$17.43	5.52
2009	$19.70	5.26
2010	$21.66	4.87

Note:

(a) Based on an average residential consumption of 600 cubic feet (cf) per month using a ¾-inch meter.

Figure 4-1: Average Monthly Residential Bill vs. Average Day Demand

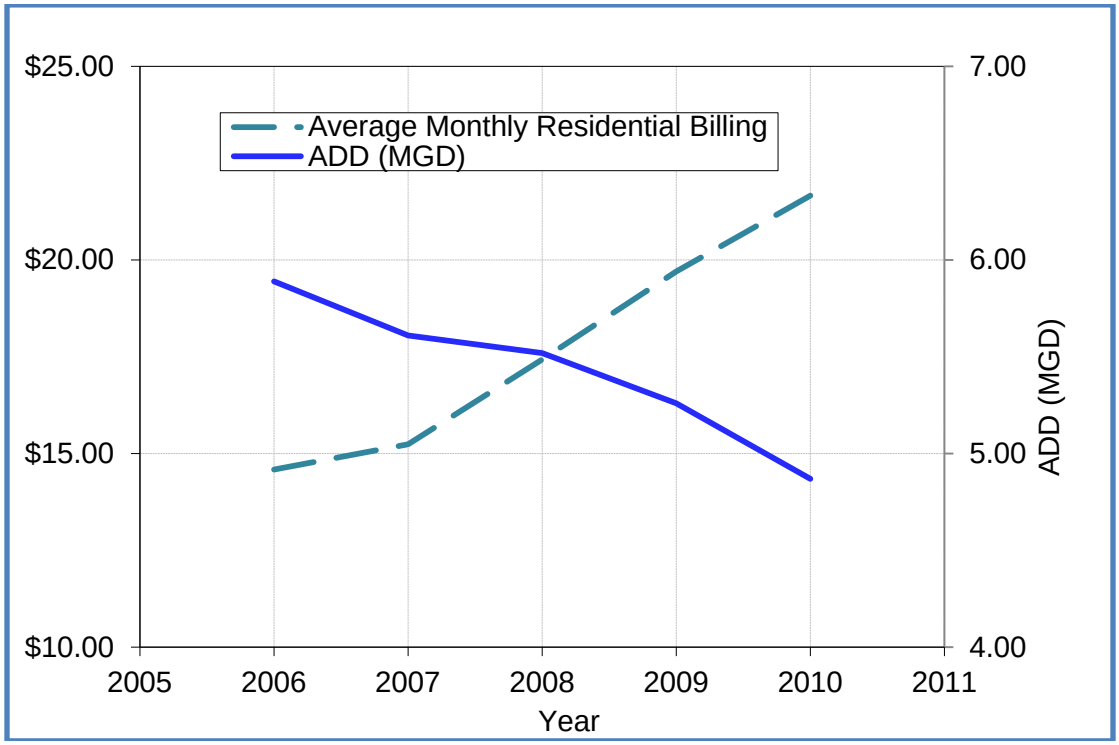


Table 4-4: 2004 and Current Residential Water Rate Schedule [(a)]

Year	Base Rate	Tier 1 per 100 cubic feet (cf)	Tier 2 per 100 cf	Tier 3 per 100 cf
2004	$8.75 [(b)]	$1.29	$1.31	
2012	$10.24	$2.15 first 800 cf	$2.52 for next 800 cf	$3.29 for over 1,600 cf

Notes:

(a) Rates sown are for services inside City limits. A slightly different rate schedule is in place for services outside the City limits. Refer to Section 9.4 for more information.

(b) Included 200 cf.

Subsequent to the adoption of the WUE regulations in 2007, the City held a public forum on 18 January 2008 and the City Council adopted a Demand Side goal to maintain the current residential per capita use of potable water. The City has been notified by the DOH that this goal does not meet the requirements of the WUE regulation.

The current WUE Program was adopted in December 2011. A revised demand side goal of reducing the current gallons per day/ERU of potable water by 1 percent by 31 December 2017 was presented to the public at a public forum on 30 November 2011. Considering the input received at that forum, the City Council adopted the new WUE customer goal on 8 December

2011. The public forum was advertised in the City Info newsletter, on the City's website, and distributed to the local media as a press release. Notice of the meeting was also sent to the DOH for inclusion on their WUE forum website. A copy of the City notice, a summary of the forum and Council Action are included in Appendix H.

The relatively small percentage reduction in demand is considered to be realistic considering the 4.2 percent deduction experienced in the past 6 years as was shown on Figure 4-1. This reduction can be accredited to the various elements of the existing conservation program, and in particular to the annual rate increases.

The following demand-side measures have been identified by the City to achieve their conservation goal:

1. Continue the annual **Customer Education** effort by including a water use efficiency related article in the annual CCR.
2. **Rate Schedule** - Maintain an inverted block rate schedule, i.e. the rate increases for increasing quantities of water. In December 2010, the City implemented a new rate structure that has a lower base rate, plus a fee for the amount of water used. Previously, the base rate included 200 cubic feet (cf) per month.
3. In December 2010, the sewer rate schedule was also changed to include a fixed monthly fee plus a usage fee based on the customer's average winter time water use during the prior winter. Apartment and commercial customer's usage fee will be based on actual water use during each billing cycle. Conversations between City staff and utility customers confirm that customers understand their water use impacts not only their water rate but also their sewer rate. Staff believes a decrease in water usage has occurred due to the sewer rate schedule.
4. Present an annual Water Use Efficiency exhibit at the Cowlitz County Fair (July).
5. Present an annual Water Use Efficiency exhibit at the Go Fourth Festival at Lake Sacajawea Park (4th of July).
6. Make WUE speakers available to civic group meetings (Chamber of Commerce, the Senior Center, Lions, Rotary, Kiwanis, Elks, etc.)
7. Present WUE materials at local elementary schools (K-5).
8. Include WUE information in the City's newsletter – City Info.
9. Include 13-month usage graph on utility bills.
10. Include WUE information on the City website.

The WUE regulations require a minimum of nine measures in addition to at least one public education measure (implemented measure may be counted for more than one class). The City, the City of Kelso, and BHWSD are planning a joint WUE program with joint funding for items 4 and 5.

The primary supply-side measures are:

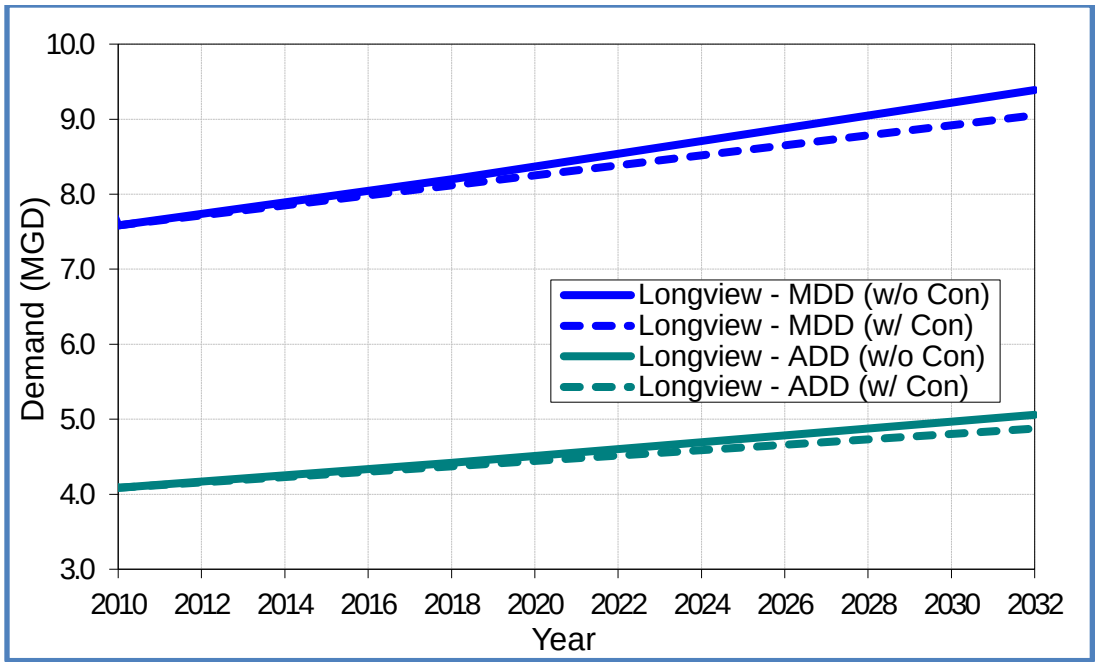
1. Test and repair/replace water meters as necessary to ensure accuracy.
2. Repair leaks when identified
3. Replace pipelines with a history of multiple leaks.

The effectiveness of the overall program will be evaluated by comparing the ADD or MDD or Max Month/ERU demands on an annual basis. Table 4-5 and Figure 4-2 show the impact on future average daily and maximum daily demands if the measures implemented by the City result in a 1 percent annual reduction by 31 December 2017.

Table 4-5: Future Water Demands (MGD) (1 Percent Conservation Each Year)

	2010		2018		2032	
Scenario	**ADD**	**MDD**	**ADD**	**MDD**	**ADD**	**MDD**
Without Additional Conservation Efforts	4.09	7.61	4.42	8.23	5.07	9.42
With Additional Conservation Efforts	4.09	7.61	4.38	8.15	4.89	9.08
Projected Conservation Program Water Savings	N/A	N/A	0.04	0.08	0.18	0.34

Figure 4-2: Longview Future Water Demand



4.4 Distribution System Leakage (DSL)

Table 4-6 shows the DSL for 2007-2010 as reported in the City's Annual Performance Reports.

Table 4-6: Distribution System Losses (DSL) for 2007-2010 [(a)]

Reporting Period (January 1 – December 31)	Distribution System Leakage Volume (gallons)	Distribution System Leakage Percentage
Jan. 2007 – Dec 2007	212,000,000	12%
1 Jan. 2008 – 31 Dec. 2008	86,181,586	4.3%
1 Jan. 2009 – 31 Dec. 2009	133,725,944	7.0%
1 Jan. 2010 – 31 Dec. 2010	76,110,014	4.3%

Note:

(a) Distribution System Loss information per WUE Annual Performance Reports.

As reported in the 2010 WUE Annual Performance Report, the 3-year average DSL is 7.9 percent. The DSL drop of 3.4 percent between 2009 and 2010 is attributed to Water Division focus on better accounting of unauthorized water. Efforts to better account for water include:

- Use of hydrant meters.
- Improved reporting of flushing and other unmetered water use by the Water Division, Sewer Division, Fire Department, and Fire District, and other City Divisions.
- Improved flushing program including better estimates of water used, more efficient unidirectional flushing (closing more valves), and better de-chlorination practices.

4.5 Source of Supply and Reliability

Traditionally, the City's source of supply has been the Cowlitz River. Due to the RWTP reliability and capacity issues and difficulties with the Cowlitz River intake discussed previously, the City will transition to its Mint Farm groundwater supply in late 2012. The Preliminary Design Report (PDR) for the Mint Farm Wellfield provides the hydrogeologic basis for the development of the wellfield as a reliable long-term source of water for the City.

Extensive monitoring of the deep source aquifer to the Mint Farm Wellfield has been conducted and is ongoing; results indicate there are no contaminants of concern in the deep aquifer. A more detailed discussion of the source water quality is included in Section 3 of this WSP. Elevated levels of iron, manganese, and possibly arsenic will be treated prior to entering the distribution system. The water will also be chlorinated and fluoridated.

4.5.1 Water Shortage Response Plan

Chapter 15.74 of the LMC is the City's Water Shortage Response Plan that will be implemented in the event of a potable water shortage or other situation that disrupts or diminishes the water

supply. The four-stage plan provides for increasingly more stringent measures depending on the severity of the shortage. Enforcement of the measures includes a Notice of Warning and then a Notice of Violation that includes a water use surcharge. The surcharge for the first violation is $100 and increases to $500 for the fourth and subsequent violations. City staff are also authorized to install water flow restrictors or discontinue water service if other efforts to enforce the code are unsuccessful.

Water users will be notified of the status of the water shortage and what measures are in place via the City's weekly newsletter (City Info), the local newspaper (The Daily News), and local Radio stations (KJVH, KWYQ, KUHN, KLYK, KBAM, KEDO, and KLOG). The City issues 'Fact Sheets' and standard press releases and will utilize the same procedure for water shortage notices.

The decision of when to implement the various stages of the plan will be made by the City's Public Works Director based on input by the Water Division manager and circumstances contributing to the water shortage. The Water Shortage Response Plan is included in Appendix F.

4.5.2 Interties

The City has an intertie with the City of Kelso, and an emergency connection to Weyerhaeuser can be installed quickly, both measures that could potentially be utilized in an emergency event. However, the Weyerhaeuser intertie can only provide non-potable water. These connections are described in more detail in Section 1.

4.6 Water Rights

In order to develop the new Mint Farm Wellfield, the City applied for a groundwater permit to meet the projected 50-year demand (i.e., 2059). On 22 November 2010, a permit was issued by the Washington State Department of Ecology (Ecology) for 13,500 acre-feet per year (ac-ft/yr) and 28,250 gpm for municipal use within the area served by the City and BHWSD. Prior to obtaining the groundwater permit, the City held three municipal water rights for up to 57 cfs and 14,629 ac-ft/yr, as well as a recreational water certificate (1,724 ac-ft/yr) for the flushing of Lake Sacajawea. Refer to the Water Rights Self-Assessment forms included as Exhibits 4A-1 through 4A-3 following this section for more detailed permit/certificate information.

The Report of Examination completed by Ecology in October 2010 determined that the City's future water needs were projected to reach 13,500 ac-ft/yr by the year 2059 which was less than the currently held surface water rights of 14,659 ac-ft/yr. Therefore, the new groundwater permit (non-additive, primary) was issued based on the projected needs of 13,500 ac-ft/yr. The City was not required to relinquish their existing municipal surface water rights which are now designated as secondary water rights. The total municipal water withdrawals for the City and BHWSD may not exceed 14,679 ac-ft/yr; the sum of the currently held water surface water rights. From a water rights standpoint, the City will continue to be allowed to withdraw municipal water from the Cowlitz River, if necessary, to supplement the new groundwater source provided the combined withdrawals do not exceed 14,679 ac-ft/yr. The City does not plan to abandon their surface water rights at this time. It is not anticipated that the City will withdraw municipal water from the river for several reasons: the river intake issues discussed previously in this Plan, the existing RWTP will be decommissioned shortly after the new facility is brought online,

and treatment will no longer be available for surface water. Emergency provisions have been included in the design and construction of the new MFRWTP and it is considered a much more reliable source of supply and treatment. A copy of the Report of Examination and the currently held water right permits/certificates are included in Appendix E. The City perfected its recreational surface water right for lake flushing in September 2008 and no additional water rights will be required for the next 20-year planning period.

Self-Assessment forms for existing, 6-year and 20-year projections are included as Exhibits 4A-1, 4A-2, and 4A-3. Tables 4-7 and 4-8 illustrate that the water rights are sufficient to provide both the annual demand and the maximum day demand through 2032 and beyond.

Table 4-7: MFRWTP Annual Demand as Percentage of Water Rights

No Additional Conservation	Raw ADD (MGD)	Treated ADD (MGD)	% of Water Rights Used
2010	5.36	4.95	41.1%
2018	5.79	5.39	44.7%
2032	6.63	6.40	53.1%
With Additional Conservation	**Raw ADD (MGD)**	**Treated ADD (MGD)**	**% of Water Rights Used**
2010	5.36	4.95	41.1%
2018	5.73	5.34	44.3%
2032	6.40	6.17	51.2%

Table 4-8: MFRWTP Maximum Day Demand as Percentage of Water Rights

No Additional Conservation	Raw MDD (MGD)	Treated MDD (MGD)	% of Water Rights Used
2010	10.06	9.18	22.6%
2018	10.87	10.01	24.6%
2032	12.45	11.85	29.1%
With Additional Conservation	**Raw MDD (MGD)**	**Treated MDD (MGD)**	**% of Water Rights Used**
2010	10.06	9.18	22.6%
2018	10.76	9.91	24.4%
2032	12.00	11.42	28.1%

4.7 Water Reclamation and Reuse

4.7.1 Reclaimed Water

The Three Rivers Regional Wastewater Treatment plant (TRRWTP), located southeast of Longview, treats sewage from the cities of Longview and Kelso, BHWSD, and Cowlitz County. Ecology and DOH have established four classes of effluent that may be used for various uses ranging from Class A standards for use in public contact areas or food production to Class D for surface irrigation of trees with restricted access. The TRRWTP is permitted to produce Class A effluent but currently treats to a secondary level. TRRWTP currently uses reclaimed water for onsite wastewater treatment plant (WWTP) irrigation and wash down water.

The Three Rivers Regional Wastewater Authority has evaluated other potential reclaimed water uses, such as irrigation, impoundments, groundwater recharge, and industrial/commercial uses. However, none of the options evaluated are economically feasible at this time due to the expense associated with the installation of the reclaimed water infrastructure and increased operational costs associated with the production and delivery of reclaimed water.

Should it become feasible to provide reclaimed water in the future, the following list of potential reclaimed water users would be considered. The following combined users account for a substantial percentage of the City's annual consumption:

- St. John's Medical Center
- Port of Longview
- Northwest Hardwoods
- Kemira Water Solutions
- Mint Valley Golf Course
- Swanson Bank and Wood Products.

4.7.2 Water Reuse

The City encourages water reuse where possible. Several area industrial users have implemented onsite reuse programs that have dramatically reduced their potable water demands. Many industrial users have onsite alternative sources for process water demands. Two of the City's largest customers, Weyerhaeuser and Longview Fibre Paper and Packaging, only utilize City water for potable uses (drinking, eye washes, shower, etc.). Millennium Bulk Terminal is another large customer that only utilizes City water for potable uses.

Design of the new MFRWTP includes a backwash recovery system whereby approximately 90 percent of the process backwash water will be recycled to the head of the treatment process for reuse. It is estimated that the MFRWTP will conserve around 51.8 million gallons of water in the year 2018 with the backwash recovery system. Other reuse opportunities are evaluated on a case-by-case basis.

