CITY OF GRANDVIEW

WATER SYSTEM PLAN

HLA
Engineering and Land Surveying, Inc.

DRAFT

PROJECT NO. 21033E

CITY OF GRANDVIEW

2022 WATER SYSTEM PLAN

Prepared by:

HLA
Engineering and Land Surveying, Inc.

PROJECT NO. 21033E

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CITY OF GRANDVIEW

INTRODUCTION

AND

EXECUTIVE SUMMARY

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INTRODUCTION

The City of Grandview is located in the lower Yakima Valley, within the south-eastern corner of Yakima County. The City lies along Interstate 82, approximately six miles south and east of the City of Sunnyside, and six miles north and west of the City of Prosser, in a dry, sunny area consisting of flat and cultivated lands. Incorporated in 1909, Grandview's economy depends largely on the agricultural industry.

Grandview recognizes the need to improve and expand its water system if it is to meet the demands of its system users and to keep pace with other growth-oriented improvements in this vital Yakima County community. HLA Engineering and Land Surveying, Inc. (HLA) was authorized by the City of Grandview to prepare this Water System Plan, which represents the culmination of planning and data collection efforts.

PLANNING REQUIREMENTS

Water systems with 1,000 or more services are required to have a water system plan approved by the Washington State Department of Health (DOH) pursuant to the Washington Administrative Code, WAC 246-290-100 and WAC 246-291-140.

To assist water utilities in preparing their plans, the DOH has published the *Water System Planning Guidebook* dated August 2020. This handbook identifies information needed to develop a "well-conceived and clearly-stated" water system plan. The handbook is organized into 10 major chapters, with each chapter representing a basic water system plan component. The 10 chapters are:

1. Description of Water System
2. Basic Planning Data
3. System Analysis and Asset Management
4. Water Use Efficiency Program
5. Source Water Protection
6. Operation and Maintenance Program
7. Distribution Facilities Design and Construction Standards
8. Capital Improvement Program
9. Financial Program
10. Miscellaneous Documents

Each chapter is divided into several sections to address specific topics in detail. The City of Grandview *2022 Water System Plan* update has been prepared in the format of the DOH *Water System Planning Handbook*.

OBJECTIVE

The principal goal of water system planning is to make efficient use of available resources. This is accomplished by making decisions about water system capital improvements and operations which are in accordance with overall system policies and directions expressed in a utility's water system plan.

An equally important reason for developing a water system plan is to assure orderly growth of the system while maintaining reliable delivery of high-quality water. The plan is intended to guide water utility actions in a manner consistent with other activities taking place in the community.

The water system plan is intended to look ahead at least 20 years into the future. Development of a definite improvement schedule and financial program is required for the first ten-year period, while the planning approach for the second period may be more conceptual. To continually provide adequate guidance to decision makers, the plan requires updating every six years.

Once adopted by the City of Grandview and approved by the DOH, the Water System Plan is considered by DOH "to be a commitment to implement the actions identified in the improvement schedule." Future water system decisions shall be in accordance with the Water System Plan.

PROJECTED WATER DEMANDS

To plan for Grandview's future water needs, the following items were examined:

Basic Planning Data (CHAPTER 2): Land use, future service area boundary, and population growth are used to evaluate demands on the Grandview water system. The City's 2014 service population was estimated to be 11,170 by the Washington State Office of Financial Management (OFM), and the future population is projected to be 11,881 by the year 2022. Grandview's 2014 number of residential water service connections was 3,158, and the future number of residential service connections is projected to be 3,232 by the year 2022.

Current Water Demands (CHAPTER 2): Grandview's greatest year of water consumption in the last seven years was in 2014 when 630.494 million gallons was consumed. This is equal to an average daily consumption of 1,727,381 gallons. The maximum month of water consumption was experienced in October 2014, when the average daily consumption for the month was 2,777,516 gallons. Maximum day consumption (based upon the maximum day of water production in the month) was 3,816,924 gallons on October 21, 2014, and peak hour consumption was calculated to be 4,771 gpm.

Projected Water Demands (CHAPTER 2): Grandview's average day water demand forecast for the year 2042, and the City's current source capacity and water rights are below:

	PROJECTED YEAR	CURRENT SOURCE	CURRENT
	2042 Demand	2022 Capacity	Water Rights
ERUs	12,001	9,020	---
Annual	894 MG	665 MG	4,640 acre-feet
Maximum Day	5.324 MGD	4.751 MGD	---
Peak Hour	7,152 gpm	5,702 gpm	6,955 gpm

SUMMARY OF SYSTEM DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

The following is a listing of the major water system deficiencies and recommended improvements which have been identified in the existing water system. A more detailed description of these deficiencies and related improvements can be found in CHAPTER 8.

SUPPLY

Water Rights – A City's water right status is crucial in determining the amount of possible future growth. Currently, Grandview has annual rights (Q_a) of 4,640 acre-feet per year and instantaneous rights (Q_i) of 6,955 gpm. As discussed in CHAPTER 3, current water rights are adequate in providing for existing and projected year 2042 demands.

As discussed in CHAPTER 1, the City currently requires that any proposed new development, which will exceed the City's current water right capacity, to transfer any water right the developer may hold to the City, prior to approval of the new development.

Industrial water consumption is still the highest among all user categories and projected future demands will need to be closely monitored by the City.

Source Well Capacity – Grandview's source wells have decreased in capacity since original construction and previous rehabilitation projects. If all source wells were to operate at original capacity, total production would equal 5,420 gpm. However, the current system source well capacity is 3,299 gpm. The year 2021 source capacity is inadequate to meet anticipated average day and maximum day demands until 2032.

STORAGE

Storage Capacity – The City's reservoir storage capacity is sufficient for current demands, but inadequate to meet the 10-year and 20-year projected demand. Based on projected growth, additional water storage capacity will be needed to meet year 2032 system demands and associated storage requirements. Other alternatives may be investigated at the City's request.

Reservoir Cleaning and Maintenance – Both City reservoirs should be inspected and cleaned, based on a five-year maintenance cycle. The 3.0 MG standpipe reservoir was last cleaned in 2019 and painted in 1990. The elevated 0.5 MG reservoir was last rehabilitated in 2007, including interior and exterior painting, new hatch, catwalk, and overflow modifications.

DISTRIBUTION

Fire Flow Capacity – Figure 3-3 identifies existing system fire flow capacities along with the minimum fire flow requirements for regions within the City. As shown on the figure, some locations are deficient based on the computer hydraulic model. Refer to CHAPTER 8 for suggested improvements to address deficiencies.

Water Main Upsizing and Replacement – Most of the deficiencies identified shown in Figure 3-3, can be addressed by upsizing water mains. Suggested improvements for water main upsizing are shown in CHAPTER 8.

Pressure – The existing City of Grandview domestic water system consists of one distribution pressure zone between elevations 740 feet and 840 feet above sea level, as shown in Figure 3-1 Water System Service Area/Elevations Map. The static pressure level ranges from 30 to 87 psi.

TELEMETRY

Grandview's telemetry control system was updated in 2015 consisting of hardware and software upgrades to the City's existing HMI computer. Additional phases of work are planned to continue improving the City's telemetry system. Phase 2 telemetry improvements will consist of servicing, replacing, and adding chlorination system equipment, submersible level transducers, and door intrusion sensors to existing source controls. Phase 3 telemetry improvements will consist of installing telemetry control panels and radios at sources S01 and S11. Additional information on planned telemetry improvements is available in CHAPTER 8.

PROPOSED WATER SYSTEM FINANCIAL PROGRAM

Recommended system improvements are scheduled for completion in annual increments for the next ten (10) years, as shown in Table 8-1 and Table 8-2 in CHAPTER 8. Scheduling of the remaining improvements beyond this ten-year period needs to be reviewed yearly as priorities and City growth patterns change and progress. Major recommended improvements for future years (2033 through 2042) have been estimated but not scheduled at this time. The estimated improvement costs are provided in Table 8-1 and Table 8-2, as well as the total projected yearly cost.

To fund the recommended water system improvements discussed in this Plan, a proposed financial program has been developed and is provided in Table 9-4 in CHAPTER 9. The proposed financial program incorporates projected operations, improvements, and loan costs for the next ten-year period. Projected revenues and expenditures of the water system include growth factors and inflation rates, in addition to the recommended rate increases, to account for estimated growth within the City, as discussed in CHAPTER 9.

The City of Grandview will continue annual reviews of the water system's financial program during their budget preparation process. The financial program will also be reviewed and revised as needed during the next update of the *Water System Plan*. This continued review will allow for modifications to the proposed rate and revenue increases, should financial conditions change.

CHAPTER 1 -

DESCRIPTION OF THE WATER SYSTEM

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1.1 OWNERSHIP AND MANAGEMENT

1.1.1 Water System Ownership

The City of Grandview, a municipal corporation located within the south-eastern part of Yakima County as shown in Figure 1-1 State Vicinity Map, owns and operates its own water system. Decisions regarding daily water system operations are made by the City Administrator/Public Works Director. Financial decisions regarding major water system improvements and establishment of water rates are made by the Grandview City Council. The following parties are involved in the operation, maintenance, and planning for the Grandview water production, storage, and distribution facilities:

WATER SYSTEM NAME, OWNER, OPERATOR, AND IDENTIFICATION NUMBER:

City of Grandview Water System

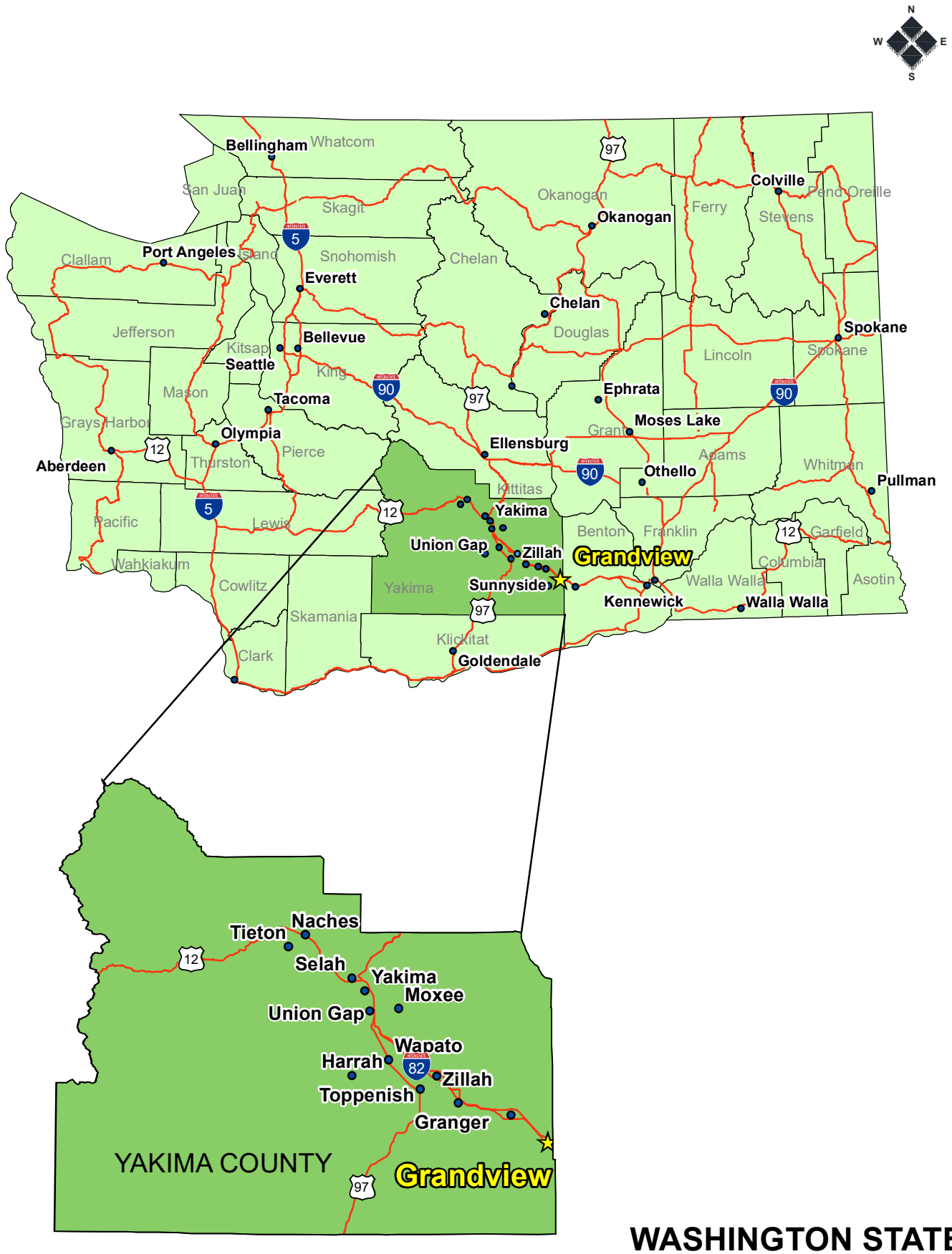
City of Grandview
207 W. 2nd Street
Grandview, WA 98930
Phone: (509) 882-9213

Mayor: Gloria Mendoza
City Administrator/Public Works Director: Cus Arteaga, WDM3 #3401
Assistant Public Works Director: Todd Dorsett
Public Works Foreman: Hector Mejia, WDM1 #14443
Water System Identification Number: 28970 J

WATER SYSTEM CONSULTING ENGINEER:

HLA Engineering and Land Surveying, Inc. (HLA)
2803 River Road
Yakima, WA 98902
Phone: (509) 966-7000
Project Engineer: Justin L. Bellamy, PE

A description of the City's water system management structure is presented in CHAPTER 6. A copy of the City's Water Facility Inventory (WFI) form is included in CHAPTER 10.



WASHINGTON STATE VICINITY MAP FIGURE 1-1

CITY OF GRANDVIEW

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P:\arcview\2021\21033 Grandview WSP\FIG 1-1a.mxd

1.2 SYSTEM HISTORY AND BACKGROUND

1.2.1 History of Water System Development and Growth

Table 1-1 provides some information as to the development of the City's water system.

TABLE 1-1 MAJOR WATER SYSTEM IMPROVEMENTS

Year	Improvement Description
1913	City water system constructed
1935	Work begun on pressure irrigation system
1950	500,000-gallon elevated tank reservoir constructed
1952	Orchard Tract Well constructed
1962	Safeway Well and Springs Well constructed
1965	Cohu Well constructed
1969	Highland Well constructed
1974	Comprehensive Water Plan by Walter Woodward completed
1978	North Willoughby Well constructed
1982	South Willoughby Well constructed
1989	5th Street water main replaced
1989	Interior of 3,000,000-gallon storage tank reservoir repainted
1990	Avenue E water main replaced (2nd Street to 5th Street)
1991	Butternut Well constructed
1992	Bonnieview Road transmission project (Euclid Road to Avenue B) completed
1992	Birch Street – 5th Street – Welch Plant transmission main project completed
1998	Elm Street water main extension project completed
1999	3rd Street water main replacement project completed
1999	Wine Country Road – Viall Road water main project completed
1999	Eastside transmission main project completed
1999	Appleway Road water main replacement project completed
2000	Cohu Well, Highland Well, and Pecan Well rehabilitation project completed
2001	Stover Road water main improvement project completed
2002	Bethany Road water main improvement project completed
2005	Orchard Tracts Well and Springs Well rehabilitation project completed
2006	Balcom Well and Velma Well redevelopment project completed
2007	South Willoughby Well rehabilitation project completed
2007	500,000-gallon elevated tank reservoir rehabilitation project completed
2009	Grandridge Area Street and Water Main Improvements – Water main replacement
2010	"Alive" Downtown Improvement – Water main replacement
2012	North Birch Street Neighborhood – Water main replacement
2013	Euclid Road – Apricot Road to Groom Lane – Water main replacement
2014	Bonnieview Road – Wilson Highway to Madison Drive – Water main replacement
2014	Old Inland Empire Water Improvements
2014	Water system plan update
2015	Water telemetry system upgrades
2016	Water telemetry system upgrades – phase 2A
2017	Asahel Curtis Well (S17) rehabilitated
2021	South Silloughby Well (S13) pump rebuilt and motor, VFD, and meter replaced

Grandview's first *Comprehensive Water System Plan (*CWP*)*, completed in 1974, provided the City with an in-depth look at its water system, deficiencies, and potential growth. Updates to the 1974 CWP were completed in 1986, 1995, 2001, 2008, and again in 2015. This *2022 Water System Plan* is intended to update the *2015 Water System Plan*.

TABLE 1-2 WATER SYSTEM GROWTH SUMMARY

	Year							% Increase 1985-2013
	1985	1993	2000	2007	2010	2013	2020	
Population*	6,344	7,590	8,377	9,408	10,862	11,010	11,762	173.5%
Total Water Services	2,150	2,219	2,425	2,796	2,739	2,788	2,991	29.7%
Total Annual Metered Consumption (MG)	505	765	681	614	554	582	646	15.2%
Total Source Capacity (MGD)	5.98	6.84	6.84	6.84	7.85	7.85	4.75	31.3%
Total Storage Capacity (MG)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	0.0%
* Based on Washington State Office of Financial Management (OFM) census data and estimates.								

1.2.2 Geography

The City of Grandview and its Urban Growth Area are in the Lower Yakima Valley, the south-eastern part of Yakima County, in the south-central portion of Washington State, as shown on Figure 1-1. The City lies along Interstate 82 between the City of Sunnyside, approximately six miles to the northwest, and the City of Prosser, approximately six miles to the southeast.

Grandview lies north of the Yakima River, between the Rattlesnake Hills to the north and the Horse Heaven Hills to the south. The topography in Grandview is relatively flat, sloping generally from the northeast to the southwest. A few rolling hills exist, mostly in the southern areas of the City. Ground elevations vary from 840 feet to 740 feet above sea level within the existing City limits.

Like the rest of the Yakima Valley, Grandview and its Urban Growth Area have a warm and dry climate. The Cascade Mountain Range acts as a barrier between Yakima County and the Pacific Ocean, Keeping precipitation low and temperatures warm. The mean annual temperature from 2015 to 2020 ranges from 39.8°F to 63.9°F with an extreme minimum of -1.0°F and extreme maximum of 103.8°F. The median temperature is 52.0°F and mean annual precipitation is 6.6 inches (*AgWeatherNet*, Grandview). With a warm climate and rich volcanic soils, Yakima County is a significant agricultural region, as well as a recreational area.

Grandview's economy depends largely on the agricultural industry. Fruit and produce grown locally are processed, packaged, and shipped from Grandview's industries. The City also has a viable commercial and service business community.

1.2.3 Ordinances/Bylaws

The City of Grandview operates its water system in accordance with the following municipal code chapters and ordinance(s):

Chapter 13.04	General Provisions
Chapter 13.18	Cross-Connection Control
Chapter 13.24	Water Service Regulations
Chapter 13.28	Rates and Charges
Chapter 13.30	Low-Income Senior Citizens and Low-Income Disabled Persons Utility Rates
Chapter 13.32	Cross-Connections to Water System (Repealed by Ord. 1649)
Chapter 13.36	Water Use
Chapter 13.40	Capital Facilities Plan for Public Works Facilities
Chapter 13.44	Recommended Standards for Water Works
Resolution 2012-59	Yakima River Basin Integrated Water Resource Management Plan
Resolution 2010-8	Sunnyside Division Water Rights Settlement Agreement

Copies of these Grandview Municipal Code chapters and ordinance(s) are included in CHAPTER 10.

1.3 RELATED PLANS

1.3.1 Previous Comprehensive Water Plans

The City's first Comprehensive Water Plan was completed in 1974, which provided Grandview with an in-depth look at its water system, deficiencies, and potential growth. Updates to the *1974 Comprehensive Water Plan* were completed in 1986, 1995, 2001, 2008, and 2015.

1.3.2 Water System Plans for Adjacent Water Systems

No other Group A water systems exist within Grandview's Urban Growth Area. The City of Sunnyside, located six miles northwest of Grandview, adopted its current water system plan in 2016. The City of Mabton, located five miles to the southwest, adopted its current water system plan in 2013, and the City of Prosser, located six miles to the southeast, adopted its current water system plan in 2016. There are currently no water service area agreements between these neighboring communities and the City of Grandview.

1.3.3 Urban Growth Area Comprehensive Plan

The City of Grandview completed and adopted its Growth Management Act (GMA) comprehensive plan in 1995 and adopted revisions to the original GMA Plan in 2008 and 2016. This Plan identifies many of the physical, environmental, and economic elements within the City and its Urban Growth Area and attempts to forecast anticipated changes within that geographical area. Understanding and predicting future changes within the City and its Urban Growth Area are critical in forecasting future demands on the City's water system. The City's existing GMA Plan, and information currently being developed for its future Plan, are important tools and have been used in developing this Comprehensive Water Plan.

1.3.4 Wellhead Protection Program

In 2000, the City of Grandview completed its Wellhead Protection Plan. This plan identifies potential sources of contamination near ground water supplies, proposes management strategies to prevent contamination of those supplies, and develops a contingency plan for contamination mitigation if ground water becomes contaminated. The document contains the following elements:

1. Identification of the wellhead protection areas for each well;
2. An inventory of potential ground water contaminant sources;
3. A contingency plan which includes short and long-term alternate water sources, and emergency and spill response procedures; and
4. A local wellhead protection management plan.

A copy of the Wellhead Protection Plan is available at the Public Works office. Grandview's Wellhead Protection Plan was last updated in 2014. The potential contaminate list has been updated as part of this plan. Refer to CHAPTER 5 for additional information.

1.3.5 General Sewer Plans

In 1997, the City of Grandview completed a General Sewer Plan for the City and its Urban Growth Area. The General Sewer Plan was updated in 2011, and is in the process of being updated. This document:

1. Describes existing and future sewer service areas (Urban Growth Area);
2. Describes existing conditions including the condition and location of existing trunk and interceptor sewers, pumping stations, the collection system, current system operation and maintenance, and problem areas;
3. Forecasts future wastewater loadings based upon growth projections;
4. Recommends a wastewater system improvement plan and a financial plan; and
5. Includes design standards for recommended wastewater collection system improvements.

The General Sewer Plan provides Grandview with one component of its Capital Improvement Plan for providing future services within both the City and its Urban Growth Area and is the wastewater counterpart to the Water System Plan.

1.3.6 Watershed Plan

In 1998, the Washington State Legislature passed the Watershed Planning Act (RCW 90.82), providing a framework for developing local solutions to water issues on a watershed basis. Framed around watersheds, this voluntary comprehensive planning process was designed to allow local citizens, governments, and tribes to form watershed management planning units to develop watershed management plans.

The watershed planning process consists of three phases. In Phase 1 (Organization), initiating governments (the counties, largest city, and largest water utility in the watershed) identify and appoint Watershed Planning Unit members who represent water resource interests within the watershed. Phase 1 activities also include the development of operating and decision-making structures and goals, and development of a scope of work for Phase 2.

Phase 2 (Technical Assessment), directed by the watershed planning unit, focuses on developing strategies for improving water quality, protecting, or enhancing fish habitat, setting instream flow recommendations, and applies for funding for the collection, management and distribution of data. Phase 2 is at least a one-year process.

Phase 3 (Plan Development and Approval) requires actual development of the watershed plan. The plan must include water supply strategies to meet minimum flows for fish and to provide for future out-of-stream uses. Phase 3 is at least a one-year process.

The City of Grandview is in the Lower Yakima River Basin Watershed Planning Area (WRIA 37). In 1998, the Yakima River Basin Watershed Planning Unit was formed to develop a comprehensive watershed management plan for the entire Yakima River Basin and the Naches River Basin watersheds. In December 2002, the Watershed Planning Unit completed and approved the *Yakima River Basin Watershed Management Plan* (Phase 3 of the planning process) and forwarded the Plan to the county commissioners of Yakima, Benton, Klickitat, and Kittitas Counties. In late 2005, Yakima, Benton and Klickitat Counties approved and adopted the Plan, while Kittitas County opted to withdraw from the process. The watershed plan contains no obligations for county or state agencies. There is not an operating lead agency for the purposes of adopted watershed plan implementation needs. Instead, water quantity-related plan implementation needs are being addressed by the Yakima River Basin Water Enhancement Project working group.

In 2009, Department of Ecology (Ecology) and Bureau of Reclamation formed the Yakima River Basin Water Enhancement Project Working Group to help develop a solution to the basin's water problems. The group includes the Yakama Nation, irrigation districts, federal, state, county, and city governments, and environmental organizations. The group developed the *Yakima River Basin Integrated Water Resource Management Plan* (YBIP). Elements of the YBIP include construction of fish passages at dams, habitat restoration, watershed protection, development of new surface water retention and groundwater storage, enhanced agricultural and municipal water conservation programs, and more effective water banking processes. In total, approximately $3.8 billion is needed to complete the priority projects identified in the YBIP.

The *Final Programmatic Environmental Impact Statement* (FPEIS) was issued in March 2012 for the YBIP. The FPEIS evaluates two alternatives to meet the water supply and environmental needs in the Yakima River Basin: "No Action Alternative" and "Yakima River Basin Integrated Water Resource Management Plan Alternative," the latter as the preferred alternative.

In July 2013, the Legislature approved more than $130 million in state funding to advance the YBIP. The funding will purchase 50,000 acres of privately owned timber land in the Teanaway River basin, east of Cle Elum, helping to preserve the area's watershed.

The City of Grandview's *Water System Plan* is consistent with the YBIP. In showing support of the YBIP, the City Council passed Resolution 2012-59 in December 2012.

1.4 SERVICE AREA

Grandview's service area is where the water system currently provides service, and where the City plans to provide service in the future. The City's existing service area and Retail Service Area generally corresponds to the City Limits as shown in Figure 1-2. Grandview's Urban Growth Area (UGA) boundary, as adopted in the City's 2016 Comprehensive Plan, shows the projected future area the City expects to provide and maintain water services in the next 20 years. The City's Service Area/UGA boundary also represents its water rights place of use. The location of the City's existing source wells is also shown on Figure 1-2 for reference.

1.4.1 Neighboring/Adjacent Purveyors

According to DOH records, three small water systems are currently operating within Grandview's Urban Growth Area. Information on these small water systems is presented in Table 1-3.

TABLE 1-3 NEIGHBORING SMALL WATER SYSTEMS

Name Location	System ID No.	Group Type	Residential Population	Approved Connections	Number of Sources	Permit Status
Bill Garrison Water System 571 Forrest Road	05180	B	6	2	1	unknown
Wagon Wheel Inn Sec 15 T9N R23E	92064	B	10	undetermined	1	unknown
J & R Apartments 751 E. Bonnieview Road	18117	B	13	undetermined	1	unknown

Other residences currently within Grandview's Urban Growth Area, which are not connected to the City's water system or to one of these other small systems, utilize individual wells for water supply.

Neighboring municipal water systems in the area include the City of Sunnyside (DOH water system ID No. 85400), located approximately six miles to the northwest, the City of Mabton (DOH water system, ID No. 49650), located approximately five miles to the southwest, and the City of Prosser (DOH water system ID No. 85400), located approximately six miles to the southeast.

CITY OF GRANDVIEW

Water System Plan Update

SERVICE AREA MAP

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LEGEND

- CITY LIMITS / RETAIL SERVICE AREA
- SERVICE AREA BOUNDARY (UGA) AND WATER RIGHT PLACE OF USE
- EXISTING SOURCE WELL
- EXISTING RESERVOIR

CITY OF GRANDVIEW

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FIGURE 1-2

1.4.2 Existing Zoning and Future Land Use

The existing water system serves a combination of residential, commercial, industrial, and public users. The Grandview City Limits, including the wastewater treatment plant, which is not served by the water system, are approximately 3,724 acres. Existing zoning within the City is presented in Table 1-4, and is shown in Figure 1-3.

TABLE 1-4 EXISTING ZONING WITHIN GRANDVIEW CITY LIMITS

Land Use Category	Total Acreage*	Percent of Total
Single-Family Residential (R-1)	719.90	19.33%
Single Family Residential Mobile Home (R-1M)	--	--
Duplex-Family Residential (R-2)	72.24	1.94%
Multi-Family Residential (R-3)	82.91	2.23%
Mobile Home, Platted (MR-1)	7.19	0.19%
Mobile Home Park (MR-2)	73.90	1.98%
Light Commercial (C-1)	2.95	0.08%
Commercial (C-2)	190.71	5.12%
Light Industrial (M-1)	779.47	20.93%
Heavy Industrial (M-2)	77.80	2.09%
Agricultural (AG)	355.96	9.56%
Public Facility (PF)	1359.40	36.50%
PUD	1.84	0.05%
TOTAL	3,724	100.0%

* Source: Yakima County Geographic Information Services, February 2021.

As shown in Table 1-4, Public Facility (PF) is the largest zoning total within the City, comprising approximately 1,359 acres (36.5% of the land within the City Limits), which is largely the wastewater treatment plant area. Light Industrial (M-1) is the second-largest area, totaling approximately 779 acres (20.9%). Of the residential lands, Single-Family Residential (R-1) lands make up the largest area, approximately 720 acres (19.3%) of the total area within the City. Agricultural (AG) land also has a large presence in the City of Grandview, approximately 356 acres (9.6%). Commercial (C-2) zoned land in the City of Grandview totals approximately 191 acres (5.1%).

The City of Grandview UGA includes an area of approximately 4,792 acres total, 2,000 acres of which is outside the City Limits. The wastewater treatment plant is designated as within City Limits, but not within the UGA. A breakdown of future land use within the City Limits is provided in Table 1-5 and future land use within the UGA is presented in Table 1-6.

TABLE 1-5 FUTURE LAND USE WITHIN GRANDVIEW CITY LIMITS

Land Use Category	Total Acreage*	Percent of Total
Residential	991	28%
Low Density Residential	70	2%
Commercial	203	6%
Industrial	870	25%
Public	1,367	39%
TOTAL	3,506	100.0%

* Source: Yakima County Geographic Information Services, September 2014.

TABLE 1-6 FUTURE LAND USE WITHIN GRANDVIEW UGA*

Land Use Category	Total Acreage*	Percent of Total
Residential	365	21%
Low Density Residential	637	37%
Commercial	107	6%
Industrial	614	36%
Public	0	0%
TOTAL	1,723	100.0%

*Source: Yakima County Geographic Information Services, September 2014.

As shown in Table 1-5, public area is the largest future land use within Grandview's City limits comprising of approximately 1,367 acres (39%), and as shown in Table 1-6, Low Density Residential area is the largest future land use within Grandview's UGA, comprising of approximately 637 acres (37%) of the land within the UGA. Figure 1-3 below shows the City's future land use.

CITY OF GRANDVIEW

Water System Plan Update

EXISTING ZONING MAP

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LEGEND

- EXISTING CITY LIMITS
- SERVICE BOUNDARY (UGA)
- (AF-1) AGRICULTURAL FOREST
- (C-1) NEIGHBORHOOD BUSINESS
- (C-2) GENERAL BUSINESS
- (C-2) HIGHWAY COMMERCIAL
- (M-1) LIGHT INDUSTRIAL
- (M-2) HEAVY INDUSTRIAL
- (MR-1) MOBILE HOME PARK
- (PF) PUBLIC FACILITY
- (PUD) PLANNED UNIT DEV.
- (R-1) SINGLE FAMILY RESIDENTIAL
- (R-1M) SINGLE FAMILY / MANUFACTURED HOME
- (R-2) MEDIUM DENSITY RESIDENT.
- (R-3) HIGH DENSITY RESIDENTIAL

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FIGURE 1-3

CITY OF GRANDVIEW

Water System Plan Update

FUTURE LAND USE MAP

N
W E
S

0 1100 2200

LEGEND

- EXISTING CITY LIMITS
- SERVICE BOUNDARY (UGA)
- INDUSTRIAL
- LOW DENSITY RESIDENTIAL
- COMMERCIAL
- HIGHWAY COMMERCIAL
- PUBLIC
- RESIDENTIAL

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FIGURE 1-4

1.5 SERVICE AREA POLICIES

Many policies are established by a utility which affect its growth and development. Some policies deal specifically with drinking water and have a direct impact upon utility development within its future service area. The City of Grandview has identified the following policies which directly or indirectly affect the water system:

1. The City will make every effort to provide domestic water service to new customers within Grandview's future service area (Urban Growth Area) under the following conditions:

    - All costs associated with providing water service, e.g., extending water mains to the site, shall be the responsibility of the proponent/developer. Requirements to be met by proponents/developers when extending the City's water system are identified in "Extension by Developers" which is provided in the Miscellaneous Documents (CHAPTER 10).
    - The City may choose to participate in such improvements through grant, loan, and/or City funding on a case-by-case basis, if it is determined that such an investment is in the interests of the community.
    - The City maintains adequate water rights capacity per DOH required "water rights self-assessment" to serve the proposed property/properties.
    - The City maintains adequate physical source and/or storage capacity to serve the proposed property/properties.
    - The proponent/developer shall transfer all potable water rights associated with the property/properties to the City.
    - The proponent/developer shall "decommission" all groundwater wells on the property in accordance with the applicable Washington Administrative Code (WAC) requirements unless a well is to become part of the City's water system.
    - The proponent/developer shall allow the City the opportunity to purchase any irrigation water rights/shares associated with the property/properties prior to offering said irrigation rights/shares to any other interested party.

2. The City may choose to require a water main extension to be oversized for future demand. The difference in material and construction costs between the two sizes may be paid for by the City, or it may enter into an agreement requiring those costs to be repaid by the future users.

3. Service will not be provided to proposed structures which have fire flow requirements greater than the capacity of the system. The cost of upgrading the existing water system which is required by a development to meet fire flow requirements shall be the responsibility of the developer including, but not limited to:

    - Upsizing existing water mains.
    - Looping the distribution system by installing new water mains.
    - Increasing storage and/or pumping capacities.

4. The City will administratively assist property owners who wish to establish a Local Improvement District for the purposes of constructing water system improvements.

5. In accordance with Chapter 13.28.170 of the Grandview Municipal Code, the City has established a Line Extension/Latecomer Provision for extension of water mains. A copy of this ordinance is provided in Chapter 10.

6. The City will not wholesale water to other utilities. The terms and conditions of the service shall be negotiated and formalized in a written agreement at the time service is requested. The City's water rights will be adjusted as part of the terms and conditions of any wholesaling of water.

7. The City will not allow its mains to be used to transmit another water purveyor's water through the City's system to other non-City water users (wheeling of water).

8. The City may provide water service to properties outside the City Limits in accordance with Chapter 13.28.010 of the City Municipal Code, a copy of which is provided in the Miscellaneous Documents (CHAPTER 10). The "outside customers" will be assessed water rates which are higher than those charged to customers within the City Limits.

9. As a prerequisite to obtaining domestic water service, the City requires property owners of existing lots of record to connect to sanitary sewers which are within 200 linear feet or less of the nearest property corner. Should sanitary sewer not be available within 200 linear feet, the property owner shall be required to sign a waiver prohibiting the property owner from opposing a future Local Improvement District (LID) for sewer service.

10. The City may choose to manage and operate or provide specific contract services for a satellite water system outside the City Limits but within the City's service area. In making its decision, the City will take into consideration such factors as:

    * Construction materials, standards, and specifications of the satellite system;
    * Condition of the various components of the satellite system including, but not limited to, pipes, valves, pumps, reservoirs, and sources of supply;
    * Easements and access of the satellite system;
    * Fire protection capability of the satellite system;
    * Cross-connection control of the satellite system;
    * Specific operation, management, or contract service responsibilities to be provided; and
    * Conditions for assuming management and operation of the satellite system.

    City operation of satellite systems will be made on a case-by-case basis. In those cases where agreements for City operation are reached between the City and the satellite system, contracts for ownership, operation, and maintenance will be developed and included within the Miscellaneous Documents (CHAPTER 10).

11. The City shall not accept ownership or operation of existing private water systems annexed into the City unless said systems meet the City of Grandview standards. Substandard systems shall be upgraded or replaced prior to integration into the City's water system.

12. Newly annexed properties will transfer the balance of unused domestic and/or irrigation water rights to the City.

1.5.1 Service Area Agreements

There are currently no other large water purveyors within Grandview's Urban Growth Area (UGA) boundary. In addition, Grandview currently has no water service area agreement with its nearest municipal neighbors, the City of Sunnyside, the City of Mabton, or the City of Prosser. Further, the City of Grandview has no intention to connect its water system to that of its neighbors

1.5.2 Conditions of Service

The City of Grandview has a water service application form, available at the Public Works Department, which includes water service charges and billing information. Other information regarding conditions of service such as developer extension requirements, meter and material specifications, connection fee schedule, cross-connection control requirements, and latecomer payback provisions (if applicable) are presented to builders and developers when they apply to the City for building permits.

1.5.3 Satellite Management Agencies

As discussed previously in Section 1.6, the City of Grandview may, in the future, choose to manage and operate a satellite water system outside the City Limits, but within the City's Urban Growth Area boundary. However, the City has no specific plans at this time to become a satellite management agency. When Grandview has specific plans to manage and/or operate a satellite water system, the City will develop a Satellite Management Program.

1.5.4 Complaints

Grandview operates and maintains a written record of water system complaints. This system is administered by the City's Public Works Department. Grandview's complaint response program is discussed in more detail in CHAPTER 6.

1.6 DUTY TO SERVE

The City of Grandview recognizes that municipal water suppliers have a duty to provide service to all new connections within their retail service area when sufficient water rights and capacity exists, when the service request is consistent with the City code, and when service can be provided in a timely and reasonable manner. Each of these factors is discussed within this *Water System Plan*.

The City of Grandview is committed to providing water service to those persons and commercial and industrial establishments in accordance with City Municipal Code Chapters 13.04, 13.18, 13.24, 13.28, 13.30, 13.36, 13.40, and 13.44. Copies of these City codes and ordinances are included in CHAPTER 10.

The Public Works Department receives and reviews service requests for consistency with adopted local plans and development regulations such as the City's *Water System Plan*, *GMA Comprehensive Plan,* and the *Extension by Developers Policy*. The requested service's location is compared to the City's Retail Service Area, City Limits, and Urban Growth Area Boundary. Large water service requests (i.e. a new industry, residential development, etc.) are reviewed by the City's Engineer for consistency with water rights, pressures, and fire flows.

The following is a summary of the City's procedures for addressing requests for water service:

Service Requests – Applications for water service within the City and within the UGA are addressed (either by an approval or through a request for additional information) within thirty (30) days and in accordance with City Code Chapter 13.24.010. Applicants are required to complete a request for service form furnished by the City.

Water Rights Adequacy – Each application for water service is reviewed by the City to determine the amount of water requested, and that the City has sufficient water rights and capacity to provide service.

Conditions of a Non-Technical Nature – Conditions for connection to the City's water system are addressed in accordance with City Code Chapters 13.04, 13.24, 13.28, 13.30, and 13.36. Copies of these City code chapters are included within the Miscellaneous Documents (CHAPTER 10).

Procedures for Handling Time Extensions, Disputes, and Appeals – The City currently has no procedures established for addressing denial of water service, as denials have never occurred. Such procedures will be developed as needed.

CITY OF GRANDVIEW

CHAPTER 2 -

BASIC PLANNING DATA

HLA
Engineering and Land Surveying, Inc.

2.1 CURRENT POPULATION, SERVICE CONNECTIONS, AND ERUS

2.1.1 Current Population

According to the U.S. Census Bureau, the 2010 population of the City of Grandview was 10,862, an increase of 29.7%, or 2,485 people since 2000. The resulting average annual growth rate for the period 2000-2010 is approximately 2.6%. This ten-year growth rate is relatively consistent with previous decades. Population trends in the City of Grandview, Yakima County, and the State of Washington for the period 1910 through 2010 are presented in Table 2-1.

TABLE 2-1 CENSUS POPULATION TRENDS

Year	City of		Yakima County		State of Washington	
	Population*	Percent Change	Population	Percent Change	Population	Percent Change
1910	320		41,709		1,141,990	
1920	1,011	215.9%	63,710	52.7%	1,356,621	18.8%
1930	1,085	7.3%	77,402	21.5%	1,563,396	15.2%
1940	1,449	33.5%	99,019	27.9%	1,736,191	11.1%
1950	2,503	72.7%	135,723	37.1%	2,378,963	37.0%
1960	3,366	34.5%	145,112	6.9%	2,853,214	19.9%
1970	3,605	7.1%	145,212	0.1%	3,413,244	19.6%
1980	5,615	55.8%	172,508	18.8%	4,132,353	21.1%
1990	7,169	27.7%	188,823	9.5%	4,866,692	17.8%
2000	8,377	16.9%	222,581	17.9%	5,894,121	21.1%
2010	10,862	29.7%	243,231	9.3%	6,724,540	14.1%

Source: U.S. Census Bureau

Every year, the Washington State Office of Financial Management (OFM) develops population estimates for the state, individual counties, and all cities. OFM population estimates for Grandview, Yakima County, and the State of Washington for the period 2011 through 2020 are presented in Table 2-2.

TABLE 2-2 OFM POPULATION TRENDS						
Year	City of		Yakima County		State of Washington	
	Population	Percent Change	Population	Percent Change	Population	Percent Change
2011	10,920	0.5%	244,700	0.6%	6,767,900	0.6%
2012	11,000	0.7%	246,000	0.5%	6,817,770	0.7%
2013	11,010	0.1%	247,250	0.5%	6,882,400	0.9%
2014	11,170	1.5%	248,800	0.6%	6,968,170	1.2%
2015	11,200	0.3%	249,970	0.5%	7,061,410	1.3%
2016	11,160	-0.4%	250,900	0.4%	7,183,700	1.7%
2017	11,170	0.1%	253,000	0.8%	7,310,000	1.7%
2018	11,180	0.1%	254,500	0.6%	7,427,570	1.6%
2019	11,200	0.2%	255,950	0.6%	7,546,410	1.6%
2020[1]	11,230	0.9%	258,200	0.9%	7,656,200	1.4%

Source: Washington State Office of Financial Management (OFM)
[1] City of Grandview 2016 Comprehensive Plan estimates an adjusted 2020 population of 11,762 people.