EXHIBIT 4A: WATER RIGHT SELF-ASSESSMENT FORMS

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

EXHIBIT 4A-1
WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – EXISTING STATUS

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		EXISTING CONSUMPTION		CURRENT WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S2-05233C	City of Longview	15 August 1940	Cowlitz River		7 CFS	Unspecified	-	-	-	-
2. S2-00823C	City of Longview	16 August 1966	Cowlitz River	Secondary	50 CFS	8,904 AF	-	-	-	-
3. S2-29641P	City of Longview	24 April 1998	Cowlitz River	Secondary	50 CFS	5,725 AF	-	-	-	-
4. S2-29642P	City of Longview	28 April 1998	Cowlitz River	Recreational	8.88 CFS	1,724 AF	-	-	-	-
5. S2-25806C	City of Longview	30 January 1981	Columbia River	Yes, Emergency Municipal	2.22 CFS	403 AF	-	-	-	-
6. G2-30521	City of Longview	8 June 2009	Mint Farm Wellfield	Primary (Non-Additive)	28,250 gpm (63 CFS)	13,500 AF	9.18 MGD (14.20 CFS)	1,807 MG (5,560 AF)	48.80 CFS	9,069 AF
Claims 1.										
2.										
TOTAL	**********	********	********	**********	63 CFS	14,629 AF	14.20 CFS	5,560 AF	48.80 CFS	9,069 AF

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		EXISTING CONSUMPTION THROUGH INTERTIE		CURRENT INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
2.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1.					
2.					

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

EXHIBIT 4A-2
WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – 6-YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (6-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S2-05233C	City of Longview	15 August 1940	Cowlitz River		7 CFS	Unspecified	-	-	-	-
2. S2-00823C	City of Longview	16 August 1966	Cowlitz River	Secondary	50 CFS	8,904 AF	-	-	-	-
3. S2-29641P	City of Longview	24 April 1998	Cowlitz River	Secondary	50 CFS	5,725 AF	-	-	-	-
4. S2-29642P	City of Longview	28 April 1998	Cowlitz River	Recreational	8.88 CFS	1,724 AF	-	-	-	-
5. S2-25806C	City of Longview	30 January 1981	Columbia River	Yes, Emergency Municipal	2.22 CFS	403 AF	-	-	-	-
6. G2-30521	City of Longview	8 June 2009	Mint Farm Wellfield	Primary (Non-Additive)	28,250 gpm (63 CFS)	13,500 AF	10.01 MGD (15.49 CFS)	1,967 MG (6,052 AF)	47.51 CFS	8,577 AF
Claims 1.										
2.										
TOTAL	**********	*********	*********	**********	63 CFS	14,629 AF	15.49 CFS	6,052 AF	47.51 CFS	8,577 AF

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
2.							
3.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1.					
2.					
3.					

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

EXHIBIT 4A-3
WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – 20 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (20-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S2-05233C	City of Longview	15 August 1940	Cowlitz River		7 CFS	Unspecified	-	-	-	-
2. S2-00823C	City of Longview	16 August 1966	Cowlitz River	Secondary	50 CFS	8,904 AF	-	-	-	-
3. S2-29641P	City of Longview	24 April 1998	Cowlitz River	Secondary	50 CFS	5,725 AF	-	-	-	-
4. S2-29642P	City of Longview	28 April 1998	Cowlitz River	Recreational	8.88 CFS	1,724 AF	-	-	-	-
5. S2-25806C	City of Longview	30 January 1981	Columbia River	Yes, Emergency Municipal	2.22 CFS	403 AF	-	-	-	-
6. G2-30521	City of Longview	8 June 2009	Mint Farm Wellfield	Primary (Non-Additive)	28,250 gpm (63 CFS)	13,500 AF	11.85 MGD (18.33 CFS)	2,336 MG (7,169 AF)	44.67 CFS	7,460 AF
Claims 1.										
2.										
TOTAL	**********	*********	*********	**********	63 CFS	14,629 AF	18.33 CFS	7,169 AF	44.67 CFS	7,460 AF

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
2.							
3.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1.					
2.					
3.					

Section 5: Source Water – Wellhead Protection Program

This section discusses the City's new source of supply and summarizes the aquifer characteristics and the City's Wellhead Protection Program. The Mint Farm Wellfield and MFRWTP are scheduled to begin producing drinking water for the City and BHWSD in late 2012. Various studies were conducted and reports generated to determine the feasibility of the site as the sole source of supply from hydrogeologic and water quality aspects. These reports are available in their entirety on the City's web site at http://www.mylongview.com/publicworks/WaterProject.html.

Information pertinent to protecting the groundwater source is contained in Part 2 of the City of Longview Mint Farm Regional Water Treatment Plant Preliminary Design Report (PDR), dated March 2010. More specifically, Part 2A, Hydrogeologic Characterization, Part 2B, Water Quality and Environmental Risk Assessment, contain hydrogeology information on the aquifer and the results of the Environmental Site Assessment (Phase I and II) and Human Health Risk Assessment. This information is also available on the City's web site. To protect the groundwater source, and in accordance with Washington Administrative Code (WAC) 246-290-135 (3), this chapter is the City's Wellhead Protection program.

5.1 Source Information

5.1.1 Aquifer Characteristics

The wellfield is located in the southwestern part of the City in an area known as the Mint Farm Industrial Park (see Figure 5-1) and is situated on a relatively flat floodplain at an elevation of approximately 10 feet above mean sea level. A network of dikes and drainage ditches in the Longview-Kelso basin lowers the overall shallow groundwater elevations and protects the basin from flooding during high river levels and large storm events. The wellfield site was used for agricultural operations, including mint and grass farming, until about 1975. The wellfield is located near industrial and commercial businesses, a managed wetland, and undeveloped property.

Two distinct groundwater systems are present at the wellfield site: a shallow system, and a deep system with a confining layer of silt and clay about 200 feet thick between the two systems. In the area around the wellfield site, the confining layer ranges in thickness from approximately 100 to 200 feet near the wellfield, but becomes appreciably thinner to the north and east near residential areas. The wellfield consists of four wells drilled into the deep aquifer, with plans to add two more wells as needed to meet future water demands. Figure 5-2 shows the wellfield and treatment plant configuration. Groundwater modeling indicates the source for the deep aquifer is the Columbia River, with a travel time to the wellfield of between 2 and 35 years. Figure 5-3 illustrates the aquifer source area and anticipated travel times. The hydrogeologic characterization of the Mint Farm area, including the deep groundwater aquifer, is provided in Hydrogeologic Characterization (Kennedy/Jenks 2010) of PDR Part 2A, Hydrogeologic Characterization (Kennedy/Jenks 2010).

The groundwater model utilized a 50-year demand scenario (2059). Based on the groundwater modeling results, the wellfield is capable of meeting and exceeding the 2059 demands.

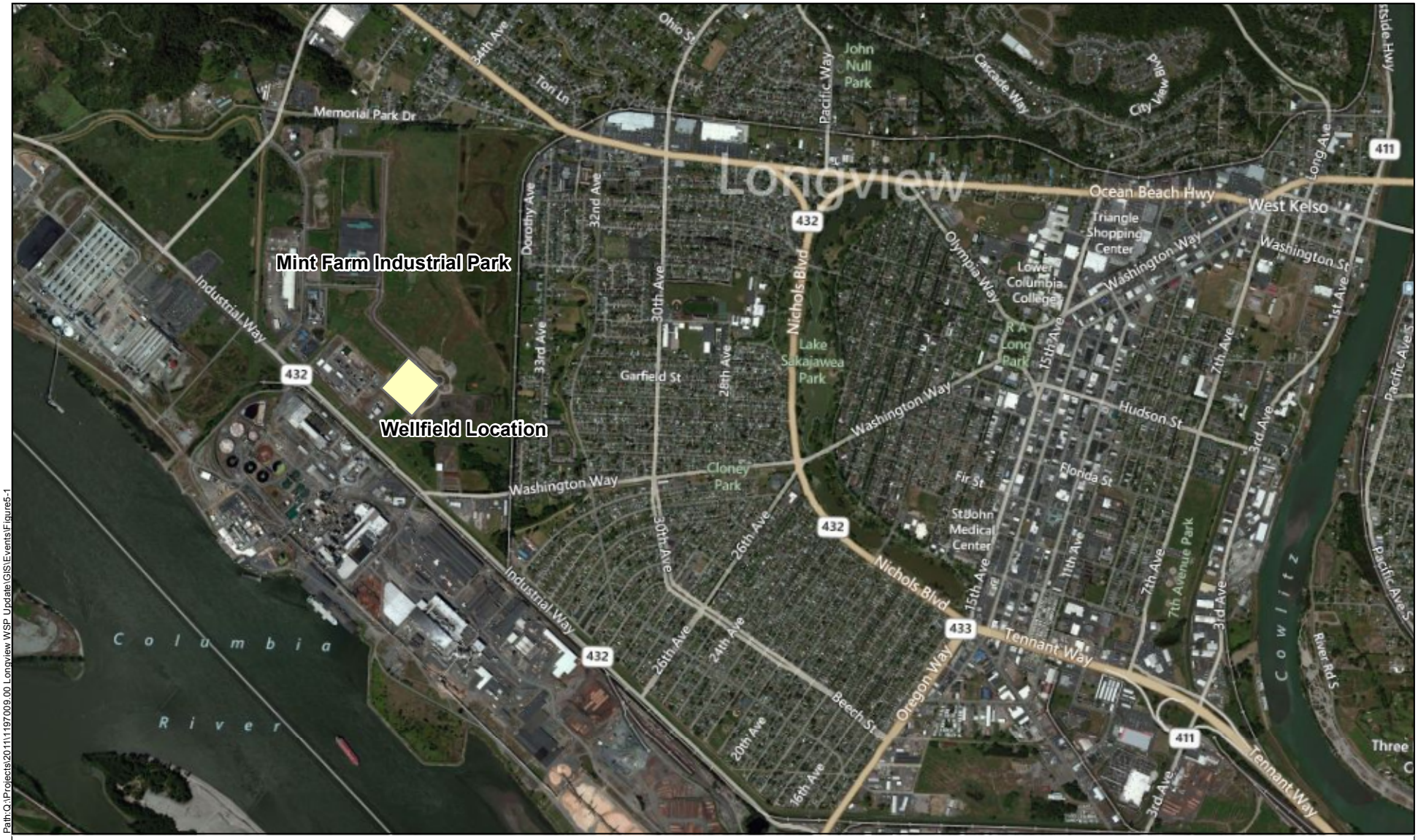
5.1.2 Constructed Wells

Four wells have been drilled on the wellfield site (PW-1 through PW-4), with plans to add two additional wells to meet future water demands. The wells are nearly identical and drilled to a depth of between 352 and 378 feet. All of the wells have sanitary seals to at least 150 feet below ground surface (bgs). Table 5-1 below summarizes the constructed wells. Copies of the well logs for each well are included in Appendix I.

Table 5-1: Mint Farm Wellfield – Constructed Wells

Well Name	Ecology Well Tag#	Depth (feet bgs)	Depth to first Open Interval (feet bgs)	Sustained Yield (gpm)	Length of Pump Test	Drawdown (feet)	Drawdown of Nearest Well (feet)
PW-1	BAM420	375	230 BGS	3,918	36 days	3.3 avg.	.33 avg.
PW-2	BHF855	378	228	3982	12 hours	2.2	0
PW-3	BHF856	352	235	3987	12 hours	1.9	0
PW-4	BHF857	352	237	3950	12 hours	1.7	0

A Groundwater Contamination Susceptibility Assessment Survey Form has been completed for each well and are included in Appendix I. In addition, a Source Approval package will be submitted to the DOH in March 2012 with a request to consider these four wells as part of a wellfield, rather than regulate them as unique separate wells.



Path:Q:\Projects\2011\1197009.00 Longview WSP Update\GIS\Events\Figure5-1

Wellfield Location

N

0 1,000 2,000

Scale: Feet

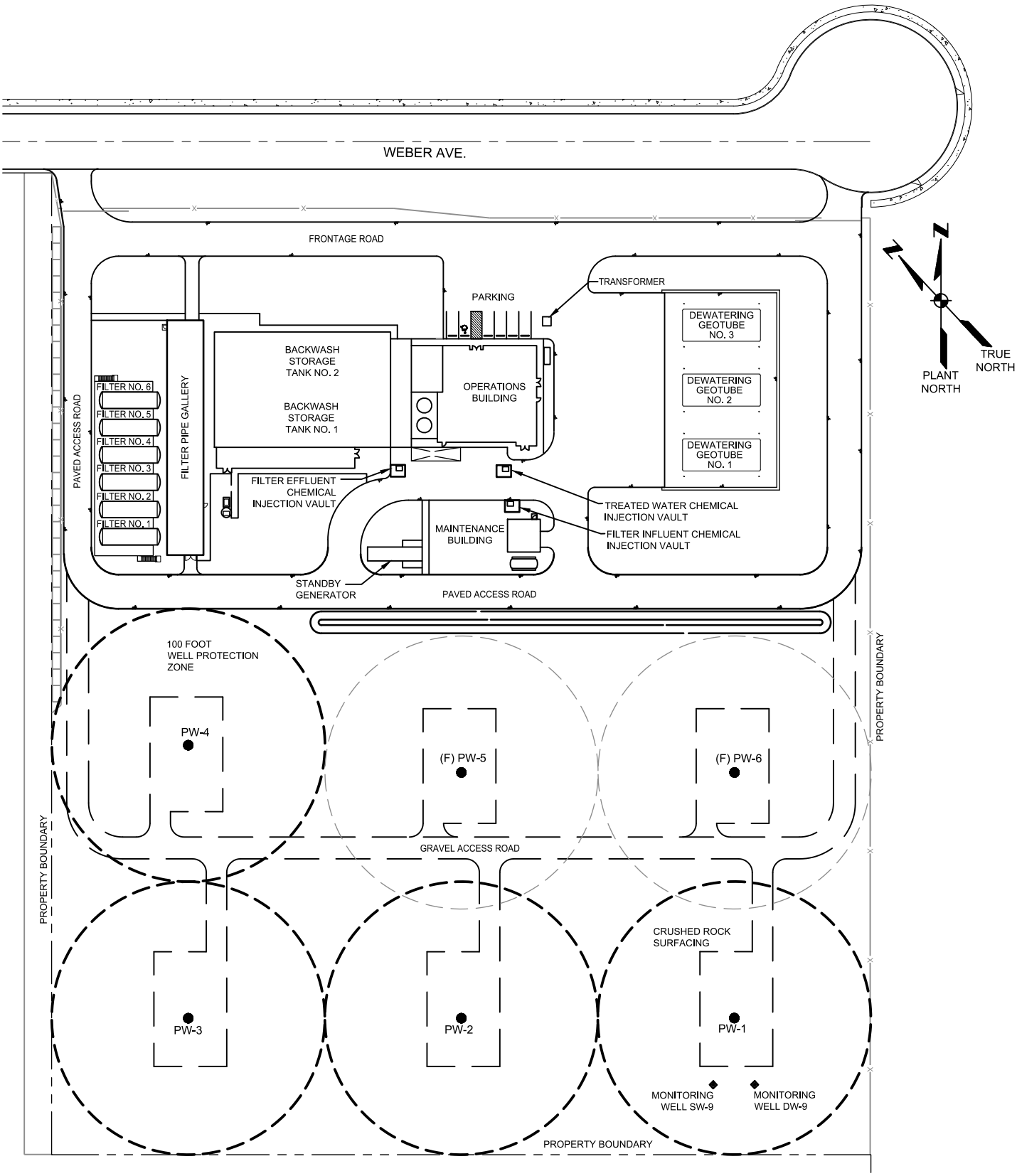
Kennedy/Jenks Consultants

Comprehensive Water System Plan Update
Longview, Washington

Wellfield Location Overview

K/J 1197009*00
August 2012

Figure 5-1



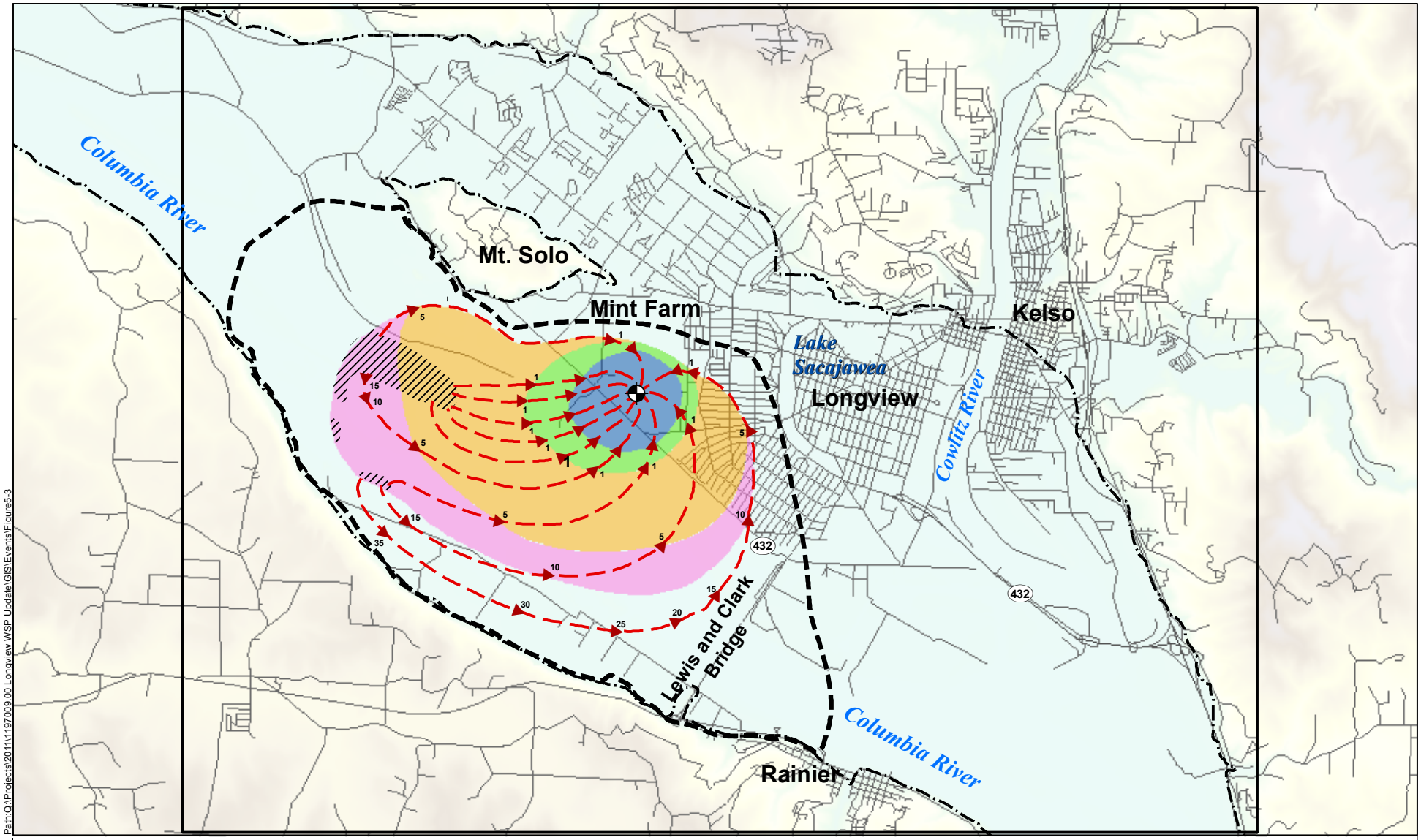
Kennedy/Jenks Consultants

Comprehensive Water System Plan Update
Longview, Washingon

Wellfield Configuration

K/J 1197009*00
August 2012

Figure 5-2



Wellfield
Gravel Aquifer Flow Path
5 Flow Direction Arrow with Years of Travel to Mint Farm Wellfield
Longview-Kelso Basin
Extent of Study Area
Gravel Aquifer Boundary
Unconfined Aquifer Conditions
6-Month WHPP Source Area
1-Year WHPP Source Area
5-Year WHPP Source Area
10-Year WHPP Source Area

N

0 3,500 7,000
Scale: Feet

Kennedy/Jenks Consultants
Comprehensive Water System Plan
Longview, Washington

Source Delineation Area
Mint Farm Wellfield

K/J 1197009*00
August 2012

Figure 5-3

5.2 Wellhead Protection Area

The Wellhead Protection Area (WHPA) delineation was developed using the three-dimensional numerical groundwater model United States Geological Survey Code MODFLOW2000 and ADD projected at 12 MGD in 2059. Current water demand forecast suggest a 2059 ADD of about 8 MGD. As a result, the analysis is quite conservative allowing for unexpected industrial or commercial demand, or higher than forecasted growth. The groundwater flow patterns were calculated using MODPATH, a particle tracking program that uses the hydraulic gradient, hydraulic conductivity, and porosity. The model results indicate the times for water from the Columbia River to travel to the Mint Farm Wellfield varies from approximately 2 years to over 35 years along the paths shown on Figure 5-3. The City's comprehensive Wellhead Protection Plan (WHPP) comprises specific elements that include:

- A susceptibility assessment
- Delineation of wellhead protection areas
- Inventory of potential contaminant sources
- Distribution of findings
- Contingency Plans
- Appropriate spill/incident response measures.