The OFM estimated that the total population within the City of Grandview in 2015 was 11,200, which is approximately a 0.6% annual increase over the 2010 census value. A decrease in projected population occurred from 2015 – 2016 by 40 people, or -0.4%. The final OFM population estimate for 2020 was 11,230 people. The City of Grandview is the only municipality in Yakima County to have a year with negative projection between 2010 and 2020.

As a result of the adjusted growth rate in the City's 2016 Comprehensive Plan, the 2020 population was modified from the OFM's estimate of 11,230 people to 11,762 people. In 2020, there was an average of 2,257 Single-Family Residential water services, 280 Mobile Home Residential water services (413 dwelling units), 88 Outside Residential water services, and 60 Apartment water services (474 dwelling units). Assuming the average household sizes of these services are similar, the average persons per residential service would be:

$$\frac{11{,}762}{2{,}257 + 413 + 88 + 474} = \mathbf{3.6}\ persons$$

This will be the basis for projecting future population and future water service demands in both the City and UGA.

2.1.2 Existing Water Service Connections and ERUs

The location and user category of each water service are critical components in assessing demands throughout a water system. The current number of metered water services by user category is used as a basis for projecting the number of future water services from population estimates provided in Section 2.1. DOH defines a "service connection" or "connection" as the number of dwelling units (single family and/or multi-family residential) the City provides water to. Equivalent residential units (ERUs) are defined as the amount of water consumed by a typical full-time single-family residential service. More information on ERUs is provided in Section 2.2.5. The average number of metered water services and service connections by user category for the year 2020 is shown in Table 2-3.

TABLE 2-3 YEAR 2020 AVERAGE METERED WATER SERVICES AND SERVICE CONNECTIONS BY USER CATEGORY		
User Category	Metered Services	Service Connections
Residential Connections		
Single-Family Residential	2,257	2,257
Single-Family Residential – Outside	88	88
Mobile Home*	280	413
Apartments**	60	474
Non-Residential Connections		
Commercial	234	234
Industrial	38	38
Government	77	77
Total Connections	3,034	3,581

* All mobile home court units are metered individually except for the Lamplighter mobile home court, which is served by a single 6-inch meter. The total number of mobile home units in the Lamplighter mobile home court is 134. Therefore, the average number of mobile home service connections in 2020 was 413.
** Exact apartment units unknown for years 2014 – 2019. Average of 60 apartment accounts and 474 units total in 2020. Assume 8.0 units average per apartment building.

2.2 WATER PRODUCTION AND USAGE

Current and historical metered water consumption and production data records are the preferred method for determining demand trends and establishing a basis for forecasting future demand. All water system sources and services in the City of Grandview are metered. Production meters are typically read daily, and consumption meters are read monthly.

2.2.1 Existing Water Production

Annual water production by source well for the period 2014 through 2020 is presented in Table 2-4. As can be seen from this table, the City has 14 wells, four of which are inactive. The primary wells which routinely produce over 75 million gallons annually are West Main (S01), Olmstead A (S07), North Willoughby (S10), South Willoughby (S13), and Butternut (S14). Production from Well S13 was increased significantly beginning in 2017 and production from other sources was decreased. However, it was recently determined the source meter inaccurate, resulting in under reported production from this well for several years. The impacts of the inaccurate source meter and resulting negative DSL since 2017 is discussed further in Section 2.3. The S13 source meter was replaced in April 2021.

TABLE 2-4 GRANDVIEW ANNUAL WATER PRODUCTION 2014-2020 *(VALUES ARE IN MILLION GALLONS)*							
Source	2014	2015	2016	2017	2018	2019	2020
West Main (S01)	77.37	78.34	75.49	75.86	74.30	72.90	71.17
Balcom (S02)	20.74	19.88	9.59	15.33	14.78	4.82	33.30
Velma (S03)	55.36	37.26	42.19	41.90	47.56	52.38	53.80
Olmstead A (S07)	105.99	80.86	80.41	34.08	33.50	75.66	1.83
North Willoughby (S10)	155.47	147.12	151.37	106.23	114.50	100.48	100.58
Highland (S11)	14.93	14.34	15.43	0.00	4.40	29.25	20.25
South Willoughby (S13)	0.00	34.17	35.61	141.53	118.90	202.28	176.93
Butternut (S14)	152.15	192.20	165.62	115.18	103.34	20.30	107.20
Ashael Curtis (S17)	0.00	0.00	0.00	43.63	33.50	27.62	41.40
Pecan B (S18)	50.82	40.83	41.63	37.79	33.69	28.17	34.84
TOTAL	632.83	645.00	617.36	611.53	578.48	613.87	641.31

2.2.2 Existing Water Consumption

Currently, water consumption data is maintained by a computer database at Grandview City Hall. Services are divided and billed based upon meter size, relation to city boundary, and consumption. In June 2014, the City updated its billing software. Average service connections in 2014 appear to be less that other years because the previous billing software only recorded active accounts, and not total number of accounts. Therefore, because a greater data set is available for consumption per total number of accounts in each user category, the July 2014 – December 2020 data will be based on total number of user accounts per category. The number of service connections by user category for the period 2014 through 2020 is presented in Table 2-5.

TABLE 2-5 AVERAGE SERVICE CONNECTIONS BY USER CATEGORY 2014-2020								
User Category	2014	2015	2016	2017	2018	2019	2020	Average
Residential Connections								
Single-Family Residential	2,193	2,248	2,243	2,247	2,245	2,246	2,257	2,240
Single-Family Residential – Outside	85	85	86	86	87	87	88	86
Mobile Home Units	406	410	410	403	410	410	413	409
Apartment Units	474	474	474	474	474	474	474	474
Non-Residential Connections								
Commercial	209	225	226	225	227	231	234	225
Industrial	33	35	35	35	38	38	38	36
Government	54	73	72	74	75	75	77	71
TOTAL	3,454	3,550	3,546	3,551	3,556	3,561	3,581	3,543

The annual volume of water consumed (in million gallons per year) by user category for the period 2014 through 2020 is presented in Table 2-6.

TABLE 2-6 ANNUAL WATER CONSUMPTION BY USER CATEGORY 2014-2020
(values are in million gallons per year)

User Category	2014	2015	2016	2017	2018	2019	2020	Average
Single-Family Residential	181.03	181.43	179.20	173.15	180.72	184.05	186.19	180.83
Single-Family Residential – Outside	7.61	7.56	7.13	6.98	7.35	7.85	7.68	7.45
Mobile Home Units	28.30	27.58	27.01	27.56	26.98	25.73	26.37	27.07
Apartment Units	38.41	37.20	34.34	31.60	35.51	34.57	39.65	35.90
Commercial	35.27	32.74	31.00	28.34	27.96	33.99	35.11	32.06
Industrial	316.09	293.67	293.63	326.34	360.48	364.29	318.72	324.75
Government	23.79	23.11	23.10	22.18	24.61	23.46	20.46	22.96
TOTAL	630.49	603.29	695.41	616.15	663.61	673.94	634.19	651.23

During the period 2014 through 2020, the total number of services increased from 2,709 to 2,889 (a 6.6% increase), and the volume of water consumption increased from 630.49 MG to 634.19 MG (a 0.6% increase).

The average day water consumption per service by user category (in gallons per service per day) for the period 2014 through 2020 including averages is presented in Table 2-7. It can be seen from Table 2-7 that the average day consumption per service for Government and Industrial user categories has generally increased from 2014 to 2020, while the Commercial user category has decreased. Outside Residential, Apartment, and Mobile Home Court users appear to be consistent, with slight decline when comparing 2014 consumption per service to average consumption per service from 2014 – 2020.

TABLE 2-7 AVERAGE DAY WATER CONSUMPTION BY USER CATEGORY 2014-2020 *(values are in gallons per service per day)*								
User Category	2014	2015	2016	2017	2018	2019	2020	Average
Single-Family Residential	226	221	218	211	221	225	229	222
Single-Family Residential – Outside	245	244	227	222	232	247	241	237
Mobile Home Units	191	184	180	184	180	172	176	181
Apartment Units	222	215	198	183	205	200	200	208
Commercial	462	399	375	345	337	403	424	392
Industrial	26,242	22,988	22,922	25,546	25,990	26,264	23,439	24,770
Government	1,207	867	877	821	899	857	693	889
TOTAL	884	864	824	800	838	844	881	848

2.2.3 Maximum and Peak Consumption

Between the years 2014 and 2020, the largest month of consumption occurred in October 2014 during the peak industrial season when 86.1 MG was used. The largest month of consumption during the peak residential season occurred in July 2015, when 74.4 MG was consumed. These consumption months represent the highest recorded reliable demand. There were a few months that were slightly higher, but not used because DSL was excessively high (likely due to mistiming of monthly meter reads) or they occurred during years with the S13 source meter was inaccurate, resulting in negative DSL. Therefore, the values from 2014 and 2015 are most accurate. For comparison, a breakdown of the maximum consumption per connection for both October 2014 and July 2015 are provided in Table 2-8 and Table 2-9, respectively. The City of Grandview is unique in that while industrial consumption accounts for more than half of the systems current annual demand, the peak usage does not occur in summer, but in the fall when peak fruit harvest occurs. The peak month of July 2015 is more representative of a typical system peak, as opposed to October 2014, which only shows the industrial peak. As a result, data from both peak demand seasons will be utilized throughout the plan. More information on seasonal consumption is provided in Section 2.2.4.

TABLE 2-8 MAXIMUM MONTH WATER CONSUMPTION, OCTOBER 2014					
User Category	No. of Connections	Maximum Month Consumption (gallons)	Average Day Consumption (gallons)	Maximum Month Consumption per Service (gallons)	Average Day Consumption per Service (gallons)
Residential					
Single-Family Residential	2,245	13,861,000	447,129	6,174	199
Single-Family Residential – Outside	86	556,000	17,935	15,904	209
Mobile Home Units	410	2,493,000	80,419	6,080	196
Apartment Units	474	2,992,000	96,516	6,312	204
Non-Residential					
Commercial	221	3,639,000	117,387	16,466	531
Industrial	34	60,057,000	1,937,323	1,766,382	56,980
Government	70	2,505,000	80,806	35,786	1,154
TOTAL	3,540	86,103,000	2,777,516	-	-

TABLE 2-9 MAXIMUM MONTH WATER CONSUMPTION, JULY 2015					
User Category	No. of Connections	Maximum Month Consumption (gallons)	Average Day Consumption (gallons)	Maximum Month Consumption per Service (gallons)	Average Day Consumption per Service (gallons)
Residential					
Single-Family Residential	2,249	30,079,000	970,290	14,128	431
Single-Family Residential – Outside	85	1,320,000	42,581	15,904	501
Mobile Home Units	410	3,732,000	120,387	9,170	294
Apartment Units	476	6,309,000	203,516	13,254	428
Non-Residential					
Commercial	227	5,268,000	169,935	29,596	749
Industrial	35	23,997,000	774,097	888,778	22,117
Government	72	3,667,000	118,290	69,189	1,643
TOTAL	3,554	74,372,000	2,278,710	-	-

The maximum day of recorded water production within the maximum consumption months of October 2014 and July 2015 is used to calculate maximum day demand (MDD). Utilizing the percentage breakdown of demand per user category from the information provided in Table 2-8 and Table 2-9, MDD is calculated as shown in Table 2-10 and Table 2-11.

Peak hour demand (PHD), also shown in Table 2-10 and Table 2-11, was calculated by multiplying the maximum day demand by a peaking factor of 1.8 and dividing by 1,440 minutes per day. A peaking factor of 1.8 is considered reasonably conservative and is consistent with the *2020 Water System Design Manual (WSDM),* Equation 3-1. Using the maximum day of water production to calculate the MDD and PHD for projection of future system demand will account for the highest possible demand on the system, based upon available historical data.

Equation:

$$PHD = (\frac{MDD_{ERU}}{1440})[(C)(N) + F] + 18 \quad \text{(WSDM, Equation 3-1)}$$

Where,

C $= Coefficient\ associated\ with\ range\ of\ ERU = 1.6$ (WSDM, Table 3-1 >500 ERUs)
N_O $= Number\ of\ ERUs\ (October\ 2014) = 13{,}946$ (ERUs for the maximum month)
N_J $= Number\ of\ ERUs\ (July\ 2015) = 5{,}561$ (ERUs for the maximum month)
F $= Factor\ associated\ with\ range\ of\ ERUs = 225$ (WSDM, Table 3-1 >500 ERUs)

$$MDD_{ERU,O} = \frac{3.817\ MG}{13{,}946\ ERUs} = 274\ gpd/ERU$$
$$MDD_{ERU,J} = \frac{2.992\ MG}{5{,}264\ ERUs} = 538\ gpd/ERU$$

Therefore,

October 2014

$$PHD_O = \left(\frac{274}{1440}\right)[(1.6 \times 13{,}946) + 225] + 18 = \mathbf{4{,}307}\ gpm$$

$$Peaking\ Factor_{\ O} = \frac{PHD}{MDDgpm} = \frac{4{,}307\ gpm}{2{,}650\ gpm} = \mathbf{1.63}$$

July 2015

$$PHD_J = \left(\frac{538}{1440}\right)[(1.6 \times 5{,}561) + 225] + 18 = \mathbf{3{,}426}\ gpm$$

$$Peaking\ Factor_{\ J} = \frac{PHD}{MDDgpm} = \frac{3{,}616\ gpm}{2{,}078\ gpm} = \mathbf{1.65}$$

For calculations, a conservative peaking factor of 1.8 is used.

TABLE 2-10 MAXIMUM DAY AND PEAK HOUR WATER CONSUMPTION, OCTOBER 21, 2014

User Category	No. of Connections	Maximum Day Demand (gallons)	Maximum Day Demand per Service (gallons)	Peak Hour Demand (gpm)	Peak Hour Demand per Service (gpm)
Residential					
Single-Family Residential	2,245	614,455	274	768	0.3
Single-Family Residential – Outside	86	24,647	287	31	0.4
Mobile Home Units	410	110,514	270	138	0.3
Apartment Units	474	132,635	280	166	0.3
Non-Residential					
Commercial	221	161,316	730	202	0.9
Industrial	34	2,662,311	78,303	3,328	97.9
Government	70	111,046	1,586	139	2.0
TOTAL	3,540	3,816,924	81,729	4,771	102

TABLE 2-11 MAXIMUM DAY AND PEAK HOUR WATER CONSUMPTION, JULY 31, 2015					
User Category	No. of Connections	Maximum Day Demand (gallons)	Maximum Day Demand per Service (gallons)	Peak Hour Demand (gpm)	Peak Hour Demand per Service (gpm)
Residential					
Single-Family Residential	2,249	1,210,330	538	1,513	0.7
Single-Family Residential – Outside	85	53,115	625	66	0.8
Mobile Home Units	410	150,170	366	188	0.5
Apartment Units	476	253,864	536	317	0.7
Non-Residential					
Commercial	227	211,976	934	265	1.2
Industrial	35	965,600	27,589	1,207	34.5
Government	72	147,554	2,049	184	2.6
TOTAL	3,554	2,992,609	32,637	3,741	41
* 2,928,200 gallons production less 6.47% DSL (2015 average DSL) to arrive at a maximum daily consumption of 2,738,745 gallons.					

2.2.4 Seasonal Water Consumption

Water consumption in the City of Grandview varies throughout the year with the seasons, primarily due to irrigation use in the summer months and industrial consumption in early fall. A very small separate non-potable irrigation system exists within the City, but domestic water is used for irrigation by most residences. Most services use a single meter for domestic and irrigation uses, resulting in increased consumption during the months of June, July, and August. Per customer class, only Single-Family Residential will be evaluated because its connections exceed 1,000.

Figure 2-1 shows the seasonal change in residential consumption per service from 2014 through 2020. Because the industrial peak occurs in the fall, rather than the summer, Figure 2-2 is provided to show the changes in peak industrial demand per service from 2014 through 2020. Additionally, Figure 2-3 shows seasonal consumption for all user categories for the most recent year, 2020.

FIGURE 2-1
SEASONAL SINGLE-FAMILY RESIDENTIAL CONSUMPTION

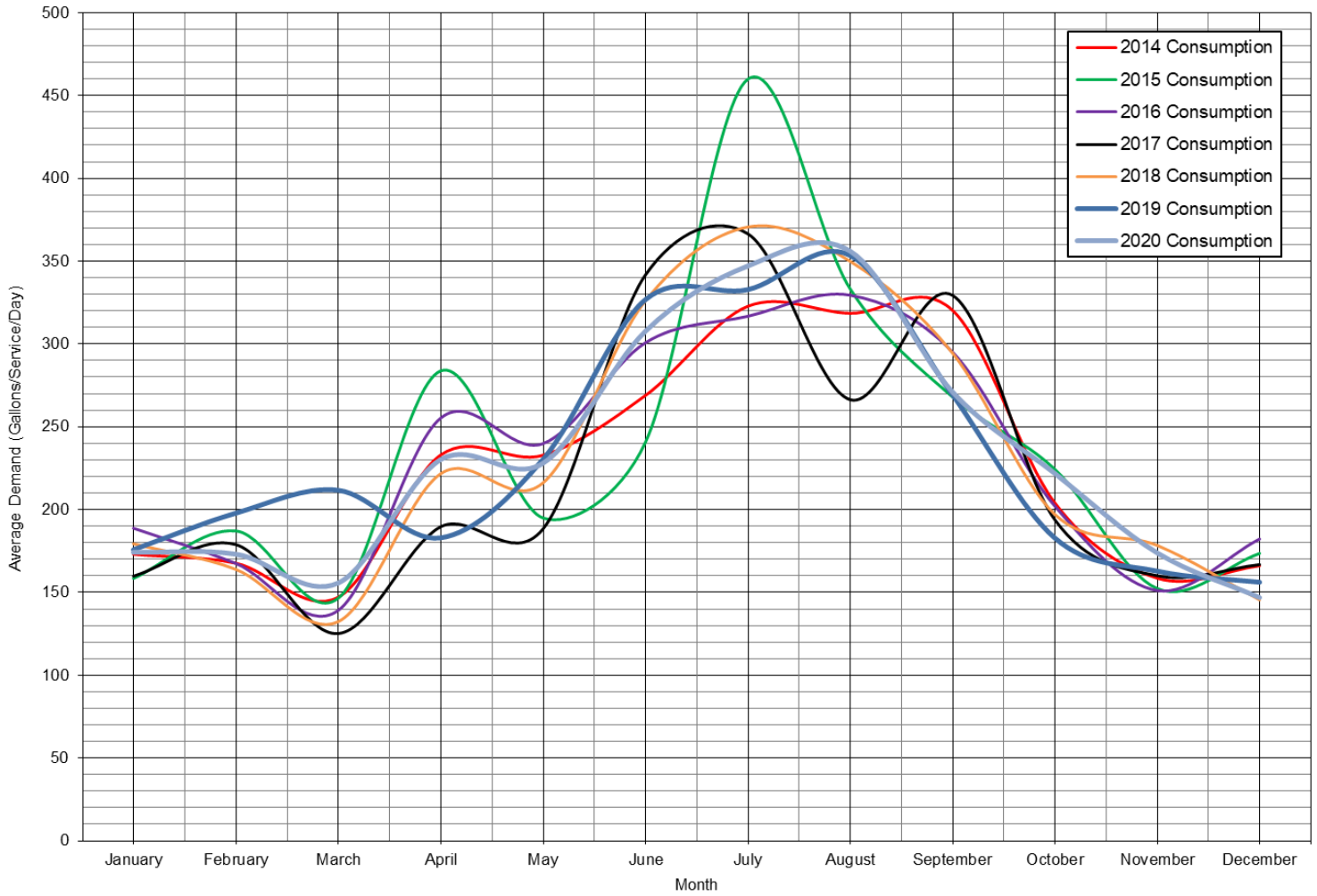


FIGURE 2-2
SEASONAL INDUSTRIAL DEMAND FROM 2014 - 2020

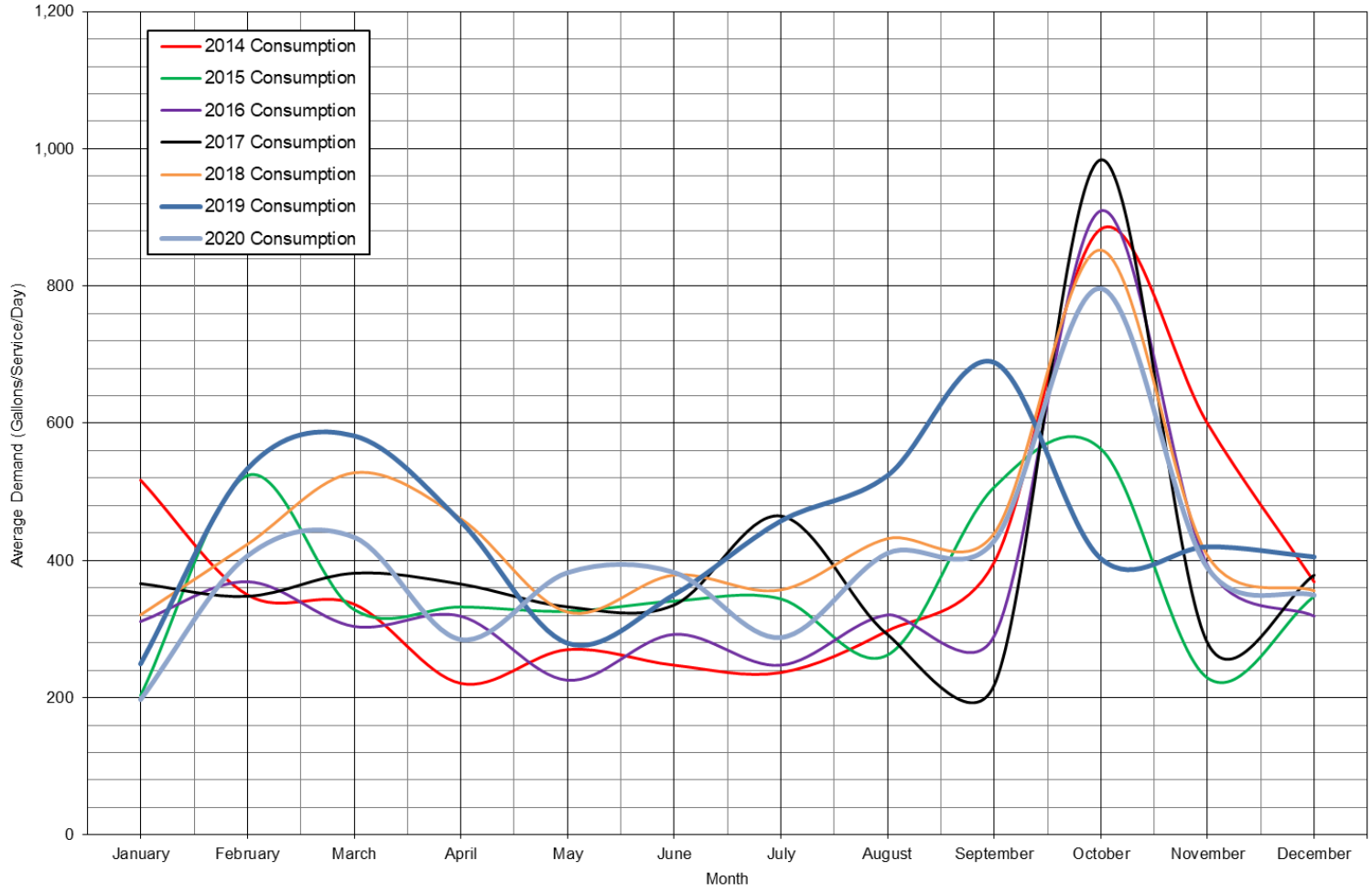
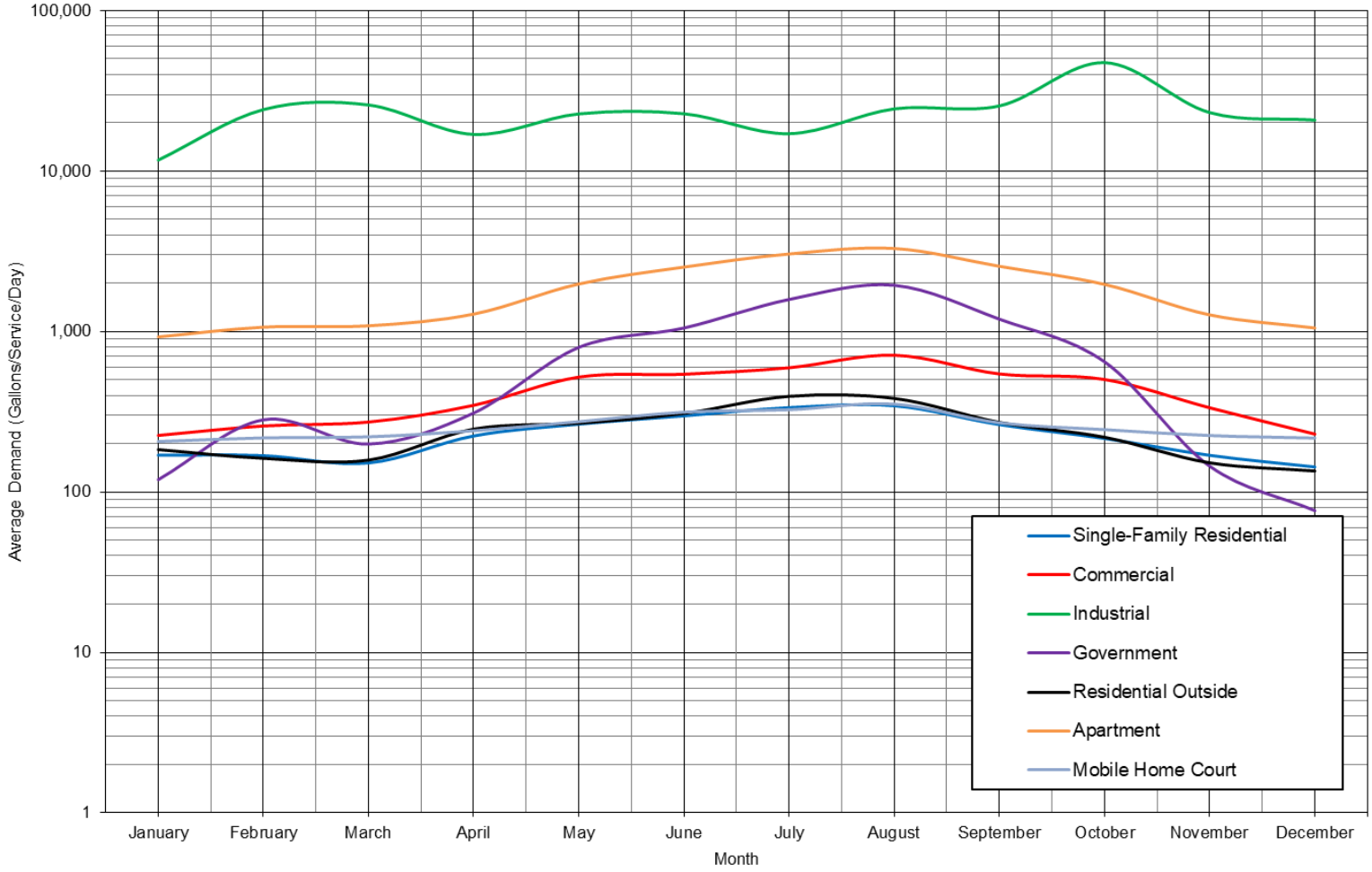


FIGURE 2-3
SEASONAL CONSUMPTION BY USER CATEGORY 2020



2.2.5 Existing Equivalent Residential Units (ERUs)

An Equivalent Residential Unit (ERU) is defined as the amount of water consumed by a typical full-time single-family residence. The actual quantity of water represented by an ERU is related to the type of demand (average day or peak) being considered. As discussed previously, maximum day demand (MDD) and peak hour demand (PHD) were calculated from the maximum day of production in the maximum month of consumption for the period between 2014 and 2020, while average day demand (ADD) is an actual measurement for a specified time period. As a result, the peaking factor from an average day demand (ADD) to a maximum day demand (MDD) is not the same for all service categories. Therefore, ERU values for ADD, MDD, and PHD have been calculated as shown in Table 2-12. This ERU information is useful for forecasting and analyzing future water system demand.

Single-Family Residential ADD per service values from the 2014 to 2020 period vary from a low of 211 gallons per service per day in 2017 to a high of 230 gallons per service per day in 2020. Similar variation in consumption per service occurs in the other user categories. The City has generally seen consistent residential demands from 2014 to 2020, providing a suitable representation of existing conditions. The average ADD from each user category for the seven-year period from 2014 through 2020 as shown in Table 2-7, were used in producing Table 2-12.

The maximum day demand per service and peak hour demand per service provided in Table 2-12, are based upon the calculated demand for July 31, 2015, and October 21, 2014, which are the maximum day of production for the maximum month of consumption during the summer (June – August) and fall between 2014 and 2020. Both summer and fall ERU values are shown for comparison. Current demand in the fall is higher and represents the largest demand on the system, but the peak day ERU values in the summer are more representative of typical usage for residential services and may be important in evaluating proposed future uses as residential demand begins to exceed industrial demand.

TABLE 2-12 EQUIVALENT RESIDENTIAL UNIT FACTORS (ERUS)

User Category	ADD (2014-2020)		MDD (July 2015)		MDD (October 2014)	
	GPD/ Connection[a]	ERUs	GPD/ Connection[b]	ERUs	GPD/ Connection[a]	ERUs
Residential						
Single-Family Residential	222	1.0	538	1.0	274	1.0
Single-Family Residential – Outside	237	1.1	625	1.2	287	1.0
Mobile Home Units	181	0.8	366	0.7	270	1.0
Apartment Units	208	0.9	536	1.0	280	1.0
Non-Residential						
Commercial	392	1.8	934	1.7	730	2.7
Industrial	24,788	111.7	27,589	51.3	78,303	286.1
Government	889	4.0	2,049	3.8	1,586	5.8

[a] ADD values based upon 2014 through 2020 average.
[b] Peak Day Demand is based upon calculated demand for July 31, 2015, as provided in Table 2-11.

2.3 DISTRIBUTION SYSTEM LEAKAGE (DSL)

The distribution leakage standard is a significant element of the WUE requirements. This standard requires that all water systems monitor total water consumption by all services. The difference between water consumption and water production is considered DSL. DSL includes meter inaccuracies, water theft, leaking water mains, and reservoir overflows. DSL may also include un-metered uses such as hydrant use for firefighting, and water used for distribution system flushing (if these uses are un-metered or un-estimated). The WUE Rule requires water distribution leakage to be 10% or less of total production based on a three-year rolling average.

All of Grandview's water sources are metered, and these source meters are read daily. All services in Grandview's distribution system are metered and read monthly. Table 2-13 presents Grandview's water production and water consumption values for the last six years and most recent three-year average (2018 through 2020).

TABLE 2-13 WATER PRODUCTION, CONSUMPTION, AND DSL

Year	Production	Consumption	DSL	% DSL
2014	633,187,600	630,494,000	2,693,600	0.43%
2015	645,004,780	603,290,000	41,714,780	6.47%
2016	617,355,000	595,411,000	21,944,000	3.55%
2017	611,532,172	616,151,000	-4,618,828	-0.76%
2018	578,476,680	663,614,000	-85,137,320	-14.72%
2019	613,868,586	673,937,000	-60,068,414	-9.79%
2020	641,309,352	634,185,000	7,124,352	1.11%
TOTAL	4,340,734,170	4,417,082,000	-76,347,830	-1.96%
3-Year Average (2018-2020)	611,218,206	657,245,333	-46,027,127	-7.80%

Grandview currently meets the 10% DSL standard when considering the current three-year average DSL, which is equal to -7.80%. As discussed in Section 2.2.1, source meter issues beginning in 2017 have led to negative system DSL. Although the City currently satisfies the 10% DSL standard, the City plans to continue making repairs to or replacing potential leaking system components such as service lines, old service meters, and aging and leaking main line water valves to further reduce the DSL percentage and accuracy in volume measurement.

2.4 WATER SUPPLY CHARACTERISTICS

The single most important aspect of a water utility is its domestic water supply source. The City of Grandview's water supply is dependent on ground water sources. As previously discussed, the City utilizes 14 source wells. The locations of these wells within the water system are shown in Map A in CHAPTER 10. All 14 City wells are located on property owned by the City, and seven City wells have protective covenants establishing a 100-foot sanitary radius. Copies of the property deeds and protective covenants for each well are provided in CHAPTER 10.

As discussed in CHAPTER 3, there has been no significant change in source well water quality from any of Grandview's wells as demonstrated by inorganic chemical and volatile organic chemical monitoring over time.

Grandview has taken steps to protect its aquifers through implementation of its *Wellhead Protection Plan* and participation in a regional wellhead protection plan. Completed in 2000, Grandview's *Wellhead Protection Plan*, is intended to protect Grandview's aquifers through a combination of regulatory measures, best management practices, and public education and awareness. Details of Grandview's *Wellhead Protection Program* are provided in CHAPTER 5.

The existing City wells all withdraw water from the Columbia River Basalt Group. This geologic formation consists of four distinct hydrogeologic units. Starting with the oldest, these four units are known as the Grande Ronde, Wanapum, and Saddle Mountain Units (made up primarily of basalts of the same name, but also include sedimentary interbeds), and the Overburden Unit.

The Grande Ronde, Wanapum, and Saddle Mountain Units vary in thickness in South-Central Washington. Each unit is composed of numerous to several hundred individual basalt flows, which can range in thickness from a few inches to more than 300 feet, with sedimentary interbeds. Distinct, thick sedimentary interbeds separate the Grande Ronde, Wanapum, and Saddle Mountain Units.

Eleven of Grandview's existing City wells penetrate and withdraw water from the Saddle Mountain Basalt Aquifer and three from the Wanapum Basalt Aquifer of the Yakima Fold Belt. Review of the well logs of each source provided in CHAPTER 10 show layers of sand, gravel, clay, shale, sandstone, and basalt consistent with the geologic definition of Saddle Mountain and Wanapum materials.

Irrigation wells for agricultural use also penetrate and withdraw from the above-described Formations. Consequently, many of the Yakima area communities have experienced diminishing capacities and/or lowering drawdown levels in their source wells over years. Trends in groundwater levels are one of several factors important in determining source reliability. The United States Geological Survey (USGS) recently completed reports determining and analyzing such trends. The *Groundwater Status and Trends for the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho* (Scientific Investigations Report 2012-5261), published in 2012 by USGS, concluded that groundwater levels in the aquifer have risen since the 1950s in areas heavily irrigated with surface water and have declined since the 1970s in areas irrigated with groundwater. For wells examined in the Report, typical rises in water level under surface-water irrigation areas were 50 feet. Declines of 200 feet or greater were common in areas where pumping groundwater is the dominant source of irrigation water. The USGS Report concluded that 72% of the wells within the aquifer experienced declines over the study period, 1968-2009. Furthermore, the trends for all wells within the aquifer declined at a mean rate of 1.9 ft/year. Source wells within Grandview were not directly involved with the USGS studies and reports. Because of this exclusion, an accurate determination of diminished capacities and lower drawdown cannot be concluded for the City's source wells. However, the City has noticed a decline in well capacity because of a combination of declining groundwater levels and other performance related reasons. The City will continue to track static and drawdown water levels in the future as wells are rehabilitated to establish a record of water levels and anticipate potential source deficiencies. See Figure 2-4 for trend in groundwater levels.

FIGURE 2-4 GRANDVIEW WATER LEVEL TRENDS 2014 - 2020

2.5 FUTURE POPULATION PROJECTIONS AND LAND USE

Water use is contingent upon a number of varying and uncertain factors, which makes forecasting future demand difficult. Of primary importance are the following factors:

1. Population
2. Type of residential development (i.e., single-family, multi-family, rural, large or small lot)
3. Per capita income
4. Types of commercial and industrial enterprises
5. Climate
6. Irrigation use of water
7. Price charged for water and type of rate structure (i.e. the base water quantity and cost for individual service meters)

Forecasting future system demands is based upon the projected number of single-family residential, outside residential, multi-family residential, mobile home court, commercial, industrial, and government service categories, as well as the annual average day, maximum day, and peak hour water demand.

The population projections for the City of Grandview are estimated based on reviewing past population trends and confirming with the City's Comprehensive Plan. Future water services are based upon the projected population growth within the City and the UGA. However, to mitigate impacts to Grandview's existing water rights and reservoir storage capacity, the City Council has determined the City will only provide water service to new customers within their UGA under specific conditions.

Other factors such as income, climate, and water cost will be assumed to remain consistent with current trends. Climate does have a major influence on Grandview's water consumption during summer months due to use of domestic water supply for irrigation purposes. However, the area's climate has generally remained consistent with historical averages.

2.5.1 Projected Population

The City's 2016 Comprehensive Plan utilizes population projections developed by Yakima County Planning Division (YCPD). The YCPD has provided the County-Wide Planning Policy Committee (CWPPC) population projections for each community within Yakima County for the years 2025, 2030, 2035, and 2040. The population estimate for the year 2025 of 12,239 was made for Grandview, based on the County's "Preferred Alternative Medium Population Projection."

The preferred alternative projection compares OFM's 2015 – 2040 medium annual population projection for Yakima County to OFM's City of Grandview estimates from 2010 – 2014. If the city's growth projection is higher than the county's, the city's rate is used. If the county's rate is higher, the average of the two rates is used. The following Table 2-14 summarizes Grandview's projected growth to 2040 in accordance with the City's Comprehensive Plan.

TABLE 2-14 CITY OF GRANDVIEW ADJUSTED GROWTH RATES

OFM City-Wide Growth Projection 2010-2014	OFM Medium County-Wide Growth Projection 2015-2040	Comp. Plan Adjusted Growth Projection	Adjusted Growth Rates						
			2015	2020	2025	2030	2035	2040	Average
0.70%	1.08%	0.89%	0.89%	0.84%	0.77%	0.71%	0.67%	0.61%	0.71%

Projecting Grandview's population growth has proven difficult due to inconsistent and widely ranged growth over the past few decades. Despite stagnant projections by the City's Comprehensive Plan, the State's OFM report, and YCPD's *Report 1*, Grandview's actual future growth is proving to be much greater. Recently, the City has gained much attention by housing developers, and five subdivisions are in the approval process, while three have already been approved. Table 2-15 details various housing subdivisions to be built within the next 10 years.

TABLE 2-15 PLANNED HOUSING DEVELOPMENTS

Housing Development	Status	# of Lots
Grandridge Estates Subdivision	Approved	437
Appleway Estates Subdivision	Approved	18
Butternut Short Plat	Approved	9
Euclid meadows	Pre-plat submitted	123
Forsell Subdivision	Pre-plat submitted	110
N. Elm Subdivision	Proposed	300
Wilson Highway East	Proposed	200
Wilson Highway West	Proposed	150
	TOTAL	1,347

The proposed subdivisions are to be classified under the single-family residential designation. A full buildout of the proposed subdivisions would provide an additional 1,347 single-family homes in City jurisdiction, resulting in a direct population increase of 5,365 people in the next 10 years at 3.6 people per dwelling average. Instead of 0.71% average growth per year, the City is poised for 4.84% average growth in single family homes per year for the next 10 years.

Residual growth in the Outside Residential, Apartment, and Mobile Home service designations is expected, and rates are estimated to increase from 0.71% to 1% during the years of subdivision growth. Because these are growing at a slower rate than single-family residential, the calculated population growth rate from 2022 - 2032 will range between 3.67% and 3.92%.

After rapid initial growth, the City's average population projection will likely fall back into the 0.71% Yakima County/OFM projections for years 2032 – 2040. Therefore, instead of concurring with the City's Comprehensive Plan, it is suggested that the projections follow the increased growth rate from 2022 – 2032, and the 0.71% growth rate from 2032 – 2040, based on development interest. Table 2-16 outlines the adjusted city growth for the next 20 years, should all housing subdivisions be built.

TABLE 2-16 CITY POPULATION PROJECTIONS					
Year	Future Population	% Increase from Previous Year	Year	Future Population	% Increase from Previous Year
2021	11,797	-	2032	17,246	3.92%
2022	11,881	0.71%	2033	17,368	0.71%
2023	12,317	3.67%	2034	17,492	0.71%
2024	12,772	3.70%	2035	17,616	0.71%
2025	13,248	3.73%	2036	17,741	0.71%
2026	13,745	3.76%	2037	17,867	0.71%
2027	14,265	3.78%	2038	17,994	0.71%
2028	14,809	3.81%	2039	18,121	0.71%
2029	15,378	3.84%	2040	18,250	0.71%
2030	15,973	3.87%	2041	18,380	0.71%
2031	16,595	3.89%	2042	18,510	0.71%

2.6 FUTURE WATER DEMAND

2.6.1 Future Water Service Connections

The number of residential water services within the City Limits is anticipated to increase consistent with the population growth rate projection. However, locations of increases in population will vary depending on the availability of undeveloped land, and potential for new construction. Locations of anticipated future residential water services for the years 2021, 2025, and 2035 were determined by identifying vacant lots and development patterns using aerial imagery and the Yakima County Assessors GIS map.

It is difficult to predict how population increases within the City and the UGA will affect increases in other user categories. The water service totals in remaining user categories were projected to increase at a rate equal to the population growth rate. The future service locations were determined based on the existing zoning and future land uses within the City. Future water services by user category for the years 2032, and 2042 are shown in Table 2-17.

TABLE 2-17 FUTURE WATER CONNECTIONS BY USER CATEGORY			
User Category	Year 2022 Total	Year 2032 Total	Year 2042 Total
Residential Connections			
Single-Family Residential	2,289	3,636	3,903
Single-Family Residential – Outside	89	99	106
Mobile Home Units	419	463	497
Apartment Units	481	531	570
Non-Residential Connections			
Commercial	237	262	281
Industrial	39	43	46
Government	78	86	93
Total Services	3,632	5,120	5,495

2.6.2 Future ERUs and ADD

The projected number of water system services, ERUs, and ADD, are calculated from the current water services by user category as shown in Table 2-17, and the average 2014 through 2020 demand per service for each user category, provided in Section 2.2.2 .

The calculated future number of services, ERUs, and projected ADD for years 2022, 2032 and 2042 are presented in Table 2-18, Table 2-19, and Table 2-20. To accommodate for uncertainties in projecting future water demand and to account for system losses, a 10% contingency factor has been applied to the final ADD projections, as shown.