The City intends to establish, by ordinance, a WHPA. The area is larger than the estimated 10-year time of travel in order to have boundaries that are readily recognizable in the field and on maps to facilitate implementation of various protective measures. The WHPA is shown on Figure 5-4.

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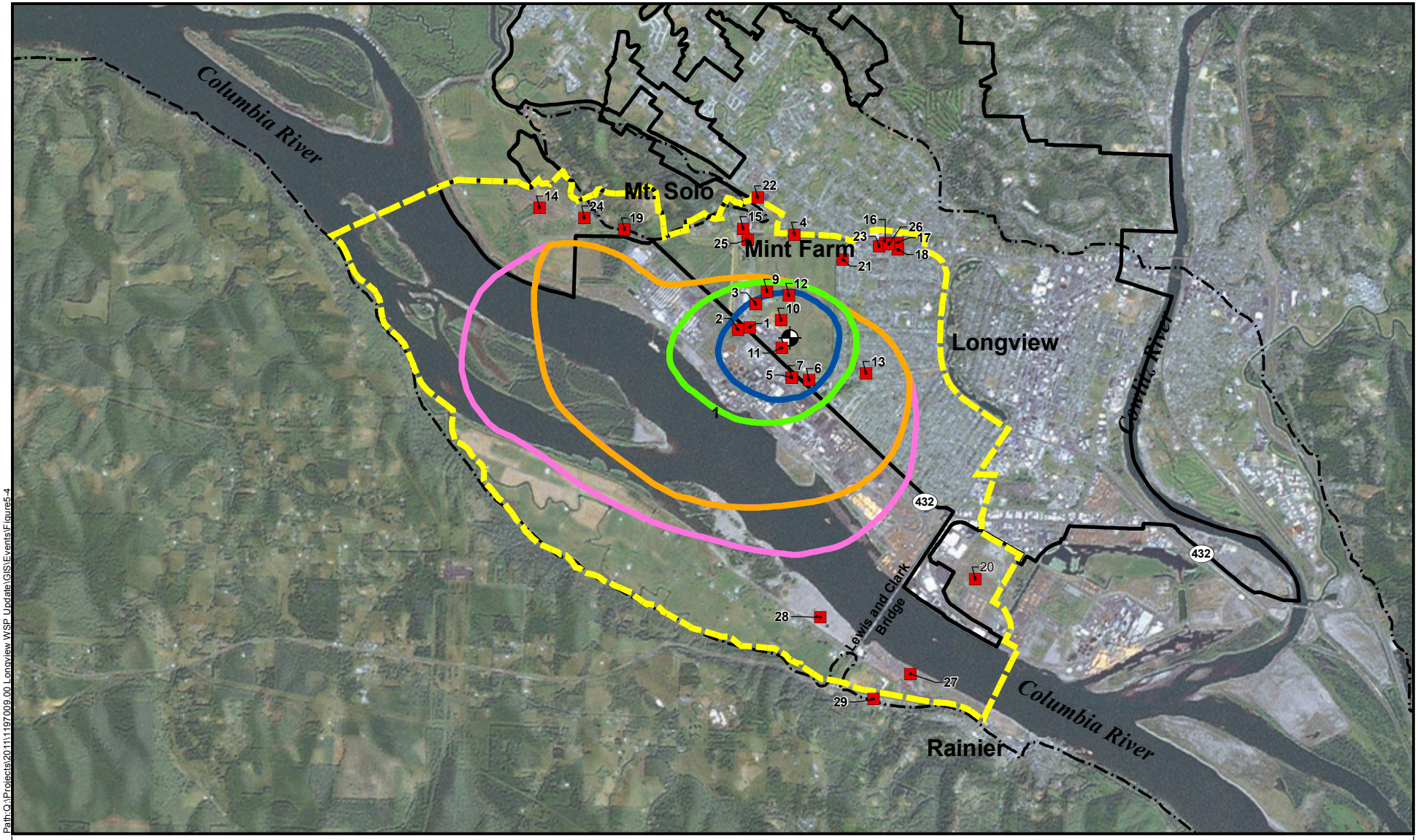

Wellfield
WHPA Boundary
F Potential Contaminant Sources with Map Location ID
Longview-Kelso Basin
6-Month WHPP Source Area
1-Year WHPP Source Area
5-Year WHPP Source Area
10-Year WHPP Source Area
Longview City Limits

N

0 3,500 7,000
Scale: Feet

Kennedy/Jenks Consultants

Comprehensive Water System Plan Update
Longview, Washington

Wellhead Protection Area (WHPA)
Mint Farm Wellfield

K/J 1197009*00
August 2012

Figure 5-4

Path:Q:\Projects\2011\1197009.00 Longview WSP Update\GIS\Events\Figure5-4

Potential threats to groundwater quality caused by 12 MGD ADD pumping at the Mint Farm wellfield were evaluated with three model scenarios:

- Forward particle tracking from potential contaminating activities (PCAs).
- Constant ground surface contaminant source at the Mint Farm.
- Constant ground source contaminant source along the Columbia River.

The results indicate that contamination from the above sources does not reach the Mint Farm production wells within a 30-year time frame (Kennedy/Jenks Consultants 2010). Figure 5-5 provides an additional illustration of the source of supply to the Mint Farm wells. Water from the Columbia River percolates through the deep water-bearing gravel to the Mint Farm and up into the wells. Therefore, the City's Wellhead Protection Plan is focused as follows:

- Most spills of light non-aqueous phase liquid will float on the river surface and not impact the deep aquifer. Major spills consisting of dense non-aqueous phase liquid could sink to the river bottom and present some concern. In both cases, the compound will be flushed downstream rapidly. A method to quickly report spills in the Columbia River to the City will be developed as part of the program.
- Protective measures within the wellhead protection area will focus on preventing or mitigating the risks from construction or drilling methods that could penetrate to the deep aquifer, such as drilled pilings, piers, or other penetrations for new buildings and structures.
- The prevention of spills or surface contamination of any kind within the wellhead protection area is essential, even if the likelihood of penetration to the deep aquifer is remote.

5.2.1 Inventory of Potential Contaminants

An environmental review was completed in 2008 by GSI Water Solutions, Inc. (GSI) that identified and assessed the potential contaminants in the Mint Farm WHPA. A copy of GSI's 2008 report is available in its entirety on the City's website. This report identified 17 risks from industrial or commercial activities, three risks from contaminated shallow groundwater plumes, and risk from inadequate well seals.

Although numerous sites for potential contamination were identified, most were determined to be low risk surface contamination sites. To address the medium risk elements, the City has established a rigorous monitoring program. The shallow groundwater plumes appear to be migrating away from the wellfield towards the Columbia River. The Water Quality and Environmental Risk Assessment Part 2B of the PDR, presents a thorough discussion of water quality findings, as well as the data gathering and analyses conducted of the deep and shallow monitoring well network constructed in 2009. The City will continue to monitor the deep sentry wells for early detection purposes. As noted previously, the Longview MODFLOW Model did not identify any complete pathways between potential contamination activities in the Mint Farm or neighboring industrial areas and the deep groundwater aquifer.

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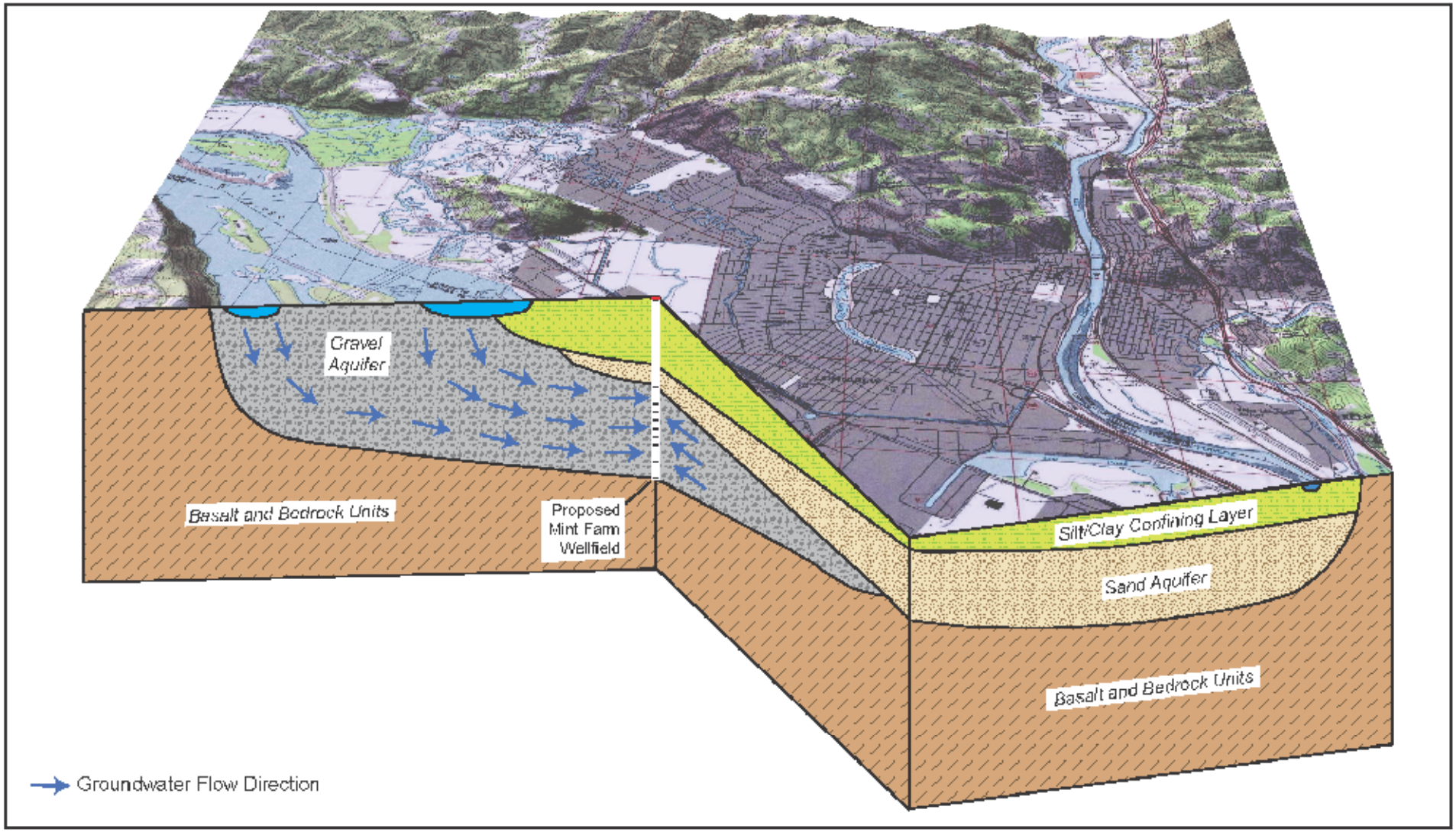

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Kennedy/Jenks Consultants

Comprehensive Water System Plan Update
Longview, Washington

Groundwater Flowpaths to Mint Farm Wellfield

K/J 1197009*00
August 2012

Figure 5-5

Spills, leaks, or discharges of potential contaminants on or near the surface will not directly impact the deeper aquifer. However, these sources of contamination may enter the Columbia River through either the shallow aquifer or the drainage canals. The tremendous flow of the Columbia River, as well as the fact that the recharge area is at the bottom of the river, minimizes the potential threat presented by the shallow aquifer or drainage canals in this area.

A list of the potential sources of contamination within and near the 10-year time of travel is included in Table 5-2. Table 5-2 summarizes the information as reported in GSI's report and the Phase I and II ESA. These sites are located on Figure 5-4. The City will notify all owners and operators of these sites of the wellfield and request their assistance in protecting the aquifer. Regulatory agencies and local governments (regulatory and first responders) involved with the areas within the WHPP will also be notified. Copies of these letters are included in Appendix I.

The following is a list of governmental agencies that will be notified of the WHPA boundary and potential contaminant inventory:

- Washington State Department of Ecology
- Washington State Department of Health
- Oregon State Department of Environmental Quality
- Cowlitz County
- Columbia County (Oregon)
- US Environmental Protection Agency
- Washington State Department of Fish and Wildlife
- Oregon State Department of Fish & Wildlife
- US Army Corps of Engineers
- US Coast Guard
- Port of Longview
- Port of St. Helens
- National Oceanic and Atmospheric Administration Fisheries / National Marine Fisheries Service
- Washington Department of Emergency Management
- City of Rainier
- Columbia River Fire District.

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Table 5-2: List of Potential Sources of Contamination

Company/Business	Site Name	Map Location	Latitude/Longitude	Time of Travel Zone
Moeller Land/Cattle Co.	Flex Foam Facility	1	46.1375/122.98583	6-Month
Bonneville Power Administration	Longview Substation	2	46.13716/-122.98786	6-Month
Mint Farm Energy Ctr, LLC	Energy Plant	3	48.14028/122.985	6-Month
Weyerhaeuser	Mint Farm	4	46 8 54.83/122 58 43.62	6-month
Weyerhaeuser	HG Chlor Alkali	5	46.13171/-122.9785	6-Month
Washington Way Market	Washington Way Market	6	46.1315/-122.97555	6-Month
Weyerhaeuser	Plywood Mill	7	46.13172/-122.9785	6-Month
Columbia/Cowlitz Railway	Rail Spur	8	N/A	6-Month
Woodinville Lumber, Inc.	Tri County Truss	9	46 8 30.38/122 58 59.29	6-Month
Solvay Interox	Solvay Interox Facility	10	46 8 18.39/122 58 50.35	6-Month
HASA (J Huber)	HASA (J Huber)	11	46 8 6.70/122 58 49.03	6-Month
Millennium Bulk Terminals	Millennium Bulk Terminals - Longview	12	46 8 29/122 59 46	5-Year
Millers Market	Millers Market	13	46.13252/-122.96597	5-Year
Unknown	Unknown Diesel Spill	14	46 9 2.63/123 1 19.23	Buffer area
Longview Auto Wrecking	Longview Auto Wrecking	15	46 8 56.501/122 59 15	Buffer area
Fred Meyer	Fred Meyer Fuel Stop	16	46 08 52.43/-122 57 48.31	Buffer area
Safeway	Safeway Fuel Station	17	46 8 52.71 / 122 57 40.93	Buffer area
Rio West Restaurant	Rio West Restaurant	18	46 8 49.898/122 57 40.702	Buffer area
McCall Trucking	McCall Trucking	19	46.14846/-123.00753	Buffer area
Port of Longview	Port of Longview	20	46 6 31.63/122 56 47.33	Buffer area
US EPA Dorothy Ave Mercury Spill	US EPA Dorothy Ave Mercury Spill	21	46 8 44.84/122 58 13.99	Buffer area
Longview School District	Longview School District 122	22	46.15274/-122.98525	Buffer area
Shell/Texaco Station	Shell/Texaco Station	23	46 8 51/122 57 52	Buffer area
Robert Radakovich Sr/ Port of Longview	Mt. Solo Landfill	24	46 8 59.04/123 00 51.68	Buffer area
Toyocom	Toyocom Devices of America	25	46 8 52.07/122 59 11.81	Buffer area
Ocean Beach Chevron	Ocean Beach Chevron	26	46 8 52/122 57 46	Buffer area
Teevin Brothers	Teevin Brothers	27	46.097391/122.956932	Buffer area
US Gypsum Co	US Gypsum Co	28	46 06 13.52/122 58 20.80	Buffer area
Rainer Shell	Shell Gas Station	29	46.094352/122.963032	Buffer area

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5.2.1.1 Existing Deep Aquifer Wells

Weyerhaeuser, who has three deep gravel aquifer wells, has been contacted and is considering decommissioning these wells. Millennium Bulk Terminals has been contacted to initiate plans for protection of their nine deep wells. At this time, Millennium Bulk Terminals does not have plans to abandon any of their wells and is restoring all nine wells to operating condition. Puget Sound Energy has two deep wells, constructed in 2001 and 2002 using modern construction methods that pose little risk of contamination to the City's wellfield.

5.2.2 Management Strategies and Implementation

The City's approach to management and implementation of the WHPP, a combination of ordinances and a monitoring well network, are discussed below.

5.2.2.1 Ordinances

Chapter 17 of the LMC deals with the environment and includes sections on Critical Areas, stormwater management, and general environmental protection. This chapter of the LMC was expanded to include protection of the municipal water source aquifer. The water supply protection ordinance (Ord. No. 3127) was first adopted on 11 February 2010 to prohibit the practice of hydraulic fracturing at all locations within or beneath the corporate city limits. The ordinance also prohibits "any other activity that has the potential to significantly reduce the Mint Farm Aquifer recharge, aquifer flow, or aquifer water quality and threaten the use of the Mint Farm Aquifer as a municipal water supply."