TABLE 2-18 YEAR 2022 ERU AND ADD

User Category	No. of Connections	ERUs/ Connection	ADD/ Connection (gallons)	Total ERUs	Total ADD (gallons)
Residential Connections					
Single-Family Residential	2,289	1.0	222	2,289.2	508,194
Single-Family Residential – Outside	89	1.1	237	98.2	21,153
Mobile Home Units	419	0.8	181	335.1	75,818
Apartment Units	481	0.9	208	432.7	99,997
Non-Residential Connections					
Commercial	237	1.8	392	427.2	93,035
Industrial	39	111.7	24,788	4,305.1	955,367
Government	78	4.0	889	312.4	69,428
Subtotal	3,632			8,200	1,822,993
10% Contingency				820	182,299
TOTAL*	3,632			9,020	2,005,293

TABLE 2-19 YEAR 2032 ERU AND ADD					
User Category	No. of Connections	ERUs/ Connection	ADD/ Connection (gallons)	Total ERUs	Total ADD (gallons)
Residential Connections					
Single-Family Residential	3,636	1.0	222	3,636.2	807,228
Single-Family Residential – Outside	99	1.1	237	108.5	23,366
Mobile Home Units	463	0.8	181	370.2	83,751
Apartment Units	531	0.9	208	477.9	110,459
Non-Residential Connections					
Commercial	262	1.8	392	471.9	102,769
Industrial	43	111.7	24,788	4,755.5	1,055,320
Government	86	4.0	889	345.1	76,692
Subtotal	5,120			10,165	2,259,584
10% Contingency				1,017	225,958
TOTAL*	5,120			11,182	2,485,543

TABLE 2-20 YEAR 2042 ERU AND ADD					
User Category	No. of Connections	ERUs/ Connection	ADD/Connection (gallons)	Total ERUs	Total ADD (gallons)
Residential Connections					
Single-Family Residential	3,903	1.0	222	3,902.7	882,356
Single-Family Residential – Outside	106	1.1	237	116.4	24,010
Mobile Home Units	497	0.8	181	397.3	89,890
Apartment Units	570	0.9	208	513.0	118,557
Non-Residential Connections					
Commercial	281	1.8	392	506.5	110,303
Industrial	46	111.7	24,788	5,104.1	1,132,687
Government	93	4.0	889	370.4	82,315
Subtotal	5,495			10,910	2,425,239
10% Contingency				1,091	242,524
TOTAL*	5,495			12,001	2,667,763
*Total accounts for service connections as defined by DOH.					

2.6.3 Future MDD and PHD

Future Maximum Day Demand (MDD) and Peak Hour Demand (PHD) on the water system were calculated for the years 2022, 2032, and 2042 using the projected number of services for each user category and the MDD per service for October 21, 2014, as discussed in Section 2.5.3. Calculated future MDD and PHD values for 2022, 2032, and 2042 are presented in Table 2-21, Table 2-22, and Table 2-23. To accommodate for uncertainties in projecting future water demand and to account for system losses, a 10% contingency factor has been applied to the ERU, MDD and PHD projections, as shown.

TABLE 2-21 YEAR 2022 MDD AND PHD

User Category	No. of Connections	ERUs/ Connection	Total ERUs	MDD/ Connect. (gal/day)	Total MDD (gal/day)	Total PHD (gpm)	PHD/ Connect (gpm)
Residential Connections							
Single-Family Residential	2,289	1.0	2,289.2	274	627,231	686.7	0.3
Single-Family Residential – Outside	89	1.0	89.3	287	25,616	35.7	0.4
Mobile Home Units	419	1.0	418.9	270	113,099	125.7	0.3
Apartment Units	481	1.0	480.8	280	134,611	192.3	0.4
Non-Residential Connections							
Commercial	237	3.0	712.0	730	173,254	213.6	0.9
Industrial	39	286.0	11,022.9	78,303	3,017,916	3,773.2	97.9
Government	78	6.0	468.6	1,586	123,862	156.2	2.0
Subtotal	3,632		15,482		4,215,590	5,183	
10% Contingency			1,548		421,559	518	
TOTAL	3,632		17,030		4,637,149	5,702	

TABLE 2-22 YEAR 2032 MDD AND PHD

User Category	No. of Connections	ERUs/ Connection	Total ERUs	MDD/ Connect. (gal/day)	Total MDD (gal/day)	Total PHD (gpm)	PHD/ Connect. (gpm)
Residential Connections							
Single-Family Residential	3,636	1.0	3,636.2	274	996,309	1,090.8	0.3
Single-Family Residential – Outside	99	1.0	98.6	287	28,296	39.4	0.4
Mobile Home Units	463	1.0	462.7	270	124,932	138.8	0.3
Apartment Units	531	1.0	531.1	280	148,695	212.4	0.4
Non-Residential Connections							
Commercial	262	3.0	786.5	730	191,380	235.9	0.9
Industrial	43	286.0	12,176.1	78,303	3,333,657	4,168.0	97.9
Government	86	6.0	517.6	1,586	136,821	172.5	2.0
Subtotal	5,120		18,209		4,960,090	6,058	
10% Contingency			1,821		496,009	606	
TOTAL	5,120		20,030		5,456,099	6,664	

TABLE 2-23 YEAR 2042 MDD AND PHD							
User Category	No. of Connections	ERUs/ Connection	Total ERUs	MDD/ Connect. (gal/day)	Total MDD (gallons)	Total PHD (gpm)	PHD/ Connect (gpm)
Residential Connections							
Single-Family Residential	3,903	1.0	3,902.7	274	1,069,350	1,170.8	0.3
Single-Family Residential – Outside	97	1.1	106.5	586	56,733	67.8	0.7
Mobile Home Units	472	0.6	283.4	338	159,674	189.0	0.4
Apartment Units	553	0.9	497.6	490	270,917	331.7	0.6
Non-Residential Connections							
Commercial	281	3.0	844.2	730	205,411	253.2	0.9
Industrial	46	286.0	13,068.8	78,303	3,578,054	4,473.5	97.9
Government	93	6.0	555.6	1,586	146,852	185.2	2.0
Subtotal	5,495		19,544		5,323,723	6,502	
10% Contingency			1,954		532,372	650	
TOTAL	5,495		21,498		5,856,096	7,152	

CHAPTER 3 -

SYSTEM INVENTORY AND ANALYSIS

HLA
Engineering and Land Surveying, Inc.

3.1 ASSET MANAGEMENT – ASSET INVENTORY AND ANALYSIS

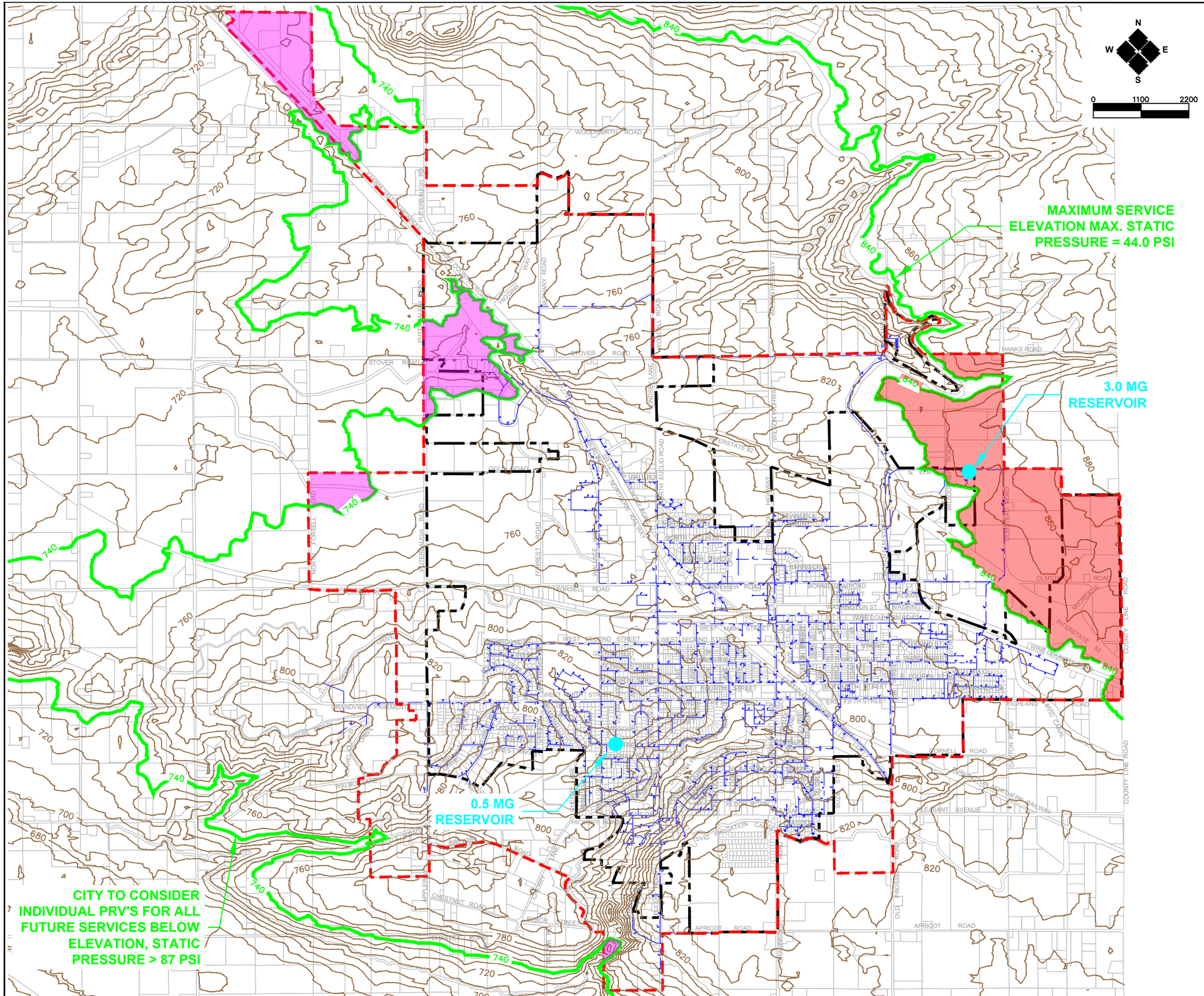
The existing City of Grandview domestic water system consists of one distribution pressure zone, as shown in Figure 3-1, which provides a minimum of 30 psi static service elevation, as required by DOH. Information on Grandview's pressure zone including the service elevations, and pressure range is also provided in Figure 3-1.

The City is supplied water from fourteen (14) primary source wells, three of which are no longer in service. The current maximum pumping capacity of the 12 active primary wells is 3,529 gallons per minute (gpm) or 5.08 million gallons per day (MGD), which includes two emergency sources. Water rights allow source capacity to increase to 6,955 gpm or 10.02 MGD. Further discussion on the City's existing water rights is provided in 3.10.

Grandview's water storage is provided by a 3.017-million-gallon (MG) standpipe reservoir and a 0.544 MG elevated reservoir, totaling 3.561 MG. During normal operation, static pressures throughout the existing water distribution system range from a low of 30 psi to a high of 87 psi, based upon the reservoir overflow elevations and well telemetry controls. Future water services within locations of static pressures above 87 psi should consider use of individual pressure reducing valves (PRV's). The City will advise developers and property owners within these areas that high pressures are likely and will recommend the use of PRV's at each lot per the Uniform Plumbing Code Chapter 608. The property owner is responsible for ownership, operations, maintenance, installation, and testing of the PRV's. PRV's will be installed by the property owner on the customer side of the water meter, inside the customer property lines. The devices shall be installed and tested per manufacturer's recommendations.

The entire water system is controlled by a comprehensive PLC (Programmable Logic Controller) based telemetry system. PLC telemetry units are located at most system wells and both reservoirs and are linked via radio communication. The telemetry system's master control station is located at the City's Public Works Shop.

Grandview's water transmission and distribution system is comprised of over 261,000 lineal feet of pipe, ranging in diameter from under 2-inch to 16-inch. The system is looped where possible, and most of the material is 6-inch or larger ductile iron, cast iron pipe, and PVC pipe. The layout of Grandview's water distribution system, including pipe sizes and valve, hydrant, reservoir, and well locations is shown in Figure 3-1. The maximum water service elevation of the system is also indicated in Figure 3-1. An enlarged map (Map A) of the water system is included in CHAPTER 10. Figure 3-2, provides a schematic depicting the interrelationship between the major water system components.



CITY OF GRANDVIEW

Water System Plan Update

WATER SYSTEM SERVICE AREA/ELEVATIONS MAP

LEGEND

- RETAIL SERVICE AREA (CITY LIMITS)
- FUTURE SERVICE AREA (URBAN GROWTH AREA)
- 800 — SERVICE ELEVATION CONTOUR
- WATER MAINS
- RESERVOIR
- 800 — YAKIMA COUNTY 20' CONTOURS
- SERVICE AREA ABOVE ELEVATION 840 FT.
- SERVICE AREA BELOW ELEVATION 740 FT.

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Yakima, WA 98902
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Fax 509.965.3800
www.hlacivil.com

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FIGURE 3-1

CITY OF GRANDVIEW

Water System Plan Update

WATER SYSTEM MAJOR COMPONENTS MAP

N
W E
S

0 750 1500

SOURCE WELL S16
OLMSTEAD B
DEPTH 623 FT
20 GPM CAPACITY

SOURCE WELL S07
OLMSTEAD A
DEPTH 112 FT
180 GPM CAPACITY

SOURCE WELL S10
NORTH WILLOUGHBY
DEPTH 610 FT
315 GPM CAPACITY

STANDPIPE RESERVOIR
TOTAL CAPACITY 3.0 MG
OVERFLOW ELEV. 941.6 FT

SOURCE WELL S13
SOUTH WILLOUGHBY
DEPTH 1,200 FT
1,000 GPM CAPACITY

SOURCE WELL S06
EUCLID DEPTH 248 FT
30 GPM CAPACITY
(EMERGENCY)

SOURCE WELL S14 BUTTERNUT
DEPTH 1,294 FT 1,275 GPM
CAPACITY

SOURCE WELL S02
BALCOM & MOE
DEPTH 1,150 FT
268 GPM CAPACITY

SOURCE WELL S01
WEST MAIN DEPTH 247 FT
135 GPM CAPACITY

SOURCE WELL S17
ASHAEL CURTIS
DEPTH 720 FT
92 GPM CAPACITY

ELEVATED RESERVOIR
TOTAL CAPACITY 0.5 MG
OVERFLOW ELEV. 941.6 FT

SOURCE WELL S11
HIGHLAND
DEPTH 250 FT
42 GPM CAPACITY

SOURCE WELL S03
VELMA
DEPTH 760 FT
102 GPM CAPACITY

SOURCE WELL S08
APPLEWAY
DEPTH 342
FT 0 GPM (INACTIVE)

SOURCE WELL S18
PECAN DEPTH 495 FT
70 GPM CAPACITY

SOURCE WELL S12
PECAN A DEPTH 269 FT 0
GPM (INACTIVE)

LEGEND

- CITY LIMITS
- FUTURE SERVICE AREA
- WATER MAINS (10" AND LARGER)
- STORAGE RESERVOIR
- GROUNDWATER WELL - SADDLE MOUNTAIN BASALT AQUIFER
- GROUNDWATER WELL - WANAPUM BASALT AQUIFER

CITY OF GRANDVIEW

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FIGURE 3-2

3.1.1 Water Sources

The City of Grandview has fourteen (14) source wells, all located on City-owned properties within a single service pressure zone, as shown in Figure 3-1 and Map A in CHAPTER 10. The following are descriptions of the City's wells and pump installations.

Source No. S01 (West Main Well, previously known as the Old Shop Well): This well is located at the northwest corner of the intersection of Wine Country Road and Wilson Highway as shown on Map A. Drilled in 1977 to a depth of 247 feet, the well has a 10-inch casing from the surface to a depth of 212 feet, and an 8-inch casing from 212 feet to 247 feet. The well is equipped with a Franklin 50 hp, 3-phase, 460-volt submersible pump installed in 2007. The well's initial capacity was 290 gpm, but its current capacity is 135 gpm. A 2-inch air release valve, 4-inch check valve, 4-inch butterfly valve, and 2-inch Mueller Hersey Solid State flow meter are installed on the discharge piping.

The well is housed in a 14-foot by 14-foot plywood and sheet metal pumphouse which was constructed in 2001. Within the pumphouse is a separate 8-foot by 8-foot chlorine room which houses an Advance 200 Series gas chlorinator (Model No. VR6020) for disinfection, a Wallace Tiernan AcuTec 35 gas detection system, and a Scaletron digital scale for measuring chlorine usage. The well is equipped with an Onan 1,800 rpm auxiliary diesel generator (Model No. DGDB3375673) for emergency well operation.

Source No. S02 (Balcom & Moe Well): This well is located at 311½ Division Street, immediately north of the Grandview School Training Center, as shown on Map A. Drilled in 1944 to a depth of 1,154 feet and reconditioned in 2006, the well has a 12-inch casing from the surface to a depth of 253 feet. The well is equipped with an ITT Goulds 5-stage submersible turbine pump, Model 8RJHC, with a Franklin Electric submersible 100 hp, 3-phase, 460-volt, 3525 rpm motor, installed in 2006. The well's initial capacity was 690 gpm, but its current capacity is 268 gpm. A 2-inch air release valve and 8-inch butterfly valve are installed on the discharge piping as well as a 12-inch Ex 80 Series Insertion Electromagnetic flow meter.

The well is housed in a 17-foot by 22-foot concrete block pumphouse. Due to the presence of hydrogen sulfide gas in the well water, the well pump discharges through 12-inch piping to a 14-foot by 12-foot aeration building which cascades the water over a series of concrete steps. The water then travels to a wet well under the pump room from which it is pumped by a vertical turbine booster pump equipped with a 30 hp, three phase, 460-volt, 1,800 rpm US Motor. The booster pump discharge piping is equipped with a 2-inch air release valve, 8-inch gate valve, 8-inch check valve, and an 8-inch Ex 80 Series Insertion Electromagnetic flow meter. A Wallace Tiernan S10K gas chlorinator for disinfection, a Scaletron digital scale for measuring chlorine usage, and a Wallace Tiernan AcuTec 35 gas detection system is located within the same room as the booster pump and electrical equipment.

Source No. S03 (Velma Well): This well is located at 1206 Velma Avenue, immediately east of the City's 500,000-gallon elevated storage reservoir at Velma Avenue and King Street, as shown on Map A. Originally drilled in 1948 to a depth 1,362 feet, the well was rehabilitated in 2005 and reduced to a depth of 760 feet. The well has a 10-inch casing from the surface to a depth of 308 feet, and an 8-inch casing from 308 feet to 760 feet, equipped with a screen and filter pack. The well is equipped with an ITT Goulds vertical turbine 13-stage pump, Model 7CHC, powered by a 30 hp, 3-phase, 460-volt, 1750 rpm U.S. Motor, Model BF39. The well's initial capacity was 130 gpm, but its current capacity is 102 gpm. A 2-inch air release valve and a 4-inch gate valve are installed on the discharge piping as well as a 4-inch Ex 80 Series Insertion Electromagnetic flow meter.

The well is housed in a 15-foot by 22-foot concrete block pumphouse with a sheet metal roof. Within the pumphouse is a separate 5-foot by 6-foot chlorine room which houses a Capital Control Advance 200 series gas chlorinator for disinfection, a Scaletron digital scale for measuring chlorine usage, and a Wallace Tiernan AcuTec 35 gas detection system. A sand trap tank (size unknown) is located on the south side of the pumphouse. Associated with the sand trap tank are three 2-inch gate valves assembled in a manifold which connects to a 2-inch blow-out flush line with a 2-inch ball valve.

Source No. S06 (Euclid Well, previously known as Safeway Well): This well is located at 200 Euclid Road, on the west side of Euclid Road just north of the Union Pacific Railroad tracks (600 feet south of Bonnieview Road), as shown on Map A. Drilled in 1962 to a depth of 248 feet, the well has an 8-inch casing from the surface to a depth of 52 feet. The well is equipped with a submersible 30 hp, three phase, 440-volt, 3,450 rpm pump. The well's initial and current capacity is 30 gpm. This well is currently offline and only used as an emergency source. There are two 4-inch gate valves on the well's 4-inch discharge piping, and a 2-inch Hersey flow meter is located outside the east side of the well vault.

The well is housed in a 7-foot by 7-foot concrete block vault with a metal roof. There is no disinfection system associated with this well. This source is considered an emergency source well and is currently inactive.

Source No. S07 (Olmstead A Well, previously known as Springs Well): This well is located at 580 Olmstead Road, at the intersection of Stover Road and Olmstead Road along the Sunnyside Canal, as shown on Map A. Originally drilled in 1963 to a depth of 112 feet, the well has a 12-inch casing from the surface to a depth of 36 feet. The well is equipped with an ITT Goulds 2-stage submersible 20 hp, 460-volt pump (Model No. 7WAHC) with a design capacity of 245 gpm at 225 feet TDH. The pump was installed in 2004, and its current capacity is about 180 gpm. A 2-inch air release valve, two 4-inch butterfly valves, and a 6-inch gate valve are installed on the discharge piping as well as a 6-inch McCrometer flow meter. Water pumped from this well is blended with Source Well No. S16 to reduce nitrate levels below the maximum contaminant level. The well is currently offline due capacity issues with S16 and the inability to blend with another source to reduce nitrate levels below the MCL.

The well is housed in a 15-foot by 21-foot plywood and sheet metal pumphouse. Within the pumphouse is a separate 7-foot by 10-foot chlorine room which houses a Wallace Tiernan S10K chlorinator and a Wallace Tiernan AcuTec 35 gas detection system. This well shares the building with Source Well No. 16, and both are currently inactive due to high nitrate levels and blending issues (see section 3.2).

Source No. S08 (Appleway Well, previously known as Cohu Well): This well is located at 801 Appleway, along the east side of Appleway approximately 150 feet north of Hill Drive, as shown on Map A. Drilled in 1999 to a depth of 342 feet, the well has a 12-inch casing from the surface to a depth of 134 feet, and an 8-inch casing from 134 feet to 342 feet. The well was equipped with a Goulds model 5CLC 8-stage, 4-inch diameter pump, powered by a Franklin 15 hp, three phase, 460-volt, 3,450 rpm submersible motor (Model 2366139020). Due to biological build-up and subsequent pump failures, the pump has been removed from service and the well is inactive. The well's initial capacity was 93 gpm and its current capacity is unknown. A 1-inch air release valve, 4-inch check valve, and a 4-inch butterfly valve are installed on the discharge piping as well as a 4-inch McCrometer flow meter.

The well is housed in a 16-foot by 16-foot plywood and sheet metal pumphouse. Within the pumphouse is a separate 8-foot by 8-foot chlorine room which houses a Capital Control Advance 200 series chlorinator for disinfection, and a Wallace Tiernan AcuTec 35 gas detection system. This well is currently inactive.

Source No. S10 (North Willoughby Well): This well is located east of the North Elm Street and Willoughby Road intersection, adjacent to the City's 3.0 MG storage reservoir, as shown on Map A. Drilled in 1978 to a depth of 610 feet, the well has a 12-inch casing from the surface to a depth of 155 feet, and an 8-inch casing from 155 feet to 610 feet. The well is equipped with a Peabody Floway 10 DKM 9-stage deepwell turbine with a 60 hp, three phase, 460-volt, 1,800 rpm motor. The pump was installed in 1978 and the well's initial capacity was 525 gpm. The pump was reconditioned in 1992, and the well's current capacity is 315 gpm. A 1-inch air release valve, 6-inch check valve, and 6-inch butterfly valve are installed on the discharge piping as well as a McCrometer flow meter.

The well is housed in a 13-foot by 21-foot concrete block, plywood, and sheet metal pumphouse. Within the pumphouse is a separate 8-foot by 6-foot chlorine room which houses a Capital Control Advance 200 series gas chlorinator for disinfection, and a Wallace Tiernan AcuTec 35 gas detection system. The well is equipped with a Hercules auxiliary gas engine drive unit for emergency operation.

Source No. S11 (Highland Well): This well is located at 620 Highland Road, along the south side of Highland Road approximately 700 feet east of Elm Avenue, as shown on Map A. Drilled in 1999 (to replace an earlier "Highland" Well) to a depth of 250 feet, the well has a 16-inch casing from the surface to a depth of 165 feet, a 12-inch casing from the surface to a depth of 184 feet, and a 10-inch casing from 184 feet to 250 feet. The well is equipped with an ITT Goulds 7-stage, 4-inch diameter pump, Model 5CLC, powered by a 15 hp, 3-phase, 460-volt, 3,450 rpm Franklin submersible motor, Model 2366139020. The well's initial capacity was 107 gpm, and its current capacity is 42 gpm. A 1-inch air release valve, 4-inch check valve, and a 4-inch butterfly valve are installed on the discharge piping as well as a 4-inch Water Specialties flow meter.

The well is housed in a 16-foot by 16-foot plywood and sheet metal pumphouse. Within the pumphouse is a separate 8-foot by 8-foot chlorine room which houses a Wallace Tiernan S10K chlorinator for disinfection, a Scaletron digital scale for measuring chlorine usage, and a Capital Control Advance gas detector, model No. 1610.

Source No. S12 (Pecan A Well): This well is located on the south side of Pecan Road about 180 feet southeast of Butternut Road, as shown on Map A. Pecan A Well was originally drilled in 1976 and reconditioned and deepened in 1999. Drilled to a depth of 269 feet, the well has a 12-inch casing from the surface to a depth of 102 feet. The well is equipped with an ITT Goulds 10-stage, 4-inch diameter pump, Model 5CLC, powered by a 20 hp, 3-phase, 460-volt, 3450 rpm Franklin submersible motor, Model 2366149020. This well is currently inactive.

The well is housed in a 16-foot by 16-foot plywood and sheet metal pumphouse that it shares with Source No. S18. Within the pumphouse is a separate 8-foot by 8-foot chlorine room which houses a Wallace Tiernan S10K gas chlorinator, a Scaletron scale, and a Wallace Tiernan AcuTec 35 gas detection system. The well is equipped with a backup generator for emergency operation.

Source No. S13 (South Willoughby Well): This well is located at 601 N. Willoughby Road, along the east side of North Willoughby Road approximately 350 feet south of Well S10, as shown on Map A. Originally drilled in 1982 to a depth of 954 feet, the well was drilled deeper in 2007 to a depth of 1,200 feet. The well has a 16-inch casing from the surface to a depth of 683 feet and a 12-inch casing from 676 feet to a depth of 1,200 feet. The well is equipped with an ITT Goulds 6-stage, submersible pump, Model 14RJMC, with a design capacity of 1,770 gpm at 465 feet TDH, powered by a 250 hp, 3-phase, 460-volt, 1,730 rpm Hitachi motor, Model G2775501H. The motor was replaced with a 14-inch, 250 hp SME motor in 2021. The well's initial capacity was 1,980 gpm, but the current capacity is 1,000 gpm. A 2-inch air release valve, 12-inch check valve, and a 12-inch butterfly valve are installed on the discharge piping as well as a 12-inch electromagnetic flow meter.

The well is housed in a 38-foot 4-inch by 21-foot 7-inch concrete block and sheet metal pumphouse. Within the pumphouse is a separate 19-foot 4-inch by 10-foot chlorine room which houses a Wallace Tiernan chlorinator, a Scaletron digital scale, and a Wallace Tiernan AcuTec 35 gas detection system. The well is equipped with an Onan 1800 rpm auxiliary diesel generator for emergency operation.

Source No. S14 (Butternut Well): This well is located at 605 Butternut Road, at the east end of Butternut Road and Briar Court, as shown on Map A. Drilled in 1991 to a depth of 1,294 feet, the well has a 16-inch casing from the surface to a depth of 739 feet. The well is equipped with a Peerless 14 MC, 4-stage deep well turbine with a 200 hp, 3-phase, 460-volt, 1,800 rpm U.S. Motor. The pump was installed in 1991 and has a current capacity of 1,400 gpm.

Due to hydrogen sulfide gas being present in the well water, aeration treatment is performed. Water from the well is conveyed to the aeration room through a 12-inch ductile iron pipe equipped with a butterfly valve. Aeration is performed by cascading the water through a series of trays with ¼-inch diameter holes. Air is circulated across the trays and is exhausted through a roof fan. Following aeration, water flows into a wet well where it is chlorinated and then boosted into the City's distribution system. Two booster pumps are utilized for this task. The lead booster pump is a Peerless 14 MC, 3-stage deep well turbine pump with a 125 hp, 3-phase, 460-volt, 1,800 rpm U.S. Motor, with a design capacity of 1,500 gpm at 180 feet TDH. Since installation in 1991, this lead booster pump has produced 1,650 gpm. The lead booster pump discharge piping includes a 6-inch deep well pump control valve, an air release valve, a 12-inch check valve, and a 12-inch butterfly valve. The lag booster pump is operated by float switches in the wet well and is used to maintain a water level range. The lag pump is a Peerless 10 MA, 5-stage deep well turbine pump equipped with a 30 hp, 3-phase, 400-volt, 1,785 rpm U.S. Motor with a current capacity of 1,275 gpm. The lag booster pump 6-inch discharge piping includes an air release valve, a 6-inch check valve, and a 6-inch gate valve. Discharge piping from the two pumps combines to a single 12-inch discharge pipe which includes a 12-inch McCrometer flow meter.

The well is housed in a 52½-foot by 43¾-foot concrete block and plywood building which includes a 10-foot by 20½-foot chlorine room, a 10-foot by 20½-foot electrical control panel room, an aeration room, a storage room, and an aeration fan room. Within the chlorine room is a Wallace Tiernan V-100 rotameter tube operated by dual Wallace Tiernan S10K gas chlorinators equipped with an automatic switchover, dual Scaletron scales, and a Chlor Alarm gas detection system.

Source No. S16 (Olmstead B Well): This well is located at 380 Olmstead Road, at the intersection of Stover Road and Olmstead Road along the Sunnyside Canal, as shown on Map A. Drilled in 2004 to a depth of 623 feet, the well has a 16-inch casing from the surface to a depth of 230 feet, and a 12-inch casing from 219 feet to 623 feet. The well is equipped with an ITT Goulds 5-stage submersible 20 hp, 460-volt pump (Model No. 7RAHC) with a design capacity of 80 gpm at 510 feet TDH. The well's current capacity is about 40 gpm but drops to about 20 gpm if ran for an extended period, due to excessive drawdown. A ½-inch air release valve, 3-inch gate valve, and 2-inch flow control valve are installed on the discharge piping as well as a 3-inch Ex 80 Series Insertion Electromagnetic flow meter. Water pumped from this well is blended with Source Well No. S07 to reduce nitrate levels below the maximum contaminant level. Current drops in production capacity from this well have made blending with S07 not beneficial.

The well is housed in a 15-foot by 21-foot plywood and sheet metal pumphouse. Within the pumphouse is a separate 10-foot by 7-foot chlorine room which houses a Wallace Tiernan S10K chlorinator and a Wallace Tiernan AcuTec 35 gas detection system. This well shares the building with S07 and both are currently inactive due to high nitrate levels and blending issues (see section 3.2).

Source No. S17 (Ashael Curtis Well): This well is located on the east side of Ashael Curtis Road, approximately 100 feet south of Ware Road, as shown on Map A. Drilled in 2004 to a depth of 720 feet, the well has a 16-inch casing from the surface to a depth of 340 feet, and a 12-inch casing from 323 feet to 720 feet. The well pump motor was replaced in 2017 with a Grundfos 15-stage submersible 25 hp, 460-volt pump (Model No. 85S200-15) with a design capacity of 101 gpm at 510 feet TDH. The well's initial capacity was 180 gpm, but currently operates at 92 gpm. A 1-inch air release valve, a 4-inch check valve, and a 4-inch butterfly valve are installed on the discharge piping as well as a 4-inch McCrometer flow meter.

The well is housed in a 10-foot by 23-foot plywood and sheet metal pumphouse. Within the pumphouse is a separate 6-foot by 9-foot chlorine room which houses a Wallace Tiernan S10K gas chlorinator, a Scaletron digital scale for measuring chlorine usage, and a Wallace Tiernan AcuTec 35 gas detection system. In 2016, the well was upgraded with new telemetry equipment, pump, motor, and chemical treatment equipment.

Source No. S18 (Pecan B Well): This well is located on the south side of Pecan Road about 180 feet southeast of Butternut Road, as shown on Map A. Drilled in 2006 to a depth of 495 feet, the well has a 12-inch casing from the surface to a depth of 304 feet, a 10-inch casing from 270 feet to a depth of 495 feet. The well is equipped with an ITT Goulds 4-stage submersible turbine pump, Model 7WAHC, powered by a 40 hp, 3-phase, 460-volt, 3,525 rpm Franklin submersible motor. The well's initial capacity was 180 gpm, but the current capacity is 70 gpm. A 2-inch air release valve, 4-inch check valve, and a 4-inch butterfly valve are installed on the discharge piping as well as a 4-inch Water Specialties flow meter. The well is equipped with an Onan 1,800 rpm auxiliary diesel generator for emergency well operation.

The well is housed in a 16-foot by 16-foot plywood and sheet metal pumphouse that it shares with Source No. S12. Within the pumphouse is a separate 8-foot by 8-foot chlorine room which houses a Wallace Tiernan S10K gas chlorinator, a Scaletron scale, and a Wallace Tiernan AcuTec 35 gas detection system.

A summary of Grandview's source wells, including well depth, current static water levels, and capacity is provided in Table 3-1. Copies of the well logs, susceptibility assessment surveys, and protective well covenants are included in CHAPTER 10.

TABLE 3-1 GRANDVIEW SOURCE WELL INFORMATION SUMMARY

	West Main	Balcom & Moe	Velma	Euclid	Olmstead A	Apple-way	North Willoughby	Highland	Pecan A	South Willoughby	Butternut	Olmstead B	Ashael Curtis	Pecan B
Source Number	S01	S02	S03	S06	S07	S08	S10	S11	S12	S13	S14	S16	S17	S18
Date Drilled	1977	1944	2005	1962	1963	1999	1978	1999	1999	2007	1991	2004	2004	2006
DOE Well Tag ID	AEP517	AEP522			AAS263	AAS279	AAS245	AAS240	AAS282		AEP519	AAS278	AAS242	AAS161
Ground Elevation (ft. above msl)	806	804	831	795	812	814	855	818	779	841	791	818	805	779
Depth (ft. BGS)	247	1,154	760	248	112	342	610	250	269	1,200	1,294	623	720	496
Casing Diameter / Depth (ft. BGS)	10”/212 8”/247	12”/243 10”/1,153	10”/350 8”/760	16”/316 12”/376 10”/430	12”/36 10”/110	12”/134 8”/342	12”/155 8”/610	16”/165 12”/184 10”/250	12”/102 10”/269	16”/683 12”/954	16”/739 12”/129	16”230 12”/623	16”/340 12”/720	12”/304 10”/495
Original Static Water Level (ft. BGS)	42	200	181	48	Artesian	85	17	140	31	187	159	Artesian	92	69
2021 Static Level (ft. BGS)	157	261	150	183	6	90	55	74	N/A	61	127	9	147	191
Initial Flow & Drawdown			559 gpm @ 136 ft.	240 gpm @ 175 ft.	325 gpm @ 70 ft.	93 gpm @ 11 ft.	573 gpm @ 189 ft.	550 gpm @ 50 ft.	155 gpm @ 90 ft.	2,000 gpm @ 349 ft.	1,550 gpm @ 83 ft.	80 gpm @ 269 ft.	180 gpm @ 353 ft.	340 gpm @ 281 ft.
Original/Design Capacity (gpm)	290	690	130	30	245	93	525	107	N/A	1,980	1,500	80	180	180
2021 Capacity (gpm)	135	268	102	30 (offline)	180 (offline)	0 (inactive)	315	42	0 (inactive)	1,000	1,275	20 (offline)	92	70

3.1.2 Water Treatment

Grandview provides no treatment of its water supply sources other than chlorine disinfection, except for Balcom & Moe (S02) and Butternut (S14). Due to the presence of methane and hydrogen sulfide gas, water from these two sources is pumped through aeration treatment facilities located at each of these two wells prior to pumping into the City's distribution system.

Source well S14 (Butternut) is one of the City's primary source wells. Capacity has decreased from about 1,500 gpm to 1,275 gpm and the well has had signs of biofouling within the well and aerators because of bacterial growth within the well. In 2020, water samples were taken, and a complete well profile analysis was performed. Recommendations from the well analysis include chemical and mechanical cleaning of the well to address the bacterial issue

Until 2007, water from South Willoughby (S13) was also aerated due to the presence of hydrogen sulfide gas. In 2007, the South Willoughby well was drilled deeper and the pumphouse rebuilt, eliminating the aeration facilities. However, discharge piping was configured in a manner to allow for future aeration if necessary. Methane gas has been discovered in the well since being drilled deeper. Currently, methane gas is released to the atmosphere as discharge piping is plumbed directly to the standpipe reservoir.

3.1.3 Storage Facilities

The City's water storage facilities consist of two painted steel reservoirs with a total storage capacity of 3.561 million gallons (MG). The usable storage volume is 2.473 MG due to service pressure requirements and pump shutoff controls being set below reservoir overflow levels. Water is pumped from all wells directly into the water system pipe network (except for Source S10 and Source S13), supplying the two reservoirs. The overflow elevation of both reservoirs is 941.6 feet above sea level. Capacity of the two reservoirs above the 30-psi static pressure level is 1.618 MG and 2.473 MG above the 20-psi static pressure level.

The City's 3.017 MG steel standpipe reservoir is located east of the North Elm Street and Willoughby Road intersection. The reservoir is 77 feet in diameter and 88 feet in height, and is equipped with access manholes at the base, an access hatch at the top, a screen vent cap at the top, an overflow pipe which discharges to the ground surface, and a 16-inch inlet/outlet pipe.

The reservoir interior was sandblasted and repainted with TNEMEC Epoxy System 20-1 in May 1989. Modifications to the exterior ladder landing at the top of the standpipe were included during the interior painting contract, as was the addition of hand railing to the roof vent. The exterior was painted in 1995, and a City logo placed on the south side. The reservoir was last inspected by a diver in 2019. The exterior coating in weathered and the interior coating is showing signs of severe corrosion. The tank interior and exterior need to be recoated in the next 5 years.

The City's 0.544 MG elevated storage reservoir was constructed in 1950 and is located at the intersection of Velma Avenue and King Street. The elevated reservoir is 51 feet in diameter and 109 feet to the top with the inlet/outlet pipe extending from the center column. The steel storage tank is 37 feet in height with the bottom elevation 906 feet above sea level. The reservoir is equipped with an access hatch and screened vent cap at the top.

The 0.544 MG elevated storage reservoir was rehabilitated in 2007. The rehabilitation work included epoxy coating of the reservoir interior and exterior, replacement of the reservoir roof framing, replacement of the exterior overflow (piped to within ten feet of the ground where it discharges onto a splash plate), and installation of SAF-T-Climb safety equipment to the reservoir's exterior and interior ladders.

Table 3-2 provides a summary of the City's reservoir characteristics.

TABLE 3-2 GRANDVIEW RESERVOIR INFORMATION		
	3.0 MG Reservoir	0.5 MG Reservoir
Type	Standpipe	Elevated Tank
Material	Steel	Steel
Date Constructed	1977	1950
Tank Height	88 feet	37 feet
Diameter	77 feet	51 feet
Base Elevation above mean sea level (msl)	855.0 feet	834.0 feet
Floor Elevation (above msl)	855.0 feet	906.0 feet
Overflow Elevation (above msl)	941.6 feet	941.6 feet
Total Storage Capacity	3,017,000 gallons	544,000 gallons
Storage Capacity Above 30 psi	1,125,059 gallons	493,554 gallons
Storage Capacity Above 20 psi	1,929,668 gallons	543,979 gallons

See Figure 3-3 Reservoir Storage Levels, for a schematic representation of reservoir storage level elevations for the year 2022 and those anticipated for 2042.

3.1.4 Telemetry Control System

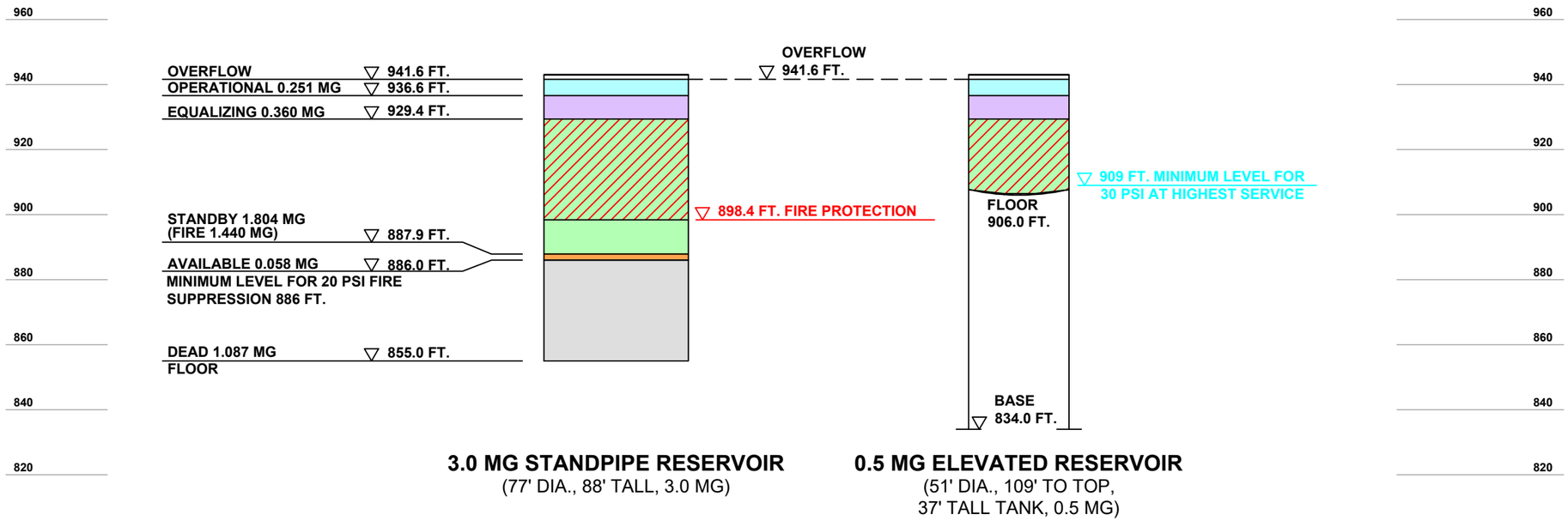
The City of Grandview's water system includes a SCADA (Supervisory Control and Data Acquisition) System for controlling and monitoring portions of the water production and distribution system. The SCADA system utilizes Allen Bradley Micrologix 1200 PLCs at both reservoir sites and at several well sites. The Master PLC, located at City Shop, is an Allen Bradley SLC 5/05 PLC. Sites having telemetry include:

0.5 MG Elevated Tank Reservoir
3.0 MG Standpipe Reservoir
Source S03 Velma
Source S07 Olmstead A
Source S10 North Willoughby
Source S13 South Willoughby
Source S14 Butternut
Source S16 Olmstead B
Source S17 Ashael Curtis
Source S18 Pecan B

The PLC at each of these remote sites communicates as a DFI half-duplex stage using Freewave FGR 115 900MHz unlicensed spread spectrum radios to the Master PLC at the City Shop. The master PLC connects via an Ethernet LAN to a Dell workstation computer (the HMI computer) running Wonderware Intouch version 2014 R2 HMI software. The Wonderware application provides a graphical interface for the SCADA system that allows operators to monitor the system operation and change operational parameters such as start/stop setpoints. WIN-911 version 7.16 is also installed on the Dell workstation computer and is intended to be used as a software alarm dialer. Operators can use a laptop computer to remotely access the HMI computer over a secure SSH connection to monitor the SCADA system during non-business hours.