The City Council approved this Wellhead Protection Plan on February 9, 2012, a copy of the meeting minutes indicating the Council's actions are included in Appendix H. The City intends to adopt a new ordinance this spring further amending the LMC to establish the WHPA boundary and to provide additional detail on regulations to protect the aquifer. A copy of the draft ordinance is included in Appendix I. Notification letters will be sent to public agencies after Council passes the WHP, notification for most others and the County will occur after the Council has passed the new WHP ordinance this spring.

5.2.2.2 Outside of Longview Jurisdiction

For areas within the WHPA but outside of Longview's jurisdiction, the City has approached Cowlitz County regarding their adoption of a wellhead protection ordinance that is similar to the City's. The City has also contacted Weyerhaeuser Company and Millennium Bulk Terminals regarding the potential for executing wellhead protection agreements if the County does not adopt a wellhead protection ordinance. Additionally, the City will contact the City of Rainier and Columbia County in Oregon regarding adoption of wellhead protection ordinances similar to the City's, to address that portion of the Wellhead Protection Area that lies within Oregon.

5.2.2.3 Monitoring Wells

The City is committed to continuing to sample select deep monitoring wells located along Industrial Way including DW-1, DW-2, DW-5, DW-6, DW-7, and DW-9 on a semi-annual basis. For the monitoring wells, the City has developed an extended list of potential contaminants to be evaluated that include both regulated and non-regulated chemicals. These monitoring wells are within the primary flow path from the river to the Mint Farm and analyses of these wells will provide an early warning system to the City if an unanticipated contamination of the deep

aquifer occurs. The wellhead protection program will utilize monitoring wells as an early identification of potential adverse changes in groundwater quality within the target aquifer. The City is considering additional monitoring wells and has contacted Weyerhaeuser Company and Millennium Bulk Terminals regarding the potential to install additional monitoring wells on their property. The location of the existing monitoring wells is shown on Figure 5-6.

The sampling protocols will be similar to those used in the initial quality assurance plan for the monitoring wells. Trained City staff will collect the samples and be responsible for record-keeping. Sampling for the monitoring wells includes the regulated drinking water contaminants and the complete EPA 524.2 list of VOCs; the lists of analytes monitored are included in Appendix I. Currently, the sentinel wells monitoring sampling is being performed by an outside consultant. In 2012, City staff will be trained on sampling protocols and begin conducting the bi-annual sampling using in-house staff in 2013. The cost associated with the continued monitoring well sampling will be included in the operating budget from 2013 forward.

Water quality in the City's Mint Farm deep production wells will be tested as required by DOH. In the event that the water quality samples from the monitoring wells indicate the presence or change in a previously measured analyte, the City will institute additional testing parameters to track the variation and to ensure that water from the wells continues to be safe and meet regulated water quality standards.

Path: Q:\Projects\2011\1197009.00 Longview WSP Update\GIS\Events\Figure5-6

Longview Well Locations

- Well Location
- Surface Water Sample Location

N

0 750 1,500

Scale: Feet

Kennedy/Jenks Consultants

Comprehensive Water System Plan Update
Longview, Washington

Groundwater Monitoring Well Sites

K/J 1197009*00
August 2012

Figure 5-6

5.2.3 Contingency Plan

Due to the characteristics of the deep aquifer, it is very unlikely that one or more wells would be impacted by a contamination event requiring immediate suspension of its use. A more likely scenario would be detection of a slight quantity of a drinking water contaminant in a monitoring well and/or production well.

If contamination is detected in a monitoring well or production well, the City will initiate a quality assurance/quality control review of the sampling and handling procedures and collect a confirmation sample as soon as possible. If the presence of a contaminant is confirmed, the City will consult with the DOH, and consideration should be given to sampling other wells in the wellfield, selected monitoring wells, and the treated water. Even if a drinking water MCL (the level at which consumers' health may be impacted after a prolonged exposure) is exceeded, the City will likely have time to address the problem without impacting public health.

If a production well, monitoring well or nearby deep aquifer well is impacted by contamination, the City will immediately notify BHWSD and the City of Kelso, water purveyors supplied by the MFRWTP. Similarly, the City will work with Ecology and the DOH to report the contamination and locate its source.

Depending on the level and extent of contamination, various operational options will be considered including:

- Using other wells in the wellfield
- Alternating use of individual wells
- Changing the length of time that each well is in operation
- Reducing water system demands by implementing the City's Water Shortage Response Plan ordinance (LMC 15.74) as discussed in Section 4.5.1
- Obtaining water from the City of Kelso through their intertie
- Equipping the City's Prudential Boulevard Well
- Obtaining water from another approved source of water
- Depending on the level of contamination, the City will consider providing treatment of water from one or more production wells. Treating and lowering the contaminant level in one production well may allow the City to blend this water with water containing a higher concentration of contaminant, to produce water containing a reduced average level. Blending is a common treatment technique for chemical contamination of wells.

5.2.4 Spill and Incident Response Planning

As previously stated, a spill or other contamination of the soil or shallow groundwater likely will not directly affect the deep aquifer. However, because of the potential for this contamination to migrate to the Consolidated Diking Improvement District's drainage ditches and/or Columbia River, the City must be notified of any event that may cause contamination of shallow groundwater or the drainage system. Current first response containment procedures should be followed rather than washing or flushing the spill into the ground or drainage system. Likewise,

the City should be notified of spills or discharges to the river that are not permitted or that exceed permit levels.

As stated above, the City will notify all first responders and governmental agencies with jurisdiction in the WHPA and requested their assistance in protecting the quality of the deep gravel aquifer. In addition to the notification list of agencies to be notified, the following entities will be requested to report spills to the City's emergency telephone operator:

- Cowlitz County Com Center (Dispatch)
- Longview Fire Department
- Longview Police Department
- Cowlitz 2 Fire & Rescue
- Washington State Patrol
- Cowlitz County Sheriff
- U.S. Coast Guard
- U.S. Army Corps of Engineers
- Columbia River Fire
- Port of Longview
- Port of St. Helens
- City of Rainier Police Department
- Washington State Department of Ecology
- U.S. Environmental Protection Agency
- Cowlitz Clean Sweep
- PNE Corporation
- Weyerhaeuser Company
- Longview Fibre Paper & Packaging Inc.
- Millennium Bulk Terminals.

The City will also maintain an awareness of new developments or discharges to the Columbia River and also monitor permit renewals and discharges on other nearby upstream tributary rivers.

Section 6: Operation and Maintenance Program

6.1 Introduction

This section summarizes the operation and maintenance (O&M) program of the City. This section discusses the O&M procedures for the City's existing distribution system and the anticipate O&M for the new MFRWTP. The major elements of each program include:

- Organization
- System Operation and Control
- Emergency Response
- Safety Procedures
- Recordkeeping
- Cross Connection Control (CCC) Program.

6.2 Organization

6.2.1 Responsibilities

The City's water system includes the Water Division and the Filter Plant Division, which are organized as two separate divisions within the Department of Public Works. The current organization chart for the Utilities Division is shown on Figure 6-1. It is anticipated that the Filter Plant Division may be absorbed by the Water Division once the MFRWTP is brought online.

6.2.2 Water Division

The Water Division is responsible for the distribution and storage of potable water. As such, it is responsible for maintenance of water mains, water meters, pump stations and reservoirs in the City service area. A private contractor is responsible for meter reading.

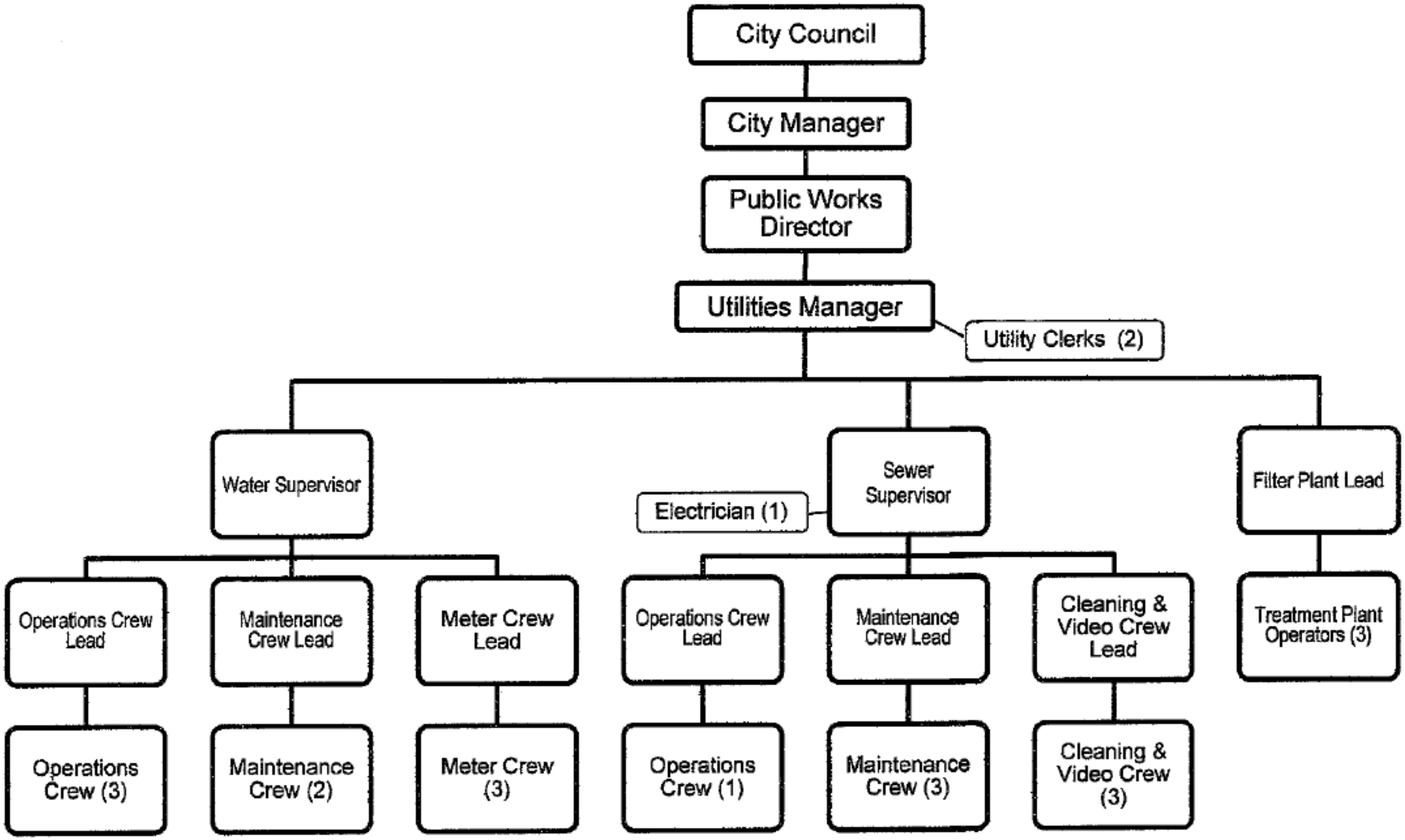
The Water Division provides assistance to the Filter Plant staff, when needed, to install and repair plant equipment (including pumps, tanks, screens, etc.) and to remove river silt from various plant facilities. Once the MFRWTP is brought online, it is unlikely that Water Division staff will need to provide the same level of assistance to the new treatment plant.

Table 6-1 summarizes the primary functions of each lead staff position shown on Figure 6-1, the organization chart for the Utilities Division.

Table 6-1: Water System Operation and Maintenance Staff Positions

Position	Essential Job Functions
Utilities Manager	Manages daily operation and maintenance of the treatment plant and the distribution system.
Water Supervisor	Supervises maintenance of metered services, water mains, pumping stations, and reservoirs.
Filter Plant Lead	Responsible for daily operation and maintenance of the treatment plant.
Treatment Plant Operators	Daily operation and maintenance of the treatment plant and water quality testing in the distribution system.
Operations Crew	Operation and maintenance of pump stations, reservoirs, and valves, and marking facility locations.
Maintenance Crew	Repair and/or replace water mains, valves, and services.
Meter Crew	Repair and/or replace broken meters and meter boxes, large meter testing, change meters to touch-read, and test City-owned backflow assemblies.

Figure 6-1: Longview Water System Organization Structure



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6.2.3 Operator Certification

The DOH waterworks certification program establishes minimum requirements and standards by which operators in charge of public water systems are examined and certified. The assigned classification of the public water system, based on the complexity of the water treatment process and the population served for a distribution system, determines the required grade level for operator certification. Once certified, operators are required to show professional growth in order to maintain their certification. This can be accomplished by advancing in level or number of certificates or by obtaining 3 Continuing Education Units (CEUs) every 3 years. The City has a budget line item to address continuing education.

The City's distribution system is classified as a Group 4 distribution system. The RWTP is currently classified as Group 4 and the new MFRWTP will be classified as Group 3. The City staff certifications shown in Table 6-2 either meet or exceed WAC 246-292-020 certification level requirements for this system. To maintain professional growth and to fulfill continuing education requirements, all certified staff are encouraged to participate in American Water Works Association (AWWA) Section and Subsection affairs and attend appropriate workshops and seminars.

Table 6-2: Water System Lead Staff Members

Position	Certification
Utilities Manager	WDM 4, CCS
Filter Plant Lead	WTPO 4
Water Supervisor	WDM 3
Sewer Supervisor	WDM 3
Cross Connection Program Supervisor	WDM 3, CCS

6.2.4 Mint Farm Regional Water Treatment Plant

The City will operate the MFRWTP in partnership with BHWSD under the direction of the Board. The Board consists of two members from the City and one member from the BHWSD.

6.3 System Operation and Control

6.3.1 System Components

Existing facilities in the City service area are summarized in Section 1. Water distribution system components are documented in an O&M manual. An interactive electronic O&M Manual is being developed for the new MFRWTP documenting the components of the new plant. The City tracks and schedules maintenance and the CCC program electronically computerized software.

6.3.2 Preventive Maintenance Program

Preventive maintenance for the City's water distribution system is summarized in Table 6-3. An electronic O&M manual is currently being developed for the new MFRWTP, and will be completed before the plant is brought into service sometime in late 2012. A copy of the manual will be provided to DOH prior to start-up and commissioning of the new plant per the requirements of WAC 246-290.

A sanitary survey conducted by the DOH on 22 March 2010 found the City's pumping, distribution, and storage facilities in excellent condition and that the City had an excellent O&M Program.

Table 6-3: Summary of Preventive Maintenance Operations

System Component	Maintenance	Frequency
Water Distribution and Storage		
Water Mains	Flush older areas	Semi-annually
	Flush entire system	Annually
Reservoirs	Clean and Inspect	Every 10 years
Valve	Exercise	At least annually
Water Meters (¾-inch to 2-inch)	Replace approximately 600 water meters	Annually
Compound Meters (2 inches or larger)	Test Repair or Replace	Annually As needed
Pumps and Booster Pump Stations including Valves and Motors	Inspect	Twice weekly
Reservoir Security	Inspect	Once weekly
Service Meters	Remove and replace, bench test, and repair or surplus service meters suspected of malfunction	As needed
Longview MFRWTP		
Refer to Longview MFRWTP Electronic O&M Manual to be submitted prior to plant start-up and commissioning.		

6.4 Equipment, Supplies, and Chemical Inventory

6.4.1 Water Distribution System

The Utilities Manager maintains an adequate and appropriate inventory of construction and maintenance/repair supplies. In the event an after-hours emergency event arises requiring supplies not currently on hand, the City maintains a list of suppliers and vendors for after-hours emergencies. The list of supplies on hand includes:

- Water main, ductile iron, 4-, 6-, 8-, 12-, and 20-inch
- Pipe fittings and couplings: 4-, 6-, 8-, 12-, and 20-inch
- Repair clamps: Various sizes
- Copper service pipe: ¾- through 2-inch
- Service meters: ¾-, 1-, 2-, 3-, and 4-inch
- Miscellaneous fittings and valves
- Pump seals and spare parts
- Control valve repair kits
- Fire hydrants and valves
- Hydraulic backhoe
- Hydraulic excavator
- Dump trucks
- Pickups
- Meter test bench
- Tapping tool
- Service truck and tools, parts bins and power take-off
- Vacuum/Jet Trailer with hydraulic valve turner.

6.4.2 Mint Farm Regional Water Treatment Plant

The Filter Plant Lead maintains the spare parts and water treatment process/chemical inventories. The chemicals are bid annually and delivered as needed throughout the year. Some of the chemicals used and representative spare parts are listed below. A more detailed list of spare parts will be included in the O&M manual for the new plant, which will be submitted to DOH prior to plant startup.

- Pump seals
- Electronic control room spares (switches, etc.)
- Filter media
- Oil and grease

- Liquid Sodium Hypochlorite (12.5 percent)
- Liquid Fluorosilicic Acid (24.4 percent)
- Liquid Sodium Hydroxide (25 percent)
- Liquid Polymer (emulsion type)
- Laboratory Supplies
- Spare equipment as recommended by manufacturers (refer to O&M Manual).

6.5 Emergency Response Program

A water supply emergency response plan was developed by HDR, Inc. for the City and the PUD in 2007. DOH approved the plan on 20 August 2007. Portions of the emergency response plan will be updated, as necessary, once the new MFRWTP is brought online.

6.5.1 Call-Up List

- **Water Distribution System:** The emergency call-up list for the Longview Water Division is on file with a contracted answering service, the police and fire departments, and the Cowlitz County Emergency Communications. The Water Supervisor is the first call, followed by the Utilities Manager and the Sewer Supervisor.

- **MFRWTP:** The emergency call-up list for the MFRWTP is on file at the Communications Center, the police and fire departments. The Filter Plant Lead is the first call, followed by the shift operators.

6.5.2 Vulnerability Analysis

The City conducted a Vulnerability Assessment of its facilities as required by the Public Health Security and Bioterrorism Preparedness Act of 2002 (Bioterrorism Act). Specific findings and information from the Vulnerability Assessment are not included here, but are available for review by authorized agencies as necessary and approved by the Utilities Manager.

- **Distribution System:** The piping materials comprising the water mains in the City system are described in Section 1. Most of the system (93 percent) consists of cast or ductile iron pipe in good condition. An appreciable amount is old lead-joint pipe. All new water main installations are ductile iron, restrained push-on-joint pipe. The remaining pipe in the system (7 percent), which is located in small distribution areas, consists mainly of small diameter galvanized steel or AC pipe. Sections of this older pipe are replaced as resources permit. Although vulnerable to damage from earthquakes, the system is well looped, which minimizes the effect of major main breaks.

- **Reservoirs:** Reservoirs are located in non-public or remote areas and have not experienced any appreciable amount of human intrusion. All reservoirs are covered and fenced.

- **Booster Pumping Stations:** Booster pump stations, both buildings and sites, have experienced occasional vandalism, but damage was insufficient to disrupt operation. The enclosures are well constructed and secure.

- **MFRWTP:** Protection of the Wellhead area is discussed in Section 5. Auxiliary power will be available onsite for the well pumps and treatment facilities. The site will be fenced and secure.

6.5.3 Contingency Plan

The City has a Water Shortage Response Plan in place, LMC, Chapter 15.74, that describes the procedures for declaring an emergency and appropriate actions based on the degree or stage of the declared emergency. The Water Shortage Response Plan is discussed in more detail in Section 4 of this Water System Plan. A source Contingency Plan is included in the Wellhead Protection Program (Section 5.2.4).

- **Emergency Water Supply:** The City also has an emergency intertie with Kelso, which was used successfully in 1980 to prevent disruption to service caused by the eruption of Mount St. Helens. Additionally, there is an agreement between the City and the Weyerhaeuser Company that provides for Weyerhaeuser to supply water to the City during an emergency. Currently, this connection is inactive but could be reactivated should it become necessary. However, this is a non-potable water supply; therefore, additional measures would be necessary to utilize this particular emergency supply.

- **Flood Plan:** The City developed an emergency flood plan after the Mount St. Helens eruption. It includes an early warning and notification system, management and supervisory rosters, general policies and procedures, specific plans for each warning level, and specific procedures for each department. The plan is reviewed annually. The Water Department and the treatment plant are protected from the 1 percent chance of the annual 100-year by a system of levees, dikes, and other structures. The flood plan is in place to address the possibility that one of these protecting structures could fail.

6.6 Safety Procedures Program

The City has a Safety and Risk Manager on staff who maintains the “Health and Safety Manual.” Monthly safety meetings are held at the utility operation center. The Washington State Department of Labor and Industries conducted a general safety inspection on 8 April 2010 and found no issues of concern.

6.7 Cross Connection Control Program

All public water systems must develop a CCC program as regulated by WAC 246-290-490. The CCC is designed to protect public health by preventing the contamination of public drinking water systems through cross connections. Thus, the City developed a CCC program to protect its treatment, storage, and distribution facilities from contamination via cross connections. The WAC requires the installation of backflow preventers commensurate with the degree of hazard and annual inspections and testing of backflow preventers. The City’s CCC program includes public education regarding cross connections using the City’s common outreach methods (water bill, CCR, newsletters, and web site).

The City's CCC program is authorized by LMC Article 15.68, which was recently revised to comply with regulatory requirements. The Cross Connection Control Ordinance 3208 was adopted on 26 June 2012; a copy of the ordinance is included in the appendices. The revised CCC program was developed to address the 10 elements identified in WAC 246-290-490. The City currently has four staff members that are certified CCS.

The City participates in DOH's online Annual Summary Report filing process for backflow prevention devices and maintains a master list of backflow service connections. The 2010 DOH sanitary survey found the City's program to be in compliance with current regulatory requirements. The 2010 Sanitary Survey also recommended that the City conduct assessments on all backflow prevention devices in hazardous locations. The City is actively conducting hazardous assessment surveys and tracking backflow prevention devices in areas of known potential contamination.

The City Manager has the authority to interpret the provisions of LCM Article and decide their applicability to a situation while the Utilities Manager is responsible for enforcement.

Compliance and enforcement covered in LMC Chapter 15, includes the following elements:

- Review and determine any potential cross-connections
- Monitor and inspect all cross-connection control assemblies relied upon for system protection
- Test all CCC assemblies owned by the City annually
- Maintain CCC assembly records, including a record of each device
- Discontinue service to any premises affected by a cross-connection until it is eliminated or controlled.

Current CCC procedures for the City are listed below:

- Cross-connections are identified by the Water Department.
- If the cross-connection cannot be eliminated, a backflow prevention device is required. All backflow prevention assemblies must be inspected and approved by the City Water Department. The assemblies must also be tested when installed.
- All backflow prevention assemblies relied upon for system protection must be tested annually. A sample of a Backflow Preventer Test Report is included in Appendix G.
- Installation, inspection, and testing of backflow prevention assemblies are conducted according to the current edition of *The Accepted Procedure and Practice in Cross-Connection Control Manual,* Pacific Northwest Section, AWWA.
- Each CCC assembly has a detailed report associated with its use and installation. An example of Backflow Preventer Detail Report is included in Appendix G.

6.8 Recordkeeping

Recordkeeping procedures by the City and the treatment plant are summarized in Table 6-4. Electronic records will be maintained on the City's computer information network and backed up by SCADA reports. Additional water quality reporting procedures are included in Section 3. The surface water reporting previously required for the RWTP is not required for the new MFRWTP and has not been identified in the following recordkeeping procedures. However, the City will continue to submit reports as required by WAC until the RWTP is no longer producing potable water.

Table 6-4: Recordkeeping Procedures

Record	Comment	Minimum Years Retained
Pumping and plant flows	Maintained at the MFRWTP	6
Bacteriological Results	Maintained at Operations Center	6
Cross Connection Control	Maintained at Operations Center	6
Disinfection Monitoring Plan	Maintained at Operations Center	10
Corrosion Control Monitoring	Maintained at Operations Center	12
Customer Complaints	Maintained at Operations Center	6
WQMR	Maintained at Operations Center and MFRWTP	6
Monitoring Well Water Quality Sampling, done on a semi-annual basis	Maintained at MFRWTP	As long as system is in operation
MFRWTP Monthly Report Includes: Daily hours of operation; amount of water treated, wash water and chemicals used; and water quality	Submitted monthly to DOH Maintained at the MFRWTP and Operations Center	6
Monthly Operating Report Includes: Amount of treated water pumped to customers, amount of water billed, and quantities of chemicals used	Maintained at the MFRWTP and Operations Center Used to calculate unauthorized water use and treatment costs	6
Fluoridation and Chlorination Reports	Submitted monthly to DOH Maintained at the MFRWTP	6
Source Meter Readings	Maintained at the MFRWTP	As long as source is in operation
Water Facilities Inventory Report	Submitted annually to DOH Maintained at the Operations Center	6
Production Well Water leveling monitoring	Maintained at the MFRWTP	As long as source is in operation
Sanitary Survey	Maintained at Operations Center	10
Consumer Confidence Reports and Public Notices	Maintained at Operations Center	6
Corrective Action Records MCL related (Groundwater Rule)	Maintained at Operations Center and MFRWTP	10
Project Reports, Construction Documents and Related Drawings, Inspection Reports and Approvals	Maintained at Operations Center and MFRWTP	Life of facility

6.8.1 Customer Complaint Process

Longview takes all customer concerns and complaints seriously. Each drinking water complaint received by City's Utilities Division is investigated as outlined in Table 6-5.

Table 6-5: Complaint Follow-up Process

	Water Quality (Taste and Odor, Color, etc.)	Water Quality (Illness)	Water Outage / Low Pressure
Complaint received by the Utility Clerks	X	X	X
Complaint logged into Maintenance Management System as a Work Request	X	X	X
Complaint forwarded directly to Utilities Manager, or a Utility Supervisor for follow-up within 1 hour		X[(a)]	
Operations Crew follow-up with site visit within 4 hours	X[(a)]		
Operations Crew notified by pager and follow-up with site visit within 1 hour			X[(b)]
Response to the complaint logged in as work order for permanent record	X	X	X
Completed work orders reviewed periodically for trends, flushing program modifications, repair/replacement, budgeting, etc.	X	X	X

Notes:

(a) Site Investigation may include chlorine residual, coliform sample, and/or distribution system flushing.
(b) Site investigation may include pressure tests on site and at neighboring connections to determine the extent and cause of the problem. May involve checking distribution system valves, and looking for leaks.

Complaints received in the field are investigated at the time the complaint is made, and then entered as a work order. All calls received after hours are transferred to the Public Works after hour emergency dispatch center who forwards complaints to the Utilities Manager or one of the field supervisors. The dispatch center has home and mobile phone numbers for the Utilities Manager and each of the field supervisors. Depending on the information received from the dispatch center, the call will be returned to determine the appropriate response which may range from calling a field crew out immediately to conducting a site visit the next working day.

Complaints received by other city staff or officials are directed to the Utilities Division for entry into the system and response. Table 6-6 indicates the number of complaints received in the five years since the current procedure has been in place.

Table 6-6: Complaints Received

Year	Water Quality (Taste and Odor, Color, etc.)	Water Quality (Illness)	Water Outage / Low Pressure
2006	22	0	0
2007	15	0	0
2008	22	0	0
2009	23	0	0
2010	24	0	0

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Section 7: Design and Construction Standards

7.1 Introduction

This section of the WSP contains information pertaining to the design and construction standards for the City. It is intended to assist the City and design engineers in preparing detailed construction plans and specifications. The following elements will be discussed: design and construction standards, policies and requirements for outside parties, project review procedures, and construction inspection procedures.

7.2 Design Standards

Design standards identify the performance standards and sizing criteria to be used in designing each water system improvement. Standards for treatment facilities, fire flow demands, storage requirements, pipeline size, and water quality will be discussed. Design guidelines for many different system components can be found in the Washington State DOH's *Water System Design Manual* (2009).

7.2.1 Treatment Facilities

The capacity of the MFRWTP was assessed based on projected ADD and MDD in Section 3: System Analysis. The demand projection methodology is presented in Section 2: Basic Planning Data. Treatment facilities are typically designed to meet MDD demands for the water system on a reliable capacity basis (i.e., one treatment train out of service).

7.2.2 Pump Station Facilities

The capacity of the City's pump stations are described in Section 3: System Analysis. Pump stations are typically sized to meet MDD for their pressure zone on a reliable capacity basis (i.e., largest pump out of service).

7.2.3 Fire Flow Demands

Design fire flow demands were used in the hydraulic analysis of the distribution systems and to determine fire storage requirements. Fire flow demand is discussed in more detail in Section 2: Basic Planning Data.

7.2.4 Storage Requirements

The City is classified as a Group A Public Water System. According to the *Water System Design Manual* (December 2009), Group A reservoirs must be designed to provide stability, durability, and protection of water quality while being compatible with existing and future facilities. Five storage components–Operational, Equalizing, Standby, Fire Suppression, and Dead Storage–must be considered in each reservoir design and in the analysis of existing storage facilities. Each component is discussed in detail in Section 3: System Analysis. The City has decided to combine or "nest" standby and fire flow storage requirements.

7.2.5 Pipeline Size

Hydraulic evaluation criteria are based on maintaining system pressure and velocity as defined in the DOH WAC 246-290-230 and in *Group A Public Water Systems Waterworks Standards*. The following criteria are recommended when new distribution mains are constructed or old mains replaced:

- Maintain a minimum pressure of 30 psi at any point in the distribution system during PHD conditions.
- Maintain a minimum pressure of 20 psi at any point in the distribution system during fire flows under MDD conditions.
- Limit pipe velocities to 8 fps.
- Limit main pressures in the distribution system to 100 psi. Some areas near the new MFRWTP will experience pressure greater than 100 psi once the plant is brought online. The City will address these concerns in these areas on a case by case basis.
- Use a hydraulic pipe model to verify system conditions and pipe size requirements.

The distribution systems were evaluated for both existing and forecasted future (2032) conditions. Existed and forecasted demands are discussed in more detail in Section 2: Basic Planning Data.

7.2.6 Water Quality Standards

Water quality must conform to the Federal SDWA as amended and the DOH criteria as specified in the Drinking Water Regulations (Chapter 246-290 WAC current edition). Part 4 of these regulations identifies water quality requirements that must be met. These regulations define monitoring requirements, maximum primary and secondary contaminant levels, follow-up action, and conditions that require public notification. Water quality requirements are presented in detail in Section 3: System Analysis.

7.3 Construction Standards

The City maintains a *Standard Plans and Specifications Manual* referred to as the "City Standards." These City Standards apply to the design and construction of all new and upgraded facilities. The City has adopted the latest versions of the Washington State Department of Transportation *Standard Specifications for Road, Bridge, and Municipal Construction* and its American Public Works Association (APWA) Supplement. The City Standards provide a supplement to the Standard Specifications. In addition, standard drawings for sewer and water utilities, among others, have been developed and included in the manual. A copy of the Standard Plans and Specifications Manual is included Appendix F and is also located on the City's website at:
http://www.mylongview.com/publicworks/EngineeringPlansProvisions.html.

7.4 Policies and Requirements for Outside Parties

Policies and requirements for outside parties are contained within the body of the City's governing documents. The governing document for the City is LMC Title 15, Article II, Water,

Section 15.72 – Extensions and Additions and the Standard Plans and Specifications Manual. The City's service area policies are summarized in Section 1.6 of this WSP.

7.5 DOH Project Report and Construction Document Submittal Exceptions

7.5.1 Applicable State Regulations

WAC 246-290-125 provides an exception to the requirement that public water systems submit certain project reports and construction documents to DOH for review and approval. DOH allows exceptions through a three-tiered policy defined in the following regulatory subsections.

- WAC 246-290-125(1) provides an exception to all utilities for the submittal and approval of valves, meters, fittings, backflow assemblies and hydrants, and maintenance of painted surfaces not contacting potable water.
- WAC 246-290-125(2) provides an exception to utilities for the submittal of new distribution main provided the utility has an approved water system plan that includes standard specifications for distribution mains. It also requires the utility to maintain on file a construction completion report.
- WAC 246-290-125(3) provides an exception to purveyors for the submittal of major projects such as transmission mains, storage tanks, and booster pump stations provided that:
  - A current department-approved water system plan is on file.
  - A professional engineer licensed in the State of Washington reviews the project. The review engineer and design engineer must not be the same individual.
  - The project is identified in the capital improvement section of the WSP.
  - The project is in accordance with the other applicable portions of WAC 246-290-125(3), Sections e, f, g, and h.

Source-of-supply projects, interties, and water quality treatment-related projects are not eligible for submittal exception procedures. The utility intends to submit major projects to DOH for review and approval.

7.5.2 Projects Identified for Exceptions

The utility maintains sufficient resources, both in house and with the use of private consultants, to meet the project submittal exceptions for all project groups defined in Section 7.5.1.

7.6 Construction Inspection Procedures

A Construction Report for Public Water System Projects, per WAC 246-290-040 is required upon completion of all water system improvement projects. The form must be completed by the purveyor and submitted to DOH upon project completion.

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Section 8: Capital Improvement Program

8.1 Introduction

This section summarizes the recommended 20-year capital improvements and their respective costs as developed throughout the previous sections. Organized by category, the section describes prioritized improvements for water supply and treatment, transmission and distribution system, booster pump stations, storage facilities, and planning, controls and general system improvements (system control, data acquisition, emergency response). Recommended projects are developed based on the analyses presented in Sections 2 and 3 and conversations with City staff. A summary table indicating project type, number, description, and benefit is included for each category.

The project recommendations presented in this chapter are intended to assist the City in identifying and prioritizing necessary water system improvement projects. Projects not included in the adopted 6-year CIP are identified as long-range projects that may be included in subsequent 6-year CIPs. The CIP improvements will be funded primarily through the City's existing reserve and replacement funds or through debt financing. The short- and long-term projects are summarized on an exhibit at the end of this section. Projects were selected and prioritized on the schedule using the following criteria:

- Compliance with regulatory/health and public safety requirements.
- Transmission, distribution, and storage improvements.
- Sources of supply to meet projected growth.
- System reliability/repair.
- Scheduling of project budgets for financing

The recommended 6-year capital improvements include source and treatment facility replacement, distribution upgrades, booster pump station improvements, telemetry and controls, pressure control, and miscellaneous activities. Figure 8-1 shows the location of the recommended improvements.

8.1.1 Planning Level Cost Estimates

Planning level cost estimates were developed for the projects identified in the 6- and 20-year window. These estimates include sales tax (7.9 percent), contractor overhead and profit (OH&P) (15 percent), planning level estimate contingency (25 percent), and engineering/design and construction management (25 percent).

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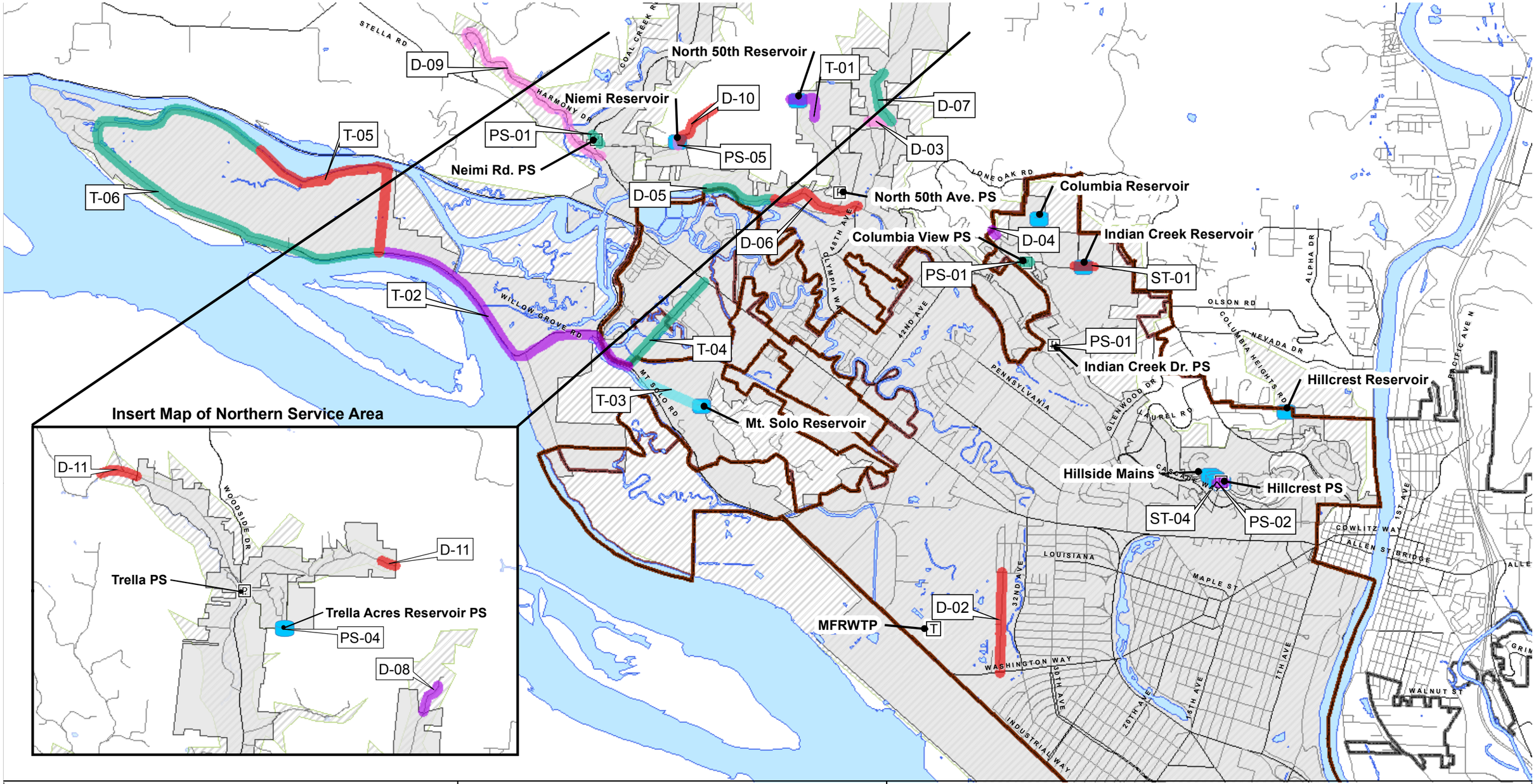

Legend

- X-00 Project Identifier
- Longview Water Reservoir
- Longview City Limits
- Street Centerline
- Longview Existing and Retail Service Area
- Longview Future and Retail Service Area
- Rivers and Lakes
- T Mint Farm Regional Water Treatment Plant (MFRWTP)
- P Longview Pump Station

This map is for information purposes only. Data was compiled from multiple sources. The data sources do not guarantee this data is accurate or complete. There may have been updates to the data since the publication of this map. All locations are approximate.