The HMI computer utilizes Wonderware's DAS ABTCP Driver as the IO server for the HMI computer to communicate with the Master PLC. Data points requested by the Wonderware Intouch HMI application are retrieved by the DAS ABTCP Driver from the Master PLC and provided to the Intouch application. Setpoints entered by system operators at the HMI are communicated by the DAS ABTCP server to the Master PLC.

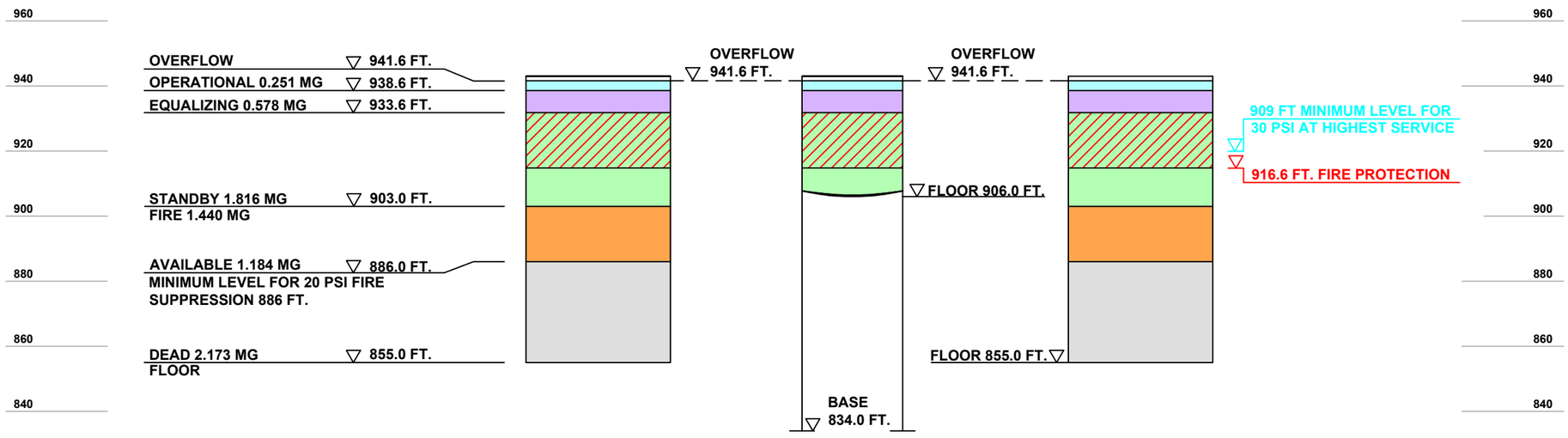
YEAR 2022 STORAGE LEVELS



3.0 MG STANDPIPE RESERVOIR
(77' DIA., 88' TALL, 3.0 MG)

0.5 MG ELEVATED RESERVOIR
(51' DIA., 109' TO TOP,
37' TALL TANK, 0.5 MG)

YEAR 2042 STORAGE LEVELS



3.0 MG STANDPIPE RESERVOIR
(77' DIA., 88' TALL,
1.929 MG ABOVE 20 PSI LEVEL)

0.5 MG ELEVATED RESERVOIR
(51' DIA., 109' TO TOP,
37' TALL TANK, 0.5 MG ABOVE
20 PSI LEVEL)

FUTURE 3.0 MG STANDPIPE RESERVOIR
(77' DIA., 88' TALL,
1.929 MG ABOVE 20 PSI LEVEL)

CITY OF GRANDVIEW

Water System Plan Update

RESERVOIR STORAGE LEVELS

LEGEND

- OPERATIONAL STORAGE
- EQUALIZING STORAGE
- STANDBY STORAGE
- FIRE SUPPRESSION STORAGE (NESTED WITHIN STANDBY STORAGE)
- AVAILABLE STORAGE
- DEAD STORAGE

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Yakima, WA 98902
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FIGURE 3-3

The Master PLC makes control decisions such as starting and stopping pumps based on reservoir levels and the operator adjustable setpoints.

The City of Grandview's existing SCADA system is capable of being expanded to include additional well and/or reservoir sites. The current telemetry control settings for low- and high-level alarms and for operating the various well pumps, based on water levels in both reservoirs, is shown in Table 3-3.

TABLE 3-3 EXISTING TELEMETRY CONTROL SETTINGS BASED ON RESERVOIR LEVELS

Source Well	Pump On	Pump Off	Control Reservoir
S03 Velma	74 feet	80 feet	3.0 MG
S07 Olmstead A	75 feet	80 feet	3.0 MG
S13 South Willoughby	75 feet	81 feet	3.0 MG
S14 Butternut	92.5 feet	106 feet	0.5 MG
S16 Olmstead B	75 feet	80 feet	3.0 MG
S17 Ashael Curtis	75 feet	81 feet	3.0 MG
S18 Pecan B	76 feet	81 feet	3.0 MG
Reservoir	Low Level Alarm	High Level Alarm	-
0.544 MG Elevated Tank	87.3 feet	105.6 feet	-
3.017 MG Standpipe	50.0 feet	87.9 feet	-

3.1.5 Transmission and Distribution Systems

The City's existing transmission and distribution system along with water main sizes, valve, and fire hydrant locations are shown on Figure 3-1 and Map A included in CHAPTER 10. Most line sizes within the system are six inches in diameter or larger. Most the City's water mains are constructed of either ductile iron, cast iron pipes, or PVC, and most are looped. An inventory of the total length of Grandview's water distribution system piping, including the length and percentage of each diameter of pipe is presented in Table 3-4.

TABLE 3-4 WATER DISTRIBUTION SYSTEM PIPE SIZE SUMMARY		
Pipe Diameter (inches)	Length (feet)	Percent of Total
< 2	2,125	0.81%
2	7,521	2.88%
3	557	0.21%
4	8,426	3.23%
6	85,710	32.81%
8	60,536	23.17%
10	26,864	10.28%
12	44,186	16.92%
14	4,227	1.62%
16	21,071	8.07%
TOTAL	261,223	100.0%

3.1.6 Asset Condition Assessment Summary

The age and condition of the City's major water system assets is summarized in Table 3-5. This information is valuable in evaluating and timing of future maintenance improvements necessary to maintain a high level of system reliability.

3.1.6.1 Facility Reliability

Pumps will continue to be maintained as discussed in CHAPTER 6. Recommended O&M improvements related to well pump rehabilitation and replacement will be as described in CHAPTER 8.

TABLE 3-5 ASSET CONDITION ASSESSMENT SUMMARY						
Water System Component/Name, Capacity/Size, and Type	Date Originally Const.	Expected Useful Life (Years)	Date of Last Service/ Replacement	Critical Number (1 to 5)***	Condition Rating (1 to 10)*	Expected Remaining Useful Life (Years)
Source Well S01	1977	30		2	9	0
Pumphouse	2001	50		3	6	30
Franklin 50 hp, 3-phase, 460 volt submersible pump	2007	15		2	7	1
Telemetry System	2005	10		2	8	0
Onan 1,800 rpm backup diesel generator	2007	15		2	8	1
Source Well S02	1944	30	2006	2	7	15
Pumphouse	1944	50	2006	3	7	35
Aeration Bldg	2006	50		1	7	35
Wet well pump: 30 hp, three phase, 460 volt, 1,800 rpm US Motor wet well pump	2006	15		2	8	0
ITT Goulds 5-stage Submersible Vertical Turbine Booster Pump with Franklin Electric 100 hp, 460V, 3-phase, 3,525 rpm motor	2006	15		2	7	0
Ex 80 Series Electromagnetic Flow Meter	2006	15		3	8	0
Source Well S03	1948	30	2005	2	7	14
Pumphouse	2005	50		3	7	34
ITT Goulds lineshaft 13-stage pump, Model 7CHC, powered by a 30 hp, 3-phase, 460 volt, 1750 rpm U.S. Motor, Model BF39	2005	15		2	6	0
Ex 80 Series Insertion Electromagnetic flow meter	2005	15		3	8	0
Source Well S06 (Inactive)	1962	30		2	10	0
Pumphouse	1962	50		3	10	0
Submersible 30 hp, three phase, 440 volt, 3,450 rpm pump	1962	15		2	10	0
2" Hersey flow meter	1962	15		2	10	0
Source Well S07	1963	30		2	6	0
Pumphouse	1963	50	2004	3	6	0
ITT Goulds 2-Stage submersible 20 hp, 460 volt pump	2004	15		2	8	0
McCrometer flow meter	2004	15		2	7	0
Source Well S08 (Inactive)	1999	30		3	10	8
Pumphouse	1999	50		3	10	28
Goulds model 5CLC 8-Stage, 4-inch diameter pump powered by a Franklin 15 hp, three phase, 460 volt, 3,450 rpm submersible motor (pump removed)	1999	15		3	10	0
Source Well S10	1978	30		2	7	0
Pumphouse	1992	50		3	8	21
Peabody Floway 10 DKM 9-stage deepwell turbine with a 60 hp, three phase, 460 volt, 1,800 rpm motor	1978	15	1992	2	9	0
Hercules gas engine-drive generator	1992	15		1	8	0
Telemetry System	2005	10		1	8	0
McCrometer flow meter	1992	15		1	8	0
Source Well S11	1999	30		2	8	8
Pumphouse	1999	50		3	7	28
ITT Goulds 7-stage, 4-inch diameter pump, Model 5CLC, powered by a 15 hp, 3-phase, 460 volt, 3,450 rpm Franklin submersible motor	1999	15		2	8	0
Water Specialties flow meter	1999	15		2	7	0
Source Well S12 (Inactive)	1976	30	1999	3	10	8
Pumphouse	1976	50	1999	3	10	28
ITT Goulds 10-stage, 4-inch diameter pump, Model 5CLC, powered by a 20 hp, 3-phase, 460-volt, 3450 rpm Franklin submersible motor	1976	15	1999	2	10	0
Backup Generator	1976	15		1	10	0
Source Well S13	1982	30	2007	2	9	16
Pumphouse	2007	50		2	5	36
ITT Goulds 6-stage, submersible pump, Model 14RJMC, powered by a 250 hp, 3-phase, 460-volt, 1,730 rpm SME motor	2021	15	2021	1	2	15
E+H Electromagnetic flow meter	2021	15	2021	1	2	15
Onan 1,800 rpm diesel backup generator	2007	15		1	7	1
Source Well S14	1991	30		2	6	0
Pumphouse	1991	50		3	7	20
Peerless 14 MC, 4-stage deepwell turbine with a 200 hp, 3-phase, 460-volt, 1,800 rpm U.S. Motor	1991	15		2	8	0
Aeration room with cascading aerators	1991	60		1	8	30
Wet well lead booster pump: Peerless 14 MC, 3-stage deepwell turbine pump with a 125 hp, 3-phase, 460-volt, 1,800 rpm U.S. Motor	1991	15		2	8	0
Wet Well lag pump: Peerless 10 MA, 5-stage deepwell turbine pump equipped with a 30 hp, 3-phase, 400-volt, 1,785 rpm U.S. Motor	1991	15		2	8	0
Source Well S16	2004	30		2	7	13
Pumphouse	2004	50		3	9	33
ITT Goulds 5-stage submersible 20 hp, 460-volt pump, Model No. 7RAHC	2004	15		2	8	0
Ex 80 Series Insertion Electromagnetic flow meter	2004	15		2	8	0
Source Well S17	2004	30		2	7	13
Pumphouse	2004	50	2004	3	6	33
Grundfos 15-stage submersible 25 hp, 460-volt pump (Model No. 85S200-15)	2017	15	2017	2	4	11
Telemetry Equipment	2004	6	2004	1	8	0

TABLE 3 5 ASSET CONDITION ASSESSMENT SUMMARY (continued)

Water System Component/Name, Capacity/Size, and Type	Date Originally Const.	Expected Useful Life (Years)	Date of Last Service/ Replacement	Critical Number (1 to 5)***	Condition Rating (1 to 10)*	Expected Remaining Useful Life (Years)
Source Well S18	2006	30		2	8	15
Pumphouse	2006	50		3	7	35
ITT Goulds 4-stage submersible turbine pump, Model 7WAHC, powered by a 40 hp, 3-phase, 460-volt, 3,525 rpm Franklin submersible motor	2006	15		2	9	0
Water Specialties flow meter	2006	15		2	9	0
Onan 1,800 rpm Diesel Generator	2006	15		1	9	0
3.0 MG Reservoir	1977	50	1995	1	8	24
0.5 MG Reservoir	1950	50	2007	1	8	36
Telemetry Control System	2016	10		1	6	5
Primary PLC: Allen Bradley SLC 5/05	2016	10		1	6	5
Common Site PLC: Allen Bradley Micrologix 1200	2016	10		1	7	5
Wonderware Intouch version 2014 R2 HMI software with Wonderware's DAS ABTCP Driver	2016	5		1	6	0

* Condition ratings are based on recommendations in DOH Water System Planning Guidebook, with a rating of 1 equal to good/expected condition and a rating of 10 equal to unserviceable (may need replacement) condition.
** Typical equipment life expectancy from EPA publication EPA 816-R-03-016 Sept. 2003.
*** Critical number designation of 1 means system would essentially shut down if component failed, and no backup is available. Ex: well failure on a single well system without a backup. Critical number of 4 means failure of asset would cause inconvenience, but not cause harm to the system. Critical number of 5 means the asset's condition is not well known and should be later evaluated.

3.2 WATER QUALITY

A public water utility must supply safe and aesthetically pleasing water to its customers. However, source waters of most water utilities vary in the types and amounts of impurities which have been acquired during their passage through atmosphere, ground surfaces, or underground strata. To assure that all drinking waters maintain a standard level of quality, acceptable limits of contaminants have been established in WAC Chapter 246-290, *Group A Public Water Supplies*, March 30, 2012, specifically WAC 246-290-310 effective January 4, 2010.

These standards of acceptability establish "maximum contaminant levels" (MCLs) and "Maximum Residual Disinfectant Levels" (MRDLs) for bacteriological, inorganic chemical and physical, and other elements. The Regulations also set forth procedures to be followed if the MCL limits are exceeded.

The City of Grandview monitors its system's water quality in accordance with the requirements of WAC 246-290-300, and 246-290-310. Follow-up action, if required, is completed in accordance with the requirements of WAC 246-290-320 and the Groundwater Rule (GWR). Bacteriological monitoring is performed at ten (10) locations within the water system in accordance with the City's *Coliform Monitoring Plan*. Lead and copper distribution system monitoring is completed in accordance with the City's lead and copper monitoring program. Inorganic chemical (IOC), volatile organic chemical (VOC), synthetic organic chemical (SOC), and radionuclide testing are performed on the City's source wells. All source wells are tested individually, though some sources are blended prior to entering the distribution system. Blending occurs at Sources S07 Olmstead A and S16 Olmstead B, and at Sources S10 North Willoughby and S13 South Willoughby. These source wells are plumbed with isolation valves to allow individual and blended testing.

3.2.1 Water Source Sampling and Testing

Inorganic Chemical (IOC) Monitoring: Water quality monitoring for primary IOCs, secondary IOCs and physical parameters is required from each source generally once every compliance cycle. Compliance cycles are nine years, per 40 CFR 141.23. Grandview collects water samples for IOCs and physical parameters prior to introduction into the distribution system chlorination at each well.

Certain chemical characteristics must be monitored more frequently than the general monitoring requirements. For example, Nitrate and Nitrite must be monitored annually. Other chemical characteristics monitoring requirements may be waived by the DOH.

Results of Grandview's latest source IOC and physical analysis, summarized in Table 3-6 and Table 3-7, show the City in compliance with State standards. Copies of the most recent test results for the source wells are provided in CHAPTER 10. Additional inorganic testing of wells occurred in previous years. Copies of these test results are furnished in CHAPTER 10, and are shown in Table 3-6 through Table 3-17. The results indicate that water quality in each of the wells has not significantly changed over time.

TABLE 3-6 INORGANIC (PRIMARY SUBSTANCES) CHEMICAL ANALYSIS SUMMARY

Chemical or Physical Property	MCL (mg/l)	S01 West Main 8/10/10	S02 Balcom & Moe 4/15/09	S03 Velma 4/20/10	S06 Euclid (Emergency Source)	S07 Olmstead A 9/11/07	S10 North Willoughby 9/11/07	S11 Highland 4/17/07	S13 South Willoughby (Emergency Source) 9/8/10	S14 Butternut 11/11/09	S16 Olmstead B 8/10/10	S18 Pecan B 7/23/13
Antimony (Sb)	0.0060	<0.005	<0.005	<0.005	---	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0001
Arsenic (As)	0.010	0.005	0.0028	<0.002	---	0.0048	0.0026	0.0022	<0.002	<0.002	0.0034	0.00288
Barium (Ba)	2.0	0.047	0.060	0.061	---	0.053	0.069	0.066	<0.002	0.003	0.049	0.01267
Beryllium (Be)	0.004	<0.0002	<0.0002	<0.0002	---	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0001
Cadmium (Cd)	0.005	<0.0003	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0001
Chromium (Cr)	0.1	<0.0047	<0.0047	<0.0047	---	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	0.00089
Copper (Cu)*	1.3	<0.002	0.0132	<0.002	---	<0.002	<0.002	<0.002	<0.002	0.00295	<0.002	0.00295
Cyanide (HCN)	0.2	<0.01	<0.01	<0.01	---	<0.01	<0.01	<0.01	<0.01	<0.0500	<0.01	<0.01
Fluoride (F)	4.0	0.48	0.41	0.45	---	0.45	0.35	0.38	2.19	<0.2000	0.45	0.47
Lead (Pb)*	0.015	<0.0005	<0.0005	0.0006	---	<0.0005	<0.0005	<0.0005	<0.0005	<0.0020	<0.0005	0.00015
Mercury (Hg)	0.0020	<0.0003	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0005	<0.0003	<0.0002
Nickel (Ni)	0.10	<0.01	<0.01	<0.01	---	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0001
Nitrate (as N)	10.0	6.80	5.06	4.73	---	7.48	9.04	6.58	<0.05	<0.07	6.28	2.56
Nitrite (as N)	1.0	<0.05	<0.05	<0.05	---	<0.05	<0.05	<0.05	<0.05	<0.07	<0.05	<0.05
Selenium (Se)	0.050	<0.005	<0.005	<0.005	---	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.00207
Sodium (Na)*	20	18.8	24.6	17.7	---	22.6	16.9	16.2	85.1	91.0	24.9	15.9
Thallium (Tl)	0.0020	<0.001	<0.001	<0.001	---	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	0.00014

* No DOH established MCL. Represents EPA established “action levels” for lead and copper, and recommended level for sodium.