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0 1 2
Miles

Kennedy/Jenks Consultants

Comprehensive Water System Plan
Longview, Washington

Capital Improvement Program
Project Overview

K/J 1197009*00
August 2012

Figure 8-1

The transmission and distribution main planning level cost estimates consist of unit and lump sum prices based upon a recent bid tabulation process for public works projects in western Washington. Cost estimates include furnishing and installation of piping, valves and fittings, gravel, asphalt repair, fire hydrant assemblies, as well as sales tax, construction contingency, engineering and administration. The following assumptions were used to develop the cost estimates:

- All pipe is ductile iron, cement-mortar lined, AWWA Class 52.
- Pipe bedding will consist of 6 inches of crushed rock above and below the pipe.
- Ten percent of the pipeline trench length is backfilled with select imported backfill.
- Along arterials, 80 percent of the pipeline trench length is filled with controlled density backfill to a depth of 4 feet.
- Hydrant assemblies are installed every 400 feet.
- Isolation valves are installed every 600 feet.

Where pipeline is in a roadway, asphalt restoration includes an 8-foot-wide patch of asphalt, 3 inches thick, overlying 6 inches of crushed surfacing. Concrete restoration includes a 10.5-foot-wide patch of concrete 8 inches thick, overlying 6 inches of crushed surfacing.

8.2 Water Supply and Treatment

As discussed in Sections 1 and 3 of this WSP, the City and BHWSD have undertaken development of a new source of supply to replace the aging RWTP facility on Fisher's Lane. The new facility is located in the Mint Farm Industrial Park on the southwestern side of the City. More detailed information regarding the development and design of the facility can be found in the Basis of Design Report, (Kennedy/Jenks Consultants 2010). At the time this WSP was written, the new MFRWTP was under construction and expected to be online in late 2012. The CIP expenditures for this project reflect the approximate amounts to be spent during this 6-year planning period for completion of this facility. The City's share of this project has been funded by a combination of EPA grants, Drinking Water State Revolving Fund (DWSRF), and Public Works Trust Fund (PWTF) loans, and City and BHWSD capital funds.

Unanticipated Growth

The design for the MFRWTP supply and treatment project was based upon 20- and 50-year planning scenarios. The new facility has the capacity to accommodate increased demands from unanticipated new industrial development. The MFRWTP's current constructed capacity is 17.4 MGD with an ultimate build out capacity of 25.3 MGD. Refer to Section 3.5.2 for more detailed information on the MFRWTP's capacity.

RWTP Decommissioning

The City intends to beginning the decommission process for the existing RWTP after the new MFRWTP has been brought online and is functioning according to design and regulatory parameters. The Department of Fish and Wildlife has stated that the City needs to make substantial upgrades to the intake in order to meet screening requirements pertaining to fish protection or to abandon the intake for municipal purposes by September 2012. As it is not cost

effective to upgrade the intake, the City has no intention of utilizing or maintaining the existing RWTP once the new MFRWTP is online; nor is it cost effective to maintain the plant as an emergency treatment facility. Once the RWTP is dewatered, it would take a minimum of three days to bring the RWTP back on line. There are provisions in place at the new MFRWTP that would allow the City to bypass the treatment process and pump directly into the system in an emergency situation.

Initial decommissioning will include the dewatering of the existing RWTP and salvaging of the metal and other equipment. The City has not yet determined what will be done with the property or the structures located on the property. It is expected that the decommissioning process will occur over time. Minor modifications will be made to the intake screen that will allow the City to continue to use the river intake for the purposes of flushing Lake Sacajawea.

Table 8-1: Source Development Projects

Project Number	Planning Window	Improvement Importance	Project Description	Benefit
MFRWTP-01	6	Growth Reliability Regulatory	Completion of new regional water supply and treatment facility.	Provide an adequate safe supply of drinking water for the 20-year planning period and beyond.
RWTP-01	6	Decommissioning	Decommissioning/demolition of existing surface water treatment plant.	Conclusion of MFRWTP-01 project.

8.3 Transmission and Distribution Mains

The City has a total of six possible transmission projects and 10 possible distribution projects listed on the CIP list. The majority of the transmission and distribution CIP projects are development driven. All of the transmission main projects fall into the 20-year planning window and are all dependent upon further development in the identified areas. Table 8-2 summarizes the possible transmission main improvements.

The distribution system improvements identified are presented in Table 8-3. Repair and replacement projects were selected based upon maintenance history and relative vulnerability to pipe failure resulting from age and material. These projects include replacement of deteriorated or undersized lines, which were selected based upon storage analysis and hydraulic model results. These projects will expand or improve the water main grid, providing increased flows and pressures to portions of the distribution area shown to be deficient.

Table 8-2: Transmission System Improvements

Project Number	Planning Window	Improvement Importance	Project Description	Benefit	Pipe Size (inches)	Pipe Length (LF)
T-01	20	Growth Reliability	Replace 1,500 LF of 6-inch dia. pipe with 12-inch-diameter pipe from North 50th Avenue Reservoir to 10-inch-diameter pipe crossing. Project is required only if development occurs.	Provide additional capacity for future development along Clark Creek Road.	12	1,500
T-02	20	Growth Reliability Regulatory	Replace10,000 LF of 8-inch-diameter pipe with 12-inch-diameter pipe from 12-inch pipe at intersection of Mount Solo Road and Hwy 432 (J-531) along Willow Grove Road to junction with 6-inch-diameter pipe (J-499) on Willow Grove Road.	Improve flow/pressure and allow for future development.	12	10,000
T-03	20	Growth Reliability Regulatory	Install 2,300 LF of 16-inch-diameter pipe from Mount Solo Reservoir to Mount Solo Road. Pipe size to be verified with level of development that occurs.	Improve distribution system reliability in Willow Grove area.	16	2,300
T-04	20	Growth Reliability Regulatory	Replace 4,300 LF of 8-inch-diameter pipe with 12-inch-diameter pipe along Mount Solo Rd from Ocean Beach Hwy. intersection (J-586) to intersection with Hwy. 432/ Industrial Way.	Improve distribution system reliability, flow and pressure in Mount Solo Area.	12	4,300
T-05	20	Growth Reliability Regulatory	Replace 8,300 LF of 6-inch-diameter pipe with 8-inch-diameter pipe from the southern loop of Willow Grove (J-499) to and west along the northern loop of Willow Grove (J-502). Project required if development occurs.	Improve flow/pressure and allow for future development.	8	8,300

Project Number	Planning Window	Improvement Importance	Project Description	Benefit	Pipe Size (inches)	Pipe Length (LF)
T-06	20	Growth Reliability Regulatory	Install 5,400 LF segment and 6,200 LF segment of 8-inch-diameter pipe along northern branch of Willow Grove Road, parallel to Coal Creek Slough. Project required as development occurs.	Create distribution system looping to improve service to Willow Grove.	8	11,600

Note:

LF = linear feet

A number of the above 20-year transmission main projects are to address fire flow and system reliability in the Willow Grove / Barlow Point area. This area is situated near the Columbia River and on soils that could be subject to liquefaction in a seismic event. The City has had some internal discussions with regard to a possible redundant supply for this area; should future development occur. The possibilities discussed include the following:

- Installation of a transmission main west on Highway 4, then crossing the slough to connect to the existing Willow Grove area infrastructure.
- Installation of a groundwater well for an emergency source of supply. Water quality in the area is unknown. Further information would be required.
- Installation of a storage facility with pump station to provide standby storage in the event of a transmission main break.

The above alternatives would only be necessary in the event that further development occurs in the Willow Grove area and would require a more detailed feasibility evaluation before appropriate action could be determined and a corresponding CIP is developed.

Table 8-3: Distribution System Improvements

Project Number	Planning Window	Improvement Importance	Project Description	Benefit	Pipe Size (inches)	Pipe Length (LF)
D-01	6	Reliability	Replace deteriorated and undersized mains throughout system.	Improve reliability and provide adequate flow and pressure.	Varies	Varies
D-02	6	Reliability	Replace 3,750 LF of 4- and 6-inch AC pipe with 8-inch-diameter in 33rd Avenue from Washington Way to Williams.	Improve distribution in this area and address concerns due related to aging pipes.	8	3,750

Project Number	Planning Window	Improvement Importance	Project Description	Benefit	Pipe Size (inches)	Pipe Length (LF)
D-03	6	Reliability Restoration	Reinstall 1,000 LF of 10-inch-diameter pipe to replace intertie between Clark Creek Lane and Clark Creek Road destroyed in 2006 flood.	Restore 2006 level of service to this area. FEMA money available for project.	10	1,000
D-04	6	Reliability Restoration	Install intertie with BHWSD on Curtis Drive. Project done jointly with BHWSD. Includes connection to City wide SCADA system.	Improve reliability and provide for future growth.	8	N/A
D-05	20	Growth Reliability	Replace 3,000 LF of 6-inch diameter pipe with 12-inch-diameter pipe on Pacific Way, east of Coal Creek Road.	Improve pressure and flow to pump stations.	12	3,000
D-06	20	Growth Reliability	Replace 3,000 LF of 6-inch-diameter pipe with 12-inch-diameter pipe on Pacific Way, east of Coal Creek Road. Phase II.	Improve pressure and flow to pump stations.	12	3,000
D-07	20	Growth Reliability	Replace 2,000 LF of 6-inch-diameter pipe with 12-inch-diameter pipe on Clark Creek Road, north of 10-inch pipe crossing. Project required as development occurs.	Provide service to future development. Pipe size to be verified with level of development that occurs.	12	2,000
D-08	20	Growth Reliability	Install 1,400 LF of 8-inch-diameter pipe on Clark Creek Road from end of existing main. Required only if development occurs.	Provide service to future developments.	8	1,400
D-09	20	Growth Reliability	Install 8,000 LF of 8-inch-diameter pipe on Harmony Drive. Required only if development occurs.	Provide service to future developments.	8	8,000
D-10	20	Growth Reliability	Install 4,060 LF of 8-inch-diameter pipe on Moilanen Road from Neimi Reservoir east. Required only if development occurs. Must be completed in conjunction with PS-05.	Provide service to future developments.	8	4,060

Project Number	Planning Window	Improvement Importance	Project Description	Benefit	Pipe Size (inches)	Pipe Length (LF)
D-11	20	Growth Reliability	Install 7,000 LF of 8-inch-diameter pipe on Coal Creek Road/ Ragland Road (combined) within Upper Coal Creek Zone 502. Project will provide service to end of the road. Required only if development occurs.	Provide service to future developments.	8	7,000

The hydraulic model identified a number of areas where the presence of 4-inch pipe limits system pressure and volume. The City is aware of these areas and intends to upgrade these pipes as part of their ongoing pipe replacement project included as project D-01. Other areas of the system are deficient at the pipeline terminus. Two such areas are the end of Coal Creek and Ragland Road in the 502 zone and the end of Clark Creek Road. City staff have indicated that development may be possible in the distant future in the area between Ragland Road and Clark Creek Road that could potentially allow for the City to loop the system in this area. However, it is a remote possibility and would require amending the City's future service area and further evaluation to determine system needs.

8.4 Booster Pump Stations Improvements

The City has a total of six booster pump station projects listed on the CIP; four of which fall within the 6-year planning period. The pumping projects within the 6-year window all relate to station upgrades to improve reliability and extend the service life; it is expected the pumping capacity will remain unchanged. Projects listed for the 20-year planning period must be reassessed based on the level of development that occurs. The booster pump station improvements are summarized in Table 8-4.

Table 8-4: Booster Pump Station Improvements

Project Number	Planning Window	Importance	Project Description	Benefit	Total Pump (HP)	Generator Capacity (kilowatt)
PS-01	6	Reliability	Upgrade Indian Creek, Columbia View and Neimi Pump stations. Replacement of pumps and suction/discharge piping manifolds to improve hydraulics of pump station at Indian Creek. Includes installation of meter all at pump stations.	Improve reliability of pump station and extend service life. Provide capacity for BHWSD intertie in Columbia View service zone.	TBD	TBD

Project Number	Planning Window	Importance	Project Description	Benefit	Total Pump (HP)	Generator Capacity (kilowatt)
PS-02	6	Reliability Storage	Replace Hillcrest pump station. Includes installation of meter at pump station and lowers pump suction elevation. Includes the demolition of tanks 1 and 2 to allow for construction of a combined pump station for City and BHWSD.	Improve reliability of pump station; allows full use of Hillside Reservoir capacity.	TBD	TBD
PS-03	6	Reliability	Miscellaneous pump station upgrades.	Improve reliability of pump station and extend service life.	TBD	TBD
PS-04	20	System Pressure Growth	Construct booster station adjacent to Trella Reservoir to provide service to future development. Necessary only if development occurs. Pump and pipe sizing to be determined based on development conditions at that time.	Improve pressure and flow. Provide service to future development. Provide required fire flow.	TBD	TBD
PS-05	20	Growth	Construct booster station on Moilanen Road. Required only if development occurs. (To be done in conjunction with LD-08 and storage project. Pump and storage requirements to be sized according to need at time of development.)	Provide service to future development.	TBD	TBD

8.5 Storage Facilities

There are three projects identified in the CIP to address storage related concerns such as reliability, capacity to meet regulatory and health standards and general improvements. The results of the storage analysis indicate the City needs additional storage in the Indian Creek service zone to provide required fire flow storage. The City may choose to either replace the existing tank with a new 200,000-gallon tank or build a second 50,000-gallon tank adjacent to the existing tank. The existing tank sits on 0.23 acre according to tax records. Existing site and topographic conditions may require the purchase of additional property in order to construct the new storage facility. Preliminary evaluation indicates that it may be possible to site the new facility on the existing site. A more detailed site evaluation would be necessary before a final determination is made with regard to the need for additional property acquisition. For planning

purposes it was assumed the City would elect to replace the existing tank with a new larger tank. The storage projects are summarized in Table 8-5.

Table 8-5: Storage Improvements

Project Number	Planning Window	Importance	Project Description	Benefit	Volume (gallons)
ST-01	6	Reliability Regulatory	Replace Indian Creek Reservoir with larger reservoir (200,000 gallons) or construct new 50,000-gallon reservoir adjacent to existing to serve Indian Creek service zone. Land acquisition may be necessary for this project.	Provide adequate fire flow/standby storage and operational flexibility for Indian Creek service zone. Rectify storage deficiency identified in this WSP.	50,000 to 200,000
ST-02	6	Reliability Safety	Reservoir Paving and Security upgrades.	Install pavement and upgraded fencing at various reservoir sites to improve access and security.	Not applicable
ST-03	6	Reliability Safety	Reservoir Cathodic Protection.	Provide cathodic protection at reservoirs to prevent degradation of metal walls and appurtenances.	Not applicable
ST-04	6	Improvement Reliability	Demolition of Hillside Reservoirs No. 1 and No. 2 as part of Hillside Pump Station Replacement.	Provide space for construction of new pump station that will allow storage in Hillside Reservoirs to be fully utilized.	Not Applicable

8.6 Planning, Controls and General System Improvements

There are a number of planning, controls, and general system improvements planned within the 6-year planning window. As discussed in Section 3.6: Telemetry and Controls, upgrades to the City's SCADA system are scheduled to begin in 2012. These upgrades will be system-wide and the capital expenditures spread over a number of years in the 6-year planning window. The City has also planned for the replacement of deteriorating large customer meters to improve system reliability and accounting. This section also includes projects to address deteriorating valves, emergency power upgrades, improved meter reading capabilities and data processing, as well as long-range planning. These projects are presented in Table 8-6 below.

Table 8-6: Planning, Controls and General System Improvements

Project Number	Planning Window	Improvement Importance	Project Description	Benefit
PCG-01	6	Reliability	Installation of SCADA controls	Allow for remote monitoring and control of water system components.
PCG-02	6	Reliability	Large Meter Replacement	Replace deteriorated large customer meters to improve system metering, reliability and accounting.
PCG-03	6	Reliability	Annual Valve Replacement	Replace deteriorated valves that no longer function properly.
PCG-04	6	Reliability	Facility relocation for road replacement	Relocate water facilities as required for road construction projects.
PCG-05	6	Reliability	Emergency Power	Acquire generators and upgrade electrical panels.
PCG-06	6	Reliability	Annual Utility Local Improvement District (ULID) Projects	Replace deteriorated water mains before ULID paving projects.
PCG-07	6	Reliability	Fixed Based Radio Meter Reading System	Provide more accurate, efficient, and timely data.
PCG-08	6	Regulatory	2018 Water System Plan Update	Meet State Planning Requirements for Class A water systems.

8.7 Summary of Longview Capital Improvements

The complete CIP list for the City is summarized in Table 8-7. These projects include a project description, CIP construction time frame, and benefit. All of the 20-year projects are assumed to be 100 percent growth driven. More detailed cost estimates for the Indian Creek Storage alternatives (ST-01) are included as Exhibit 8 at the end of this section.

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Table 8-7: City of Longview CIP Project Summary 2012-2032

Note: All costs are shown in 2012 dollars; no inflation applied to future years.					Year of Construction						
Project ID	**Planning Period**	**Related Projects**	**Project Description**	**Benefit**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018-2032**
Water Treatment Plant											
MFRWTP-01	6		Completion of new regional water supply and treatment facility.	Refer to PDR for more detail	$14,500,400						
RWTP-01	6		Decommissioning/demolition of existing surface water treatment plant.	Refer to PDR for more detail					$545,000	$545,000	
Transmission											
T-01	20	D-03; D-07	Replace 1,500 lf of 6-inch dia. pipe with 12-inch dia. pipe from N. 50th Ave. Reservoir to 10-inch dia. pipe crossing. Project is required only if development occurs.	Provide additional capacity for future development along Clark Creek Road.							$384,000
T-02	20	T-03; T-04; T-05; T-06	Replace10,000 lf of 8-inch dia. pipe with 12-inch dia. pipe from 12-inch pipe at intersection of Mt. Solo Road and Hwy 432 (J-531) along Willow Grove Road to junction with 6-inch dia. pipe (J-499) on Willow Grove Road.	Improve flow/pressure and allow for future development.							$2,560,000
T-03	20	T-02; T-04; T-05; T-06	Install 2,300 lf of 16-inch dia. pipe from Mount Solo Reservoir to Mount Solo Road. Pipe size to be verified with fire flow requirements/level of development that occurs.	Improve distribution system reliability in Willow Grove area.							$785,000
T-04	20	T-02; T-03; T-05; T-06	Replace 4,300 lf of 8-inch dia. pipe with 12-inch dia. pipe along Mt Solo Rd from Ocean Beach Hwy. intersection (J-586) to intersection with Hwy 432/ Industrial Way.	Improve distribution system reliability, flow and pressure in Mt Solo Area.							$1,101,000
T-05	20	T-02; T-03; T-04; T-06	Replace 8,300 lf of 6-inch dia. Pipe with 8-inch dia. pipe from the southern loop of Willow Grove (J-499) to and west along the northern loop of Willow Grove (J-502). Project required if development occurs.	Improve flow/pressure and allow for future development.							$1,417,000
T-06 Phase I and II	20	T-02; T-03; T-04; T-05	Install 5,400 lf segment and 6,200 lf segment of 8-inch dia. pipe along northern branch of Willow Grove Road, parallel to Coal Creek Slough. Project required as development occurs.	Create distribution system looping to improve service to Willow Grove.							$1,980,000
Distribution											
D-01	6		Replace deteriorated and undersized mains throughout system.	Improve reliability and provide adequate flow and pressure.	$350,000	$350,000	$350,000	$350,000	$350,000	$350,000	$4,900,000
D-02	6		Replace 3,750 lf of 4- and 6-inch AC pipe with 8-inch dia. in 33rd Ave from Washington Way to Williams.	Improve distribution in this area and address concerns due related to aging pipes.	$900,000						
D-03	6	T-01; D-07; D-08	Reinstall 1,000 lf of 10-inch dia. pipe to replace intertie between Clark Creek Lane and Clark Creek Road destroyed in 2006 flood.	Restore 2006 level of service to this area. FEMA money available for project.	$250,000						

Note: All costs are shown in 2012 dollars; no inflation applied to future years.

Project ID	Planning Period	Related Projects	Project Description	Benefit	Year of Construction 2012	2013	2014	2015	2016	2017	2018-2032
D-04	6		Install Intertie with BHWSD on Curtis Drive. Project done jointly with BHWSD. Includes connection to City wide SCADA system.	Improve reliability and provide for future growth.	$30,000						
D-05	20		Replace 3,000 lf of 6-inch dia. pipe with 12-inch dia. pipe on Pacific Way, east of Coal Creek Road.	Improve pressure and flow to pump stations.							$768,000
D-06	20		Replace 3,000 lf of 6-inch dia. pipe with 12-inch dia. pipe on Pacific Way, east of Coal Creek Road. Phase II.	Improve pressure and flow to pump stations.							$768,000
D-07	20	T-01; D-03; D-08	Replace 2,000 lf of 6-inch dia. pipe with 12-inch dia. pipe on Clark Creek Road, north of 10-inch pipe crossing. Project required as development occurs.	Provide service to future development. Pipe size to be verified level of development that occurs.							$512,000
D-08	20	T-01; D-03; D-07	Install 1,400 lf of 8-inch dia. pipe on Clark Creek Road from end of existing main. Required only if development occurs.	Provide service to future developments.							$239,000
D-09	20		Install 8,000 lf of 8-inch dia. pipe on Harmony Drive. Required only if development occurs.	Provide service to future developments.							$1,365,000
D-10	20	PS-06	Install 4,060 lf of 8-inch dia. pipe on Moilanen Road from Neimi Reservoir east. Required only if development occurs. Must be completed in conjunction with PS-05.	Provide service to future developments.							$693,000
D-11	20		Install 7,000 lf of 8-inch dia. pipe on Coal Creek Road/Ragland Road (combined) within Upper Coal Creek Zone 502. Project will provide service to end of the road. Required only if development occurs.	Provide service to future developments.							$1,195,000
Pumping											
PS-01	6		Upgrade Indian Creek Pump Station, Columbia View and Neimi Pump stations. Pump replacement and remanifolding of suction/discharge piping to improve hydraulics of pump station at Indian Creek. Includes installation of meter at pump stations.	Improve reliability of pump station and extend service life. Provide capacity for BHWSD intertie in Columbia View service zone.	$100,000						
PS-02	6	ST-04	Replace Hillcrest pump station. Includes installation of meter at pump station and lowers pump suction elevation. Includes the demolition of tanks 1 and 2 to allow for construction of a combined pump station for City and BHWSD. Must be completed with ST-04.	Improve reliability of pump station; allows full use of Hillside Reservoir capacity.		$500,000					
PS-03	6		Miscellaneous pump station upgrades.	Improve reliability of pump station and extend service life.			$100,000				
PS-04	20		Construct booster station adjacent to Trella Reservoir to provide service to future development. Necessary only if development occurs. Pump and pipe sizing to be determined based on development conditions at that time.	Improve pressure and flow. Provide service to future developments.							TBD

Note: All costs are shown in 2012 dollars; no inflation applied to future years.

Project ID	Planning Period	Related Projects	Project Description	Benefit	Year of Construction 2012	2013	2014	2015	2016	2017	2018-2032
PS-05	20	D-10	Construct booster station on Moilanen Road. Required only if development occurs. (To be done in conjunction with LD-08 and storage project. Pump and storage requirements to be sized according to need at time of development.) Must be completed with D-10.	Provide service to future developments.							TBD
Storage											
ST-01	6		Replace Indian Creek Reservoir with larger reservoir (200,000 gallons) or construct new 50,000-gallon tank adjacent to existing to serve Indian Creek service zone. Land acquisition may be necessary for this project.	Provide adequate fire flow/standby storage and operational flexibility for Indian Creek service zone. Rectify storage deficiency identified in this plan.						$718,000	
ST-02	6		Reservoir Paving and Security upgrades.	Install pavement and upgraded fencing at various reservoir sites to improve access and security.	$100,000	$100,000					
ST-03	6		Reservoir Cathodic Protection.	Provide cathodic protection at reservoirs to prevent degradation of metal walls and appurtenances	$25,000	$25,000	$25,000	$25,000			
ST-04	6	PS-02	Demolition of Hillside Reservoirs No .1 and No.2 as part of Hillside Pump Station Replacement. Must be completed with PS-02.	Provide space for construction of new pump station that will allow storage in Hillside Reservoirs to be fully utilized.		$100,000					
Planning, Controls and General System Upgrades											
PCG-01	6		Installation of Upgraded SCADA controls.	Allow for remote monitoring and control of water system components.	$310,000	$167,000	$255,000	$200,000			
PCG-02	6		Large Meter Replacement.	Replace deteriorated large customer meters to improve system metering, reliability and accounting.	$100,000	$100,000	$100,000	$100,000			
PCG-03	6		Annual Valve Replacement.	Replace deteriorated valves that no longer function properly.	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$840,000
PCG-04	6		Facility Relocation for Road Replacement.	Relocate water facilities as required for road construction projects.	$100,000	$100,000	$100,000	$100,000	$200,000	$200,000	
PCG-05	6		Emergency Power.	Acquire generators and upgrade electrical panels.				$60,000	$60,000		
PCG-06	6		Annual ULID Projects.	Replace deteriorated water mains before ULID paving projects.			$100,000		$100,000		
PCG-07	6		Fixed Based Radio Meter Reading System.			$1,000,000	$1,000,000	$1,000,000	$1,000,000		
PCG-08	6		2018 Water System Plan Update.	Meet State Planning Requirements for Class A water systems.						$100,000	$150,000
Totals					**$16,825,400**	**$2,502,000**	**$2,090,000**	**$1,895,000**	**$2,315,000**	**$1,973,000**	**$19,657,000**

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EXHIBIT 8: COST ESTIMATES

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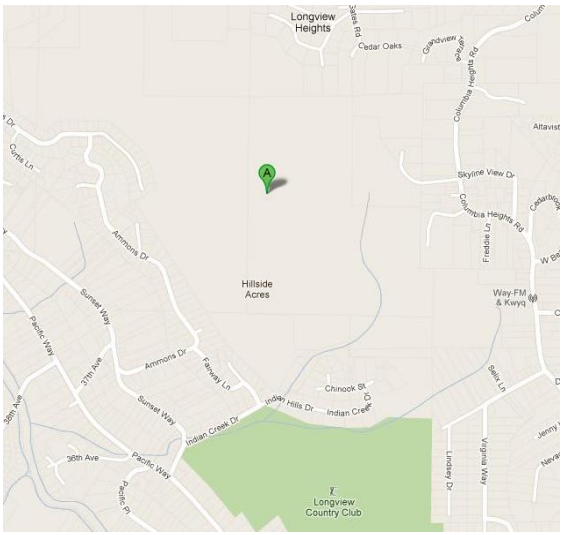
City of Longview
Capital Improvement Project Description

PROJECT SUMMARY	
PROJECT TYPE: Additional Storage at the Indian Creek Reservoir Site	
PROJECT NUMBER: ST-01	**ESTIMATED COST: $ 718,000**
PROJECT DESCRIPTION: Demolish the existing reservoir and construct new 200,000-gallon reservoir. The acquisition of additional property may be necessary.	**MAP:** 
PROJECT BENEFIT: Improve storage capacity in the Indian Creek zone to supply demand and fire flow requirements at adequate pressures.	
COMMENTS: An alternate ST-01 provides for construction of additional storage facility to augment existing facility in lieu of constructing new single large facility.	

SCHEDULE AND FUNDING PLAN	
PROJECT COST	
Land and Right of Way Acquisition	$ 25,000
Engineering, Design and Construction Management	$ 139,000
Construction	$ 554,000
Total	**$ 718,000**
Funding Source: Rate payers, debt financing	

City of Longview
Indian Creek Storage
ST-01

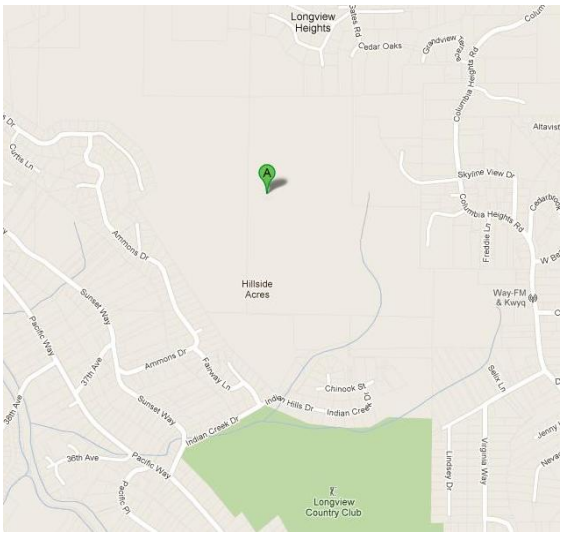
Prepared by: Christopher Stoll

Date Prepared: 2 March 2012

Estimate of Probable Cost - Summary by Division

DIV. No	ITEM DESCRIPTION			MATERIALS	INSTALLATION	TOTAL
1	General Requirements			$0	$0	**$0**
2	Site Work			$5,164	$39,136	**$44,300**
3	Concrete			$0	$0	**$0**
4	Masonry			$0	$0	**$0**
5	Metals			$375,800	$0	**$375,800**
6	Woods & Plastics			$0	$0	**$0**
7	Thermal & Moisture Protect.			$0	$0	**$0**
8	Doors and Windows			$0	$0	**$0**
9	Finishes			$0	$0	**$0**
10	Specialties			$0	$0	**$0**
11	Equipment			$0	$0	**$0**
12	Furnishings			$0	$0	**$0**
13	Special Construction			$0	$0	**$0**
14	Conveying Systems			$0	$0	**$0**
15	Mechanical			$0	$0	**$0**
16	Electrical			$0	$0	**$0**
17	Instrumentation			$0	$0	**$0**
Subtotals				$381,000	$39,000	**$420,000**
Taxes		@	7.9%	$30,000	$3,000	**$33,000**
Subtotals				$411,000	$42,000	**$453,000**
Contractor OH&P		@	0%	$0	$0	**$0**
Subtotals				$411,000	$42,000	**$453,000**
Estimate Contingency		@	20%	$82,000	$8,000	**$90,000**
Subtotals				$493,000	$50,000	**$543,000**
Escalate to Midpt of Const.		@	2%	$10,000	$1,000	**$11,000**
Estimated Bid Price				$503,000	$51,000	**$554,000**
Engineering, Design & Const Mgmt		@	25%	$126,000	$13,000	**$139,000**
Total Estimate				**$629,000**	**$64,000**	**$693,000**

City of Longview
Capital Improvement Project Description

PROJECT SUMMARY	
PROJECT TYPE: Additional Storage at the Indian Creek Reservoir Site	
PROJECT NUMBER: ST-01 Alt.	**ESTIMATED COST: $ 272,000**
PROJECT DESCRIPTION: Construct new 50,000-gallon reservoir adjacent to the existing reservoir. The acquisition of additional property may be necessary.	**MAP:** 
PROJECT BENEFIT: Improve storage capacity in the Indian Creek zone to supply demand and fire flow requirements at adequate pressures.	
COMMENTS: ST-01 provides for construction of a single new storage facility in lieu of constructing an additional smaller facility to augment existing facility.	

SCHEDULE AND FUNDING PLAN	
PROJECT COST	
Land and Right of Way Acquisition	$ 25,000
Engineering, Design and Construction Management	$ 49,000
Construction	$ 198,000
Total	**$ 272,000**
Funding Source: Rate payers, debt financing	

City of Longview
Indian Creek Storage
ST-01 Alt.

Prepared by: Christopher Stoll

Date Prepared: 2 March 2012

Estimate of Probable Cost - Summary by Division

DIV. No	ITEM DESCRIPTION			MATERIALS	INSTALLATION	TOTAL
1	General Requirements			$0	$0	**$0**
2	Site Work			$5,164	$1,307	**$6,471**
3	Concrete			$0	$0	**$0**
4	Masonry			$0	$0	**$0**
5	Metals			$137,500	$0	**$137,500**
6	Woods & Plastics			$0	$0	**$0**
7	Thermal & Moisture Protect.			$0	$0	**$0**
8	Doors and Windows			$0	$0	**$0**
9	Finishes			$0	$0	**$0**
10	Specialties			$0	$0	**$0**
11	Equipment			$0	$0	**$0**
12	Furnishings			$0	$0	**$0**
13	Special Construction			$0	$0	**$0**
14	Conveying Systems			$0	$0	**$0**
15	Mechanical			$0	$0	**$0**
16	Electrical			$0	$0	**$0**
17	Instrumentation			$0	$0	**$0**
Subtotals				$143,000	$1,000	**$144,000**
Taxes		@	7.9%	$11,000	$0	**$11,000**
Subtotals				$154,000	$1,000	**$155,000**
Contractor OH&P		@	0%	$0	$0	**$0**
Subtotals				$154,000	$1,000	**$155,000**
Estimate Contingency		@	20%	$39,000	$0	**$39,000**
Subtotals				$193,000	$1,000	**$194,000**
Escalate to Midpt of Const.		@	2%	$4,000	$0	**$4,000**
Estimated Bid Price				$197,000	$1,000	**$198,000**
Engineering, Design & Const Mgmt		@	25%	$49,000	$0	**$49,000**
Total Estimate				**$246,000**	**$1,000**	**$247,000**

Section 9: Financial Program

9.1 Introduction

The development of a financial plan is one of the most important aspects of the WSP. It establishes the total cost of providing water, outlines a utility improvement schedule, identifies potential funding sources, and evaluates adequacy of rates and fees. This section summarizes the financial status of the City and discusses financing of the capital improvement projects that were identified in Section 8: Capital Improvement Program. Although a rate analysis is not provided, the overall revenue stream is impacted by the proposed capital improvements identified. However, consistent with WAC 246-290-100 requirements, potential rate structure refinements are identified that could enhance water demand efficiency. The financial plan is for the 6-year period from 2012-2018. The discussion includes:

- A 5-year summary of the Water Utility's financial status
- The current water rate structure
- Past methods used by the Water Utility to finance improvements
- A comparison of available funds to the recommended capital improvements.

The Longview RWTP and the City water distribution system are financially separate entities. The MFRWTP will continue to be a financially separate from the City water distribution system. The Longview RWTP Participants Agreement establishes the joint ownership percentages for the City and BHWSD. The terms of this agreement are also applicable to the MFRWTP. Per the terms of the Participants Agreement, these percentages are adjusted annually based on actual usage. The 2012 joint ownership percentages for the City and Beacon Hill are currently approximately 85.5 percent and 14.5 percent, respectively. The ownership percentages are adjusted monthly based on actual consumption. This section includes the recent financial history for the City Water Utility and the Longview RWTP. The MFRWTP will not be operational until later 2012; therefore, no financial history is available at the time of this WSP update.

9.2 RWTP Financial Status

The City provided historical financial data for the Longview RWTP for the period 2006-2010. Data for the 2011 fiscal period were not finalized at the time of this analysis. Table 9-1 provides a summary for the Longview RWTP's range of financial operation (2006-2010). A summary of the Longview RWTP's financial statements (2006-2010) is shown in Table 9.2. The majority of revenue is generated from the sale of water by BHWSD, and from payments from each entity to fund capital improvements. As is shown by the historical data, the RWTP is financially sound.

Table 9-1: Longview Regional Water Treatment Plant - Financial Range of Operation

Item	Minimum	Maximum	Median
Net Operating Revenue	$1,039,723	$1,183,105	$1,093,661
Net Operating Expenses	$1,470,669	$1,644,920	$1,488,990
Net Income (Loss)	(123,554)	3,455,767	31,214
Net Income (Loss) excluding depreciation	399,474	3,993,761	545,984

Table 9-2: Longview Regional Water Treatment Plant – Annual Financial Summary 2006-2010

Financial Summary *Longview-Longview RWTP*	**2006**	**2007**	**2008**	**2009**	**2010**
Operating Revenues					
Charges for services	$1,039,723	$1,066,593	$1,110,959	$1,181,136	$1,093,293
Miscellaneous:			$129	$1,969	$368
Total operating revenues	**$1,039,723**	**$1,066,593**	**$1,111,088**	**$1,183,105**	**$1,093,661**
Operating Expenses					
Cost of sales and services	$829,399	$1,005,015	$916,226	$795,787	$812,150
Administration	$126,500	$166,466	$125,617	$143,617	$138,846
Depreciation	$514,770	$473,439	$523,028	$537,994	$537,994
Total operating expenses	**$1,470,669**	**$1,644,920**	**$1,564,871**	**$1,477,398**	**$1,488,990**
Operating Income (loss)	**($430,946)**	**($578,327)**	**($453,783)**	**($294,293)**	**($395,329)**
Nonoperating Revenues (Expenses)					
Interest revenue	$5,355	$5,495	$616	$786	$1,657
Interest expense					
Operating grant revenue					$8,740
Intergovernmental revenue	$72,689	$118,115	$50,098	$98,514	
Disposition of fixed assets					
Other:			$12,280	$83,441	
Total nonoperating revenues (expenses)	**$78,044**	**$123,610**	**$62,994**	**$182,741**	**$10,397**
Income (loss) before transfers	**($352,902)**	**($454,717)**	**($390,789)**	**($111,552)**	**($384,932)**
Capital contributions				$361,452	$662,741
Transfers in	$395,408	$415,212	$290,587	$2,093,403	$3,177,958
Transfers out	($11,292)	($25,200)	($23,352)	($19,404)	
Net income (loss)	**$31,214**	**($64,705)**	**($123,554)**	**$2,323,899**	**$3,455,767**
Net income excluding depreciation (loss)	**$545,984**	**$408,734**	**$399,474**	**$2,861,893**	**$3,993,761**

9.3 Longview Water Utility Financial Status

A summary of the City's Water Utility range of financial operation (2006-2010) is shown in Table 9-3. The historical financial summary for the City's water distribution system, shown in Table 9-4, reflects the Water Utility portion only. Revenues are generated from metered service fees, connection charges, miscellaneous fees, and non-operating revenues such as interest, grants, and taxes. As shown by the historical data, the City's water utility is financially sound.

Table 9-3: Longview Water Utility – Financial Range of Operation

Item	Minimum	Maximum	Median
Net Operating Revenue	$4,632,930	$6,307,495	$4,927,271
Net Operating Expenses	$3,553,254	$4,373,945	$4,157,090
Net Income (Loss)	($597,168)	$818,620	$332,995
Net Income (Loss) excluding depreciation	$49,074	$1,355,448	$903,433

Table 9-4: Longview Water Utility – Annual Financial Summary 2006-2010

Financial Summary *Longview – Water Utility*	**2006**	**2007**	**2008**	**2009**	**2010**
Operating Revenues					
Charges for services	$4,575,274	$4,745,343	$4,906,238	$5,935,481	$6,292,073
Miscellaneous	$57,656	$3,836	$21,033	$11,300	$15,422
Total operating revenues	**$4,632,930**	**$4,749,179**	**$4,927,271**	**$5,946,781**	**$6,307,495**
Operating Expenses					
Cost of sales and services	$2,413,270	$2,634,328	$2,962,293	$3,087,842	$3,076,289
Administration	$603,156	$613,111	$624,359	$645,036	$651,414
Depreciation	$536,828	$546,626	$570,438	$578,812	$646,242
Total operating expenses	**$3,553,254**	**$3,794,065**	**$4,157,090**	**$4,311,690**	**$4,373,945**
Operating Income (loss)	**$1,079,676**	**$955,114**	**$770,181**	**$1,635,091**	**$1,933,550**
Nonoperating Revenues (Expenses)					
Interest revenue	$206,868	$230,175	$115,057	$25,973	$12,192
Interest expense	($161,715)	($170,106)	($138,258)	($45,121)	($37,810)
Operating grant revenue		$79,911			$2,324
Intergovernmental revenue					
Tax revenue					
Disposition of fixed assets					
Other	$9,311	$11,847	$8,586	$23,707	$20,751
Total non-operating revenues (expenses)	**$54,464**	**$151,827**	**($14,615)**	**$4,559**	**($2,543)**
Income (loss) before operating transfers	**$1,134,140**	**$1,106,941**	**$755,566**	**$1,639,650**	**$1,931,007**
Capital Contributions	$138,484	$154,386	$47,932	$157,391	$104,423
Transfers in	$844,104	$660,924	$636,144	$296,700	$841,861
Transfers out	($1,298,108)	($1,180,032)	($1,106,647)	($2,470,839)	($3,474,459)
Net income (loss)	**$818,620**	**$742,219**	**$332,995**	**($377,098)**	**($597,168)**
Net income excluding depreciation (loss)	**$1,355,448**	**$1,288,845**	**$903,433**	**$201,714**	**$49,074**

9.4 Water Rate Structure

The City's water rate structure consists of a fixed monthly or bi-monthly fee dependent upon billing cycle, plus a unit rate for usage for the amount of water used. The City has an inverted block rate structure; the cost per cubic foot of water increases with each block. A Rate Study was completed for the City by FCS Group in 2008 and the City updates and uses that rate model to recommend changes in its water rates. As a result of the 2008 rate study, the City implemented revised water and sewer rate structures in late 2010, and the rates shown in Table 9-5 were implemented in January 2012. Note that customers outside the City limits have a higher rate schedule. A copy of the City's rate resolution is provided in the Appendices. The City also charges Capital Recovery Fees as shown in Table 9-5.

Table 9-5: Water Rate Structure and Capital Recovery Fees

Purveyor	Service Area	Water Rate	Quantity (Cubic Feet)
Longview	Inside City Limits	$10.24	Monthly Base Charge [(a)]
		$2.15/100 CF	First 800 CF /month
		$2.52/ 100 CF	For next 800 CF/month
		$3.29/ 100 CF	For all over 1,600 CF/month
	Outside City Limits	$16.90	Monthly Base Charge
		$3.55/100 CF	First 800 CF/month
		$4.16/ 100CF	For next 800 CF/month
		$5.43/ 100 CF	For all over 1,600 CF/month

Meter Size (inch)	Inside City Limits Monthly Meter Charge	Capital Recovery Fees
3/4	$ 10.24	$ 2,031
1	$ 20.64	$ 5,078
1-1/2	$ 37.94	$ 10,155
2	$ 58.70	$ 16,248
3	$ 114.07	$ 32,496
4	$ 176.37	$ 50,775
6	$ 349.43	$101,550
8	$ 557.06	$162,480
10	$ 799.32	$233,565
12	$1,145.41	$335,115

Note:

(a) Monthly base charge is for ¾-inch and 5/8-inch meter. City's rate resolution provides additional rate information for larger and irrigation meters.

9.5 Historical Capital Improvement Financing Methods

The City funds improvements through a combination of:

- Cash Reserves – The City has an equipment depreciation fund to build reserves for replacing equipment.
- Developer Financing - Developer financing is used for capital improvements that are installed by developers as mitigation of impacts to the City water system. Developer financing may include full or partial funding for reservoirs, pump stations, and water mains that serve the particular development.
- Revenue Bonds - Major capital improvements may be financed by issuance of revenue bonds. Revenue bond debt service is paid from monthly utility rates.
- Utility Local Improvement Districts (ULID) - These are typically used when property owners want to install water mains in an area where there is no service. In these instances, ULID bonds are paid off by assessments levied against all properties benefited by the improvements.
- Capital Recovery Charge – Fees are assessed for new water services, based upon meter size. These charges recover the cost of connecting the new customer to the utility and are sometimes referred to as connection charges.
- Public Works Board Loans - PWTF and DWSRF loans have been used in recent history to finance large capital improvement projects related to the MFRWTP project.

9.6 Revenue Analysis

A revenue analysis was conducted to assess the City's ability to finance the projects identified in the CIP list developed in Section 8: Capital Improvement Program. The historic data provided by the City was analyzed to determine revenue and expense trends. These trends were then used to project the revenues and expenses though the year 2018. The results of the revenue analysis are shown in Table 9-6.

The capital improvements related to major debt financed public works projects are shown as Non-Operating Expenses for purposes of illustration. The City's 2005 revenue bond debt will be retired by the end of 2012. The City incurred large debt financing in the form of PWTF and DWSRF loans for the MFRWTP project. One of those loans will not enter the repayment period until 2013 and the final disbursement amount is yet to be determined; therefore, the debt service associated with this loan was approximated based on information currently available. Besides the debt financed projects, a number of smaller capital projects to be completed in the 6-year planning period will be financed via a "pay as you go" method. These include annual pipe and valve replacement, SCADA upgrades, metering upgrades, reservoir security and protection, two distribution system upgrades, pump station upgrades, and additional storage. A list of the CIP projects in the 6-year window is located in Table 8-7.

As can be seen from the revenue projections in Table 9-5, the City will incur a large amount of new debt in the form of DWSRF and PWTF loans in order to complete the MFRWTP. The City's rate structure has been adjusted to account for the increased debt service and as can be seen, the City is able to adequately fund the identified CIP projects and maintain a minimum of $3.5 million in cash equivalents through 2017.

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Table 9-6: Revenue Projections

CITY OF LONGVIEW - WATER DIVISION
PROJECTED OPERATING AND NON-OPERATING REVENUES AND EXPENSES
INCLUDING THE PROJECTED CAPITAL IMPROVEMENT PROGRAM

Sources and Uses of Funds	Budgeted 2012	Projected 2013	2014	2015	2016	2017
Operating Revenues						
Charges for Services [a]	6,489,806	6,746,153	7,120,750	7,516,147	7,971,100	8,174,463
Miscellaneous Revenues [a]	264,566	355,278	355,279	355,281	355,282	355,284
Total Operating Revenues	**6,754,372**	**7,101,431**	**7,476,029**	**7,871,428**	**8,326,382**	**8,529,747**
Operating Expenses						
Cost of Sales and Services [b]	2,311,679	2,381,029	2,452,460	2,550,559	2,652,581	2,758,684
Administration [c]	560,900	574,923	592,170	615,857	640,491	666,111
Cost of Filtration	1,060,202	1,023,590	810,877	776,334	798,910	822,349
Total Operating Expenses	**3,932,781**	**3,979,542**	**3,855,508**	**3,942,750**	**4,091,983**	**4,247,144**
Net Operating Income	**2,821,591**	**3,121,889**	**3,620,521**	**3,928,678**	**4,234,400**	**4,282,602**
Net Operating Income as % of Total Operating Revenues	**41.77%**	**43.96%**	**48.43%**	**49.91%**	**50.86%**	**50.21%**
Non-Operating Revenue						
Connection Charges [d]	10,000	10,000	50,000	50,000	50,000	50,000
Interest Revenue [e]	22,913	18,255	28,247	48,286	42,692	49,885
PWTF/DWSRF Proceeds [f]	14,495,000					
Other [g] FEMA	250,000					
Total Non-Operating Revenue	**14,777,913**	**28,255**	**78,247**	**98,286**	**92,692**	**99,885**
Non-Operating Expense [h]						
Public Works Trust Fund (PWTF) Payments (existing)						
PWTF Principal	195,193	195,193	195,193	195,193	195,193	195,193
PWTF Interest	16,019	15,616	14,639	13,663	12,688	11,712
Total PWTF Payments	211,212	210,809	209,832	208,856	207,881	206,905
Estimated New Loan Payments [i]						
Principal & Interest	501,288	1,207,057	1,207,057	1,207,057	1,207,057	1,207,057
Total Non-Operating Expense	**712,500**	**1,417,866**	**1,416,889**	**1,415,913**	**1,414,938**	**1,413,962**
Total Available for Capital Expenditures	**16,887,004**	**1,732,278**	**2,281,880**	**2,611,051**	**2,912,154**	**2,968,525**
Total Capital Expenditures [j]	**16,825,400**	**2,502,000**	**2,090,000**	**1,895,000**	**2,315,000**	**1,973,000**
Capital Expenditures (rate funded) [k]	2,325,000	2,502,000	2,090,000	1,895,000	2,315,000	1,973,000
Capital Expenditures Associated With MFRWTP [l]	14,500,400					
Balance of Funds	**61,604**	**(769,722)**	**191,880**	**716,051**	**597,154**	**995,525**
Beginning Cash and Equivalents [m]	**4,243,786**	**4,305,390**	**3,535,668**	**3,727,548**	**4,443,598**	**5,040,752**
Ending Cash and Equivalents [n]	**4,305,390**	**3,535,668**	**3,727,548**	**4,443,598**	**5,040,752**	**6,036,277**
Basis of Projection - Percent Increase per Year in Costs						
Charges for Services [a]		5.00%	5.50%	5.50%	6.00%	2.50%
Miscellaneous Revenues [a]		0.50%	1.00%	2.00%	2.00%	2.00%
Cost of Sales and Services [b]		3.00%	3.00%	4.00%	4.00%	4.00%
Administration [c]		2.50%	3.00%	4.00%	4.00%	4.00%

Notes:
Sources: City of Longview, Income Statement - Actual and Budgeted Financial Summary, Water Division.
2011/2012 CIP Budget, 2011 Rate Study projections

(a) Operating revenues and miscellaneous revenues are projected based on 2011 Rate Study results.
(b) Cost of sales and services is projected based escalation established in 2011 Rate Study. (Distribution System)
(c) Administration expenses are escalated based on rates established in 2011 Rate Study.
(d) Connection charges are estimated to be $10,000 annually during the planning period based on 2011 Rate Study.
(e) Interest revenues are based on projected interest revenue from 2011 Rate Study.
(f) Proceeds from Public Works Trust Fund (PWTF) Loan for MFRWTP.
(g) Other non-operating revenue as estimated by 2011 Rate Study and money received from FEMA in 2012.
(h) Source: City of Long View, Bond Payment Schedule. Payments have been allocated per percentage owed by the Water Division.
(i) Public Works Trust Fund (PWTF) expenses are related to the MFRWTP project.
(j) Refer to Chapter 8 of this report for the City's draft CIP schedule.
(k) These costs are associated with rate-funded capital and replacement projects as identified in this report and in the City's 2011/2012 CIP Budget. They include annual main replacement, SCADA improvements, pump station upgrades and other miscellaneous work described in the Section 8 - CIP.
(l) MFRWTP capital expenditures equals City of Longview's share for completion of facility per 2012 Budget estimates provided by City.
(m) Beginning cash and equivalents balance includes the City's Water Construction Fund and Water Depreciation Fund balances. The 2012 beginning cash balance estimated was provided by the City based on 2011 year-end financial information.
(n) Ending Cash and Equivalents equals to the balance of the 'Beginning Cash and Equivalents' and the 'Balance of Funds'.

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9.7 Sources of Funding

In general, the City prefers to finance capital improvement projects on a "pay-as-you-go" basis. However, large capital projects generally require debt financing. The most common financing instruments available to the purveyors are discussed as follows.

General Obligation and Revenue Bonds – Revenue bonds use the revenues of the issuing utility to secure the bond. The debt obligation does not extend to other City revenue sources. General Obligation bonds are secured based on the municipality's ability to repay the debt by generating tax revenues. There are bonding limits for General Obligation bonds based on assessed property value in the City and whether or not the bond is voter approved. Revenue bonds do not have a statutory bonding limit, only the utility's ability to generate sufficient revenue to repay the debt.

Washington State Public Works Board – Established in 1985 by the Washington Legislature to provide financial assistance to local governments for public works projects; the Board manages a number of loan programs. Chief among these are PWTF and DWSRF. Eligible projects include major capital construction projects, planning, rehabilitation and infrastructure replacement, and funds for emergency repairs. PWTF may fund projects up to $15 million per jurisdiction annually, with interest rates ranging from 0.0 percent to 2.0 percent and repayment periods of up to 20 or 30 years. DWSRF-funded projects have slightly different interest rates, 1.0 percent to 1.5 percent, with up to 50 percent loan forgiveness for qualifying communities and are limited to $12 million. More complete information pertaining to the Washington State Public Works Board can be found at www.pwb.wa.gov.

Drinking Water State Revolving Fund (DSRF) - The DSRF is the only fund strictly dedicated to drinking water infrastructure design and construction projects. DSRF offers interest rates between 0 percent and 1.5 percent and terms of 20 or 30 years, all based on the City's proven financial need. The current funding limits are up to $6 million per City project or up to $12 million for jointly-owned projects.

System Development Charges (SDC) - Utilities experiencing substantial growth need to increase capacity without penalizing existing ratepayers. To do so, utilities often look to new customers to pay both the cost of existing facilities and some sort of capital contribution charge. This type of capital contribution is referred to as a System Development Charge or SDC. The City utilizes SDCs in the form of a Capital Recovery Fee for the water system.

Community Block Development Grant (CDBG) Fund - CDBG offers planning and design/construction grant funding for infrastructure. This grant fund is available to districts that benefit "low to moderate income" areas. The City would need to conduct a CDBG income survey to prove that their service area qualifies. The current funding limits for planning grants are up to $25,000 for a single entity or $40,000 for multiple entities. Design and construction projects may receive up to $1 million for projects costing less than $10 million, and up to $1.5 million for projects more than $10 million.

Community Economic Revitalization Board (CERB) - CERB offers planning only grant funding based on the economic development potential of a specific project. The City would need to prove that a water infrastructure project is needed for a private sector industry development in the community. Grant funding limits are currently $25,000.

Developer Participation - The Developer Extension is a requirement that a developer install onsite and sometimes offsite improvements as a condition of extending service. These are in addition to the SDC required and must be built to City standards. Part of the agreement between the City and the developer for the developer to extend service might include a late-comer agreement, resulting in a late-comer charge to new connections to the developer extension.

Utility Local Improvement District (ULID) Financing - A ULID is established to provide for the construction of infrastructure improvements to benefit the properties within the City boundaries. This process allows the City to use long-term tax exempt financing to install infrastructure improvements to benefit properties within their boundaries. ULIDs assess the benefited properties based on the special benefit received by the construction of specific facilities. In addition, utility revenues are also pledged to the prepayment of the ULID debt. Most often used for local facilities, some ULIDs also recover related general facilities costs. Substantial legal and procedural requirements can make this a relatively expensive process, and there are mechanisms by which a ULID can be rejected.

9.8 Conclusions and Recommendations

As can be seen from the financial projections, the City is able to maintain the water system and fund the capital improvement projects identified in the 6-year planning window. The 2005 Plan recommended that the City re-evaluate their rate structure and Capital Recovery Fees. The City has followed those recommendations. The City currently maintains a rate model that is updated at least annually. Additionally, the City plans to pass annual rate increases ranging from 5 percent to 6 percent through 2016 and 2.5 percent in 2017, and has increased the Capital Recovery Fees to help recover previous infrastructure investments from future users.

The City's largest capital improvement project, the new MFRWTP, will be complete in late 2012. Once that is completed, the City will be able to fund the identified Capital Improvement Program through rates. It is recommended that City continue to evaluate their rate structure and Capital Recovery Fees on an annual basis to monitor and account for any changes due to growth and development.