TABLE 3-7 INORGANIC (SECONDARY SUBSTANCES) CHEMICAL ANALYSIS SUMMARY												
Chemical or Physical Property	MCL (mg/l)	S01 West Main 8/10/10	S02 Balcom & Moe 4/15/09	S03 Velma 4/20/10	S06 Euclid (Emergency Source)	S07 Olmstead A 9/11/07	S10 North Willoughby 9/11/07	S11 Highland 4/17/07	S13 South Willoughby (Emergency Source) 9/8/10	S14 Butternut 11/11/09	S16 Olmstead B 8/10/10	S18 Pecan B 7/23/13
Chloride (Cl)	250.0	16.6	19.4	12.5	---	16.6	21.9	24.1	16.1	23.1	15.3	9.83
Fluoride (F)	2.0	0.48	0.41	0.45	---	0.45	0.35	0.38	2.19	0.97	0.45	0.47
Iron (Fe)	0.3	<0.0097	0.120	0.0135	---	0.0358	0.053	<0.0097	<0.0097	0.0311	<0.0097	<0.0097
Manganese (Mn)	0.05	<0.002	0.0094	<0.002	---	<0.002	0.0024	<0.002	<0.002	<0.002	0.0024	0.00023
Silver (Ag)	0.1	<0.0047	<0.0047	<0.0047	---	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0001
Sulfate (SO_4)	250.0	43.4	50.9	45.4	---	49.1	65.4	69.5	<0.1	1.0	47.4	29.7
Zinc (Zn)	5.0	0.0146	<0.02	<0.02	---	<0.02	0.031	<0.02	<0.005	<0.02	0.0205	0.00138
Color	15 Color Units	<4	<4	<4	---	<4	<4	<4	<4	<4	<4	<4
Specific Conductivity	700 umhos/cm	494	531	427	---	591	564	564	376	393	551	352
Total Dissolved Solids (TDS)	500	364	366	298	---	368	372	400	244	304	374	202

Table 3-8, Table 3-9, Table 3-10, Table 3-11, Table 3-12, Table 3-13, Table 3-14, Table 3-15, Table 3-16, and Table 3-17, present both the latest, and previously conducted IOC analysis test results for each primary source well.

TABLE 3-8 INORGANIC CHEMICAL ANALYSIS RESULTS FOR WEST MAIN (S01)

Chemical or Physical Characteristics	MCL (mg/l)	5/14/2019	8/10/2010	8/13/2007	8/11/2004	12/23/1997
Primary Substances						
Antimony (Sb)	0.006	0.0001	<0.005	<0.0050	<0.0050	<0.0050
Arsenic (As)	0.01	0.0035	0.005	0.0044	0.0043	<0.0100
Barium (Ba)	2	0.0477	0.047	0.047	0.046	<0.1000
Beryllium (Be)	0.004	0.0001	<0.0002	<0.0002	<0.0002	<0.0030
Cadmium (Cd)	0.005	0.0001	<0.0003	<0.0003	<0.0003	0.002
Chromium (Cr)	0.1	0.0023	<0.0047	<0.0047	<0.0047	<0.0100
Copper (Cu)*	1.3	0.0005	<0.002	<0.0020	<0.0020	<0.2000
Cyanide (HCN)	0.2	0.01	<0.01	<0.0100	<0.0100	<0.0500
Fluoride (F)	4	0.32	0.48	0.42	0.45	0.5
Lead (Pb)*	0.015	0.0001	<0.0005	<0.0005	<0.0005	0.014
Mercury (Hg)	0.0020	0.0002	<0.0003	<0.0003	<0.0003	<0.0005
Nickel (Ni)	0.1	0.0017	<0.01	<0.0100	<0.0100	<0.0400
Nitrate (as N)	10	7.32	6.8	6.68	6.36	6.6
Nitrite (as N)	1	0.05	<0.05	<0.0500	<0.0500	---
Selenium (Se)	0.05	0.0015	<0.005	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	19.6	18.8	20	19.4	20
Thallium (Tl)	0.002	0.0006	<0.001	<0.0010	<0.0010	<0.0020
Secondary Substances						
Chloride (Cl)	250	16.8	16.6	14.8	15.2	<20.0000
Fluoride (F)	2	0.32	0.48	0.42	0.45	0.5
Iron (Fe)	0.3	0.0097	<0.0097	0.0178	0.0275	<0.1000
Manganese (Mn)	0.05	0.0003	<0.002	<0.0020	<0.0020	<0.0100
Silver (Ag)	0.1	0.0001	<0.0047	<0.0047	<0.0047	<0.0100
Sulfate (SO_4)	250	45.3	43.4	41.1	41.8	41
Zinc (Zn)	5	0.0062	0.0146	<0.0200	<0.0200	<0.2000
Color	15 Color Units	4	<4	<4.0000	<4.0000	<20.0000
Specific Conductivity	700 umhos/cm	534	494	249	491	---
Total Dissolved Solids (TDS)	500	312	364	342	326	---

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-9 INORGANIC CHEMICAL ANALYSIS RESULTS FOR BALCOM & MOE (S02)						
Chemical or Physical Characteristics	MCL (mg/l)	4/3/2018	4/15/2009	7/17/2007	7/1/2003	10/17/2000
Primary Substances						
Antimony (Sb)	0.006	0.0001	<0.005	<0.0050	<0.0050	<0.0050
Arsenic (As)	0.01	0.0026	0.0028	<0.0020	0.0022	<0.0100
Barium (Ba)	2	0.0627	0.06	0.026	0.044	<0.1000
Beryllium (Be)	0.004	0.0001	<0.0002	<0.0002	<0.0002	<0.0030
Cadmium (Cd)	0.005	0.0001	<0.0003	<0.0003	<0.0003	<0.0020
Chromium (Cr)	0.1	0.002	<0.0047	<0.0047	<0.0047	<0.0100
Copper (Cu)*	1.3	0.0019	0.0132	0.0158	<0.0025	<0.2000
Cyanide (HCN)	0.2	0.01	<0.01	<0.0100	<0.0100	<0.0500
Fluoride (F)	4	0.44	0.41	1.2	0.61	0.87
Lead (Pb)*	0.015	0.0002	<0.0005	<0.0005	<0.0005	<0.0020
Mercury (Hg)	0.0020	0.0002	<0.0003	<0.0003	<0.0003	<0.0005
Nickel (Ni)	0.1	0.0003	<0.01	<0.0100	<0.0100	<0.0400
Nitrate (as N)	10	5.46	5.06	0.32	2.66	<0.5000
Nitrite (as N)	1	0.07	<0.05	0.07	<0.0700	<0.5000
Selenium (Se)	0.05	0.002	<0.005	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	25	24.6	56.5	28.8	56
Thallium (Tl)	0.002	0.0014	<0.001	<0.0010	<0.0010	<0.0020
Secondary Substances						
Chloride (Cl)	250	18.5	19.4	16.1	16.1	<20.0000
Fluoride (F)	2	0.44	0.41	1.2	0.61	0.87
Iron (Fe)	0.3	0.0392	0.12	0.113	0.0128	<0.1000
Manganese (Mn)	0.05	0.005	0.0094	0.0246	0.0022	0.041
Silver (Ag)	0.1	0.0001	<0.0047	<0.0047	<0.0047	<0.0100
Sulfate (SO_4)	250	44.6	50.9	11.7	50	14
Zinc (Zn)	5	0.0037	<0.02	<0.0200	<0.0200	1.7
Color	15 Color Units	4	<4	<4.0000	<4.0000	<5.0000
Specific Conductivity	700 umhos/cm	533	531	408	484	410
Total Dissolved Solids (TDS)	500	344	366	272	302	---
* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.						

TABLE 3-10 INORGANIC CHEMICA ANALYSIS RESULTS FOR VELMA (S03)					
Chemical or Physical Characteristics	MCL (mg/l)	4/23/2019	4/20/2010	4/17/2007	7/1/2003
Primary Substances					
Antimony (Sb)	0.006	0.0001	<0.005	<0.0050	<0.0050
Arsenic (As)	0.01	0.0028	<0.002	0.0028	0.0029
Barium (Ba)	2	0.0544	0.061	0.06	0.044
Beryllium (Be)	0.004	0.0001	<0.0002	<0.0002	<0.0002
Cadmium (Cd)	0.005	0.0001	<0.0003	<0.0003	<0.0003
Chromium (Cr)	0.1	0.0028	<0.0047	<0.0047	<0.0047
Copper (Cu)*	1.3	0.0012	<0.002	0.0038	<0.0020
Cyanide (HCN)	0.2	0.01	<0.01	<0.0100	<0.0100
Fluoride (F)	4	0.3	0.45	0.43	0.51
Lead (Pb)*	0.015	0.0005	0.0006	0.0024	<0.0005
Mercury (Hg)	0.0020	0.0002	<0.0003	<0.0003	<0.0003
Nickel (Ni)	0.1	0.0001	<0.01	<0.0100	<0.0100
Nitrate (as N)	10	4.65	4.73	4.51	3.95
Nitrite (as N)	1	0.05	<0.05	<0.0500	<0.0700
Selenium (Se)	0.05	0.0022	<0.005	<0.0050	<0.0050
Sodium (Na)*	20	16	17.7	16.1	16.6
Thallium (Tl)	0.002	0.0003	<0.001	<0.0020	0.0014
Secondary Substances					
Chloride (Cl)	250	13.8	12.5	13.2	10.2
Fluoride (F)	2	0.3	0.45	0.43	0.51
Iron (Fe)	0.3	0.0104	0.0135	0.0112	<0.0097
Manganese (Mn)	0.05	0.0008	<0.002	<0.0020	<0.0020
Silver (Ag)	0.1	0.0002	<0.0047	<0.0047	<0.0047
Sulfate (SO_4)	250	45.1	45.4	42.6	46.2
Zinc (Zn)	5	0.0088	<0.02	<0.0200	<0.0200
Color	15 Color Units	4	<4	<4.0000	<4.0000
Specific Conductivity	700 umhos/cm	444	427	415	387
Total Dissolved Solids (TDS)	500	288	298	308	252

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium

TABLE 3-11 INORGANIC CHEMICAL ANALYSIS RESULTS FOR OLMSTEAD A (S07)			
Chemical or Physical Characteristics	MCL (mg/l)	9/12/2016	9/11/2007
Primary Substances			
Antimony (Sb)	0.006	0.0001	<0.005
Arsenic (As)	0.01	0.0029	0.0048
Barium (Ba)	2	0.0533	0.053
Beryllium (Be)	0.004	0.0001	<0.0002
Cadmium (Cd)	0.005	0.0001	<0.0003
Chromium (Cr)	0.1	0.0008	<0.0047
Copper (Cu)*	1.3	0.0009	<0.002
Cyanide (HCN)	0.2	0.01	<0.01
Fluoride (F)	4	0.29	0.45
Lead (Pb)*	0.015	0.0002	<0.0005
Mercury (Hg)	0.0020	0.0002	<0.0003
Nickel (Ni)	0.1	0.0001	<0.01
Nitrate (as N)	10	8.3	7.48
Nitrite (as N)	1	0.05	<0.05
Selenium (Se)	0.05	0.0013	<0.005
Sodium (Na)*	20	24.1	22.6
Thallium (Tl)	0.002	0.0004	<0.001
Secondary Substances			
Chloride (Cl)	250	17.3	16.6
Fluoride (F)	2	0.29	0.45
Iron (Fe)	0.3	0.0097	0.0358
Manganese (Mn)	0.05	0.0014	<0.002
Silver (Ag)	0.1	0.0001	<0.0047
Sulfate (SO_4)	250	58	49.1
Zinc (Zn)	5	0.0123	<0.02
Color	15 Color Units	4	<4
Specific Conductivity	700 umhos/cm	614	591
Total Dissolved Solids (TDS)	500	406	368
* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium			

TABLE 3-12 INORGANIC CHEMICAL ANALYSIS RESULTS FOR WILLOUGHBY (S10)				
Chemical or Physical Characteristics	MCL (mg/l)	9/12/2016	9/11/2007	12/23/1997
Primary Substances				
Antimony (Sb)	0.006	0.0001	<0.005	<0.0050
Arsenic (As)	0.01	0.0017	0.0026	<0.0100
Barium (Ba)	2	0.0593	0.069	<0.1000
Beryllium (Be)	0.004	0.0001	<0.0002	<0.0030
Cadmium (Cd)	0.005	0.0001	<0.0003	<0.0020
Chromium (Cr)	0.1	0.0005	<0.0047	<0.0100
Copper (Cu)*	1.3	0.0016	<0.002	<0.2000
Cyanide (HCN)	0.2	0.01	<0.01	<0.0500
Fluoride (F)	4	0.18	0.35	0.4
Lead (Pb)*	0.015	0.0003	<0.0005	<0.0020
Mercury (Hg)	0.0020	0.0002	<0.0003	<0.0005
Nickel (Ni)	0.1	0.0001	<0.01	<0.0400
Nitrate (as N)	10	9	9.04	9.3
Nitrite (as N)	1	0.05	<0.05	---
Selenium (Se)	0.05	0.0018	<0.005	<0.0050
Sodium (Na)*	20	15.4	16.9	16
Thallium (Tl)	0.002	0.0004	<0.001	<0.0020
Secondary Substances				
Chloride (Cl)	250	21.4	21.9	37
Fluoride (F)	2	0.18	0.35	0.4
Iron (Fe)	0.3	0.0097	0.053	<0.1000
Manganese (Mn)	0.05	0.0001	0.0024	<0.0100
Silver (Ag)	0.1	0.0001	<0.0047	<0.0100
Sulfate (SO_4)	250	68.8	65.4	69
Zinc (Zn)	5	0.0104	0.031	<0.2000
Color	15 Color Units	4	<4	---
Specific Conductivity	700 umhos/cm	551	564	---
Total Dissolved Solids (TDS)	500	376	372	---

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium

TABLE 3-13 INORGANIC CHEMICAL ANALYSIS RESULTS FOR HIGHLAND (S11)					
Chemical or Physical Characteristics	MCL (mg/l)	4/4/2016	4/17/2007	5/5/2003	5/19/1999
Primary Substances					
Antimony (Sb)	0.006	0.0001	<0.005	<0.0050	<0.0050
Arsenic (As)	0.01	0.0024	0.0022	0.0074	<0.0100
Barium (Ba)	2	0.0585	0.066	0.062	<0.1000
Beryllium (Be)	0.004	0.0001	<0.0002	<0.0030	<0.0030
Cadmium (Cd)	0.005	0.0001	<0.0003	<0.0020	<0.0020
Chromium (Cr)	0.1	0.0015	<0.0047	0.016	<0.0100
Copper (Cu)*	1.3	0.0004	<0.002	<0.2000	<0.2000
Cyanide (HCN)	0.2	0.01	<0.01	<0.0500	<0.0500
Fluoride (F)	4	0.39	0.38	0.23	0.8
Lead (Pb)*	0.015	0.0004	<0.0005	0.0018	<0.0020
Mercury (Hg)	0.0020	0.0002	<0.0003	<0.0005	<0.0005
Nickel (Ni)	0.1	0.0001	<0.01	<0.0400	<0.0400
Nitrate (as N)	10	7.7	6.58	7.25	6.4
Nitrite (as N)	1	0.05	<0.05	<0.5000	---
Selenium (Se)	0.05	0.0017	<0.005	<0.0050	<0.0050
Sodium (Na)*	20	15.3	16.2	16.7	20
Thallium (Tl)	0.002	0.0009	<0.002	<0.0020	<0.0020
Secondary Substances					
Chloride (Cl)	250	23.7	24.1	26.3	<20.0000
Fluoride (F)	2	0.39	0.38	0.23	0.8
Iron (Fe)	0.3	0.0097	<0.0097	0.012	0.11
Manganese (Mn)	0.05	0.0001	<0.002	<0.0100	<0.0100
Silver (Ag)	0.1	0.0001	<0.0047	<0.0100	<0.0100
Sulfate (SO_4)	250	72.9	69.5	79.6	46
Zinc (Zn)	5	0.0081	<0.02	0.032	<0.2000
Color	15 Color Units	4	<4	<5.0000	<20.0000
Specific Conductivity	700 umhos/cm	583	564	585	---
Total Dissolved Solids (TDS)	500	412	400	416	---

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium

TABLE 3-14 INORGANIC CHEMICAL ANALYSIS RESULTS FOR SOUTH WILLOUGHBY (S13)						
Chemical or Physical Characteristics	MCL (mg/l)	5/14/2019	9/8/2010	2/1/2007	10/17/2006	12/13/1994
Primary Substances						
Antimony (Sb)	0.006	0.0001	<0.005	<0.0050	<0.0050	<0.0050
Arsenic (As)	0.01	0.0001	<0.002	0.0127	<0.0020	<0.0100
Barium (Ba)	2	0.0022	<0.002	0.006	0.007	0.012
Beryllium (Be)	0.004	0.0001	<0.0002	<0.0002	<0.0002	<0.0030
Cadmium (Cd)	0.005	0.0001	<0.0003	<0.0020	<0.0020	<0.0020
Chromium (Cr)	0.1	0.0013	<0.0047	<0.0047	<0.0047	<0.0100
Copper (Cu)*	1.3	0.0002	<0.002	0.0047	0.0124	<0.2000
Cyanide (HCN)	0.2	0.01	<0.01	<0.0100	<0.0100	<0.0500
Fluoride (F)	4	2.31	2.19	2.16	1.99	1.91
Lead (Pb)*	0.015	0.0008	<0.0005	0.0012	0.0039	<0.0020
Mercury (Hg)	0.0020	0.0002	<0.0003	<0.0003	<0.0003	<0.0005
Nickel (Ni)	0.1	0.0002	<0.01	<0.0100	<0.0100	<0.0400
Nitrate (as N)	10	0.05	<0.05	<0.0500	0.08	0.14
Nitrite (as N)	1	0.05	<0.05	0.05	<0.0500	<0.5000
Selenium (Se)	0.05	0.0005	<0.005	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	78.9	85.1	80.5	85	83.9
Thallium (Tl)	0.002	0.0011	<0.001	<0.0020	<0.0020	<0.0020
Secondary Substances						
Chloride (Cl)	250	19.1	16.1	17.2	18.2	18.2
Fluoride (F)	2	2.31	2.19	2.16	1.99	1.91
Iron (Fe)	0.3	0.0097	<0.0097	0.0438	0.0675	0.059
Manganese (Mn)	0.05	0.0008	<0.002	0.0026	0.0023	<0.0100
Silver (Ag)	0.1	0.0001	<0.0047	<0.0047	<0.0047	<0.0100
Sulfate (SO_4)	250	0.54	<0.1	3.58	1.46	6.28
Zinc (Zn)	5	0.0006	<0.005	<0.0200	<0.0200	<0.2000
Color	15 Color Units	4	<4	<4.000	<4.0000	<5.0000
Specific Conductivity	700 umhos/cm	414	376	409	412	342
Total Dissolved Solids (TDS)	500	220	244	268	274	---

* No DOH established MCL. Represents EPA established "action levels" for lead and copper and recommended level for sodium.

TABLE 3-15 INORGANIC CHEMICAL ANALYSIS RESULTS FOR BUTTERNUT (S14)						
Chemical or Physical Characteristics	MCL (mg/l)	9/11/2018	11/11/2009	12/21/2000	12/23/1997	12/13/1994
Primary Substances						
Antimony (Sb)	0.006	0.0001	<0.005	<0.0050	<0.0050	<0.0030
Arsenic (As)	0.01	0.0002	<0.002	<0.0100	<0.0100	<0.0050
Barium (Ba)	2	0.0019	0.003	<0.1000	<0.1000	0.014
Beryllium (Be)	0.004	0.0001	<0.0002	<0.0030	<0.0003	<0.0040
Cadmium (Cd)	0.005	0.0001	<0.0003	<0.0020	<0.0020	<0.0040
Chromium (Cr)	0.1	0.0006	<0.0047	<0.0100	<0.0100	<0.0200
Copper (Cu)*	1.3	0.0002	0.00295	<0.2000	<0.2000	0.012
Cyanide (HCN)	0.2	0.01	<0.0500	<0.0500	<0.0500	<0.0050
Fluoride (F)	4	2.66	<0.2000	<0.2000	2.6	2.87
Lead (Pb)*	0.015	0.0001	<0.0020	<0.0020	<0.0020	0.005
Mercury (Hg)	0.0020	0.0002	<0.0005	<0.0005	<0.0005	<0.0002
Nickel (Ni)	0.1	0.0003	<0.01	<0.0400	<0.0400	<0.0300
Nitrate (as N)	10	0.05	<0.07	<0.5000	<0.5000	0.12
Nitrite (as N)	1	0.05	<0.07	<0.5000	<0.5000	<0.0500
Selenium (Se)	0.05	0.0005	<0.005	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	88	91	82	81	94
Thallium (Tl)	0.002	0.0001	<0.001	<0.0020	<0.0020	<0.0020
Secondary Substances						
Chloride (Cl)	250	23.4	23.1	<20.0000	<20.0000	20.9
Fluoride (F)	2	2.66	0.97	<0.2000	2.6	2.87
Iron (Fe)	0.3	0.0216	0.0311	<0.1000	<0.1000	0.205
Manganese (Mn)	0.05	0.0009	<0.002	<0.0100	<0.0100	<0.0200
Silver (Ag)	0.1	0.0001	<0.0047	<0.0100	<0.0100	<0.0100
Sulfate (SO_4)	250	0.94	1	<10.0000	<10.0000	3.41
Zinc (Zn)	5	0.0015	<0.02	<0.2000	<0.2000	0.027
Color	15 Color Units	4	<4	<5.0000	<5.0000	<15.0000
Specific Conductivity	700 umhos/cm	400	393	390	540	352
Total Dissolved Solids (TDS)	500	272	304	---	---	---
* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.						

TABLE 3-16 INORGANIC CHEMICAL ANALYSIS RESULTS FOR OLMSTEAD B (S16)					
Chemical or Physical Characteristics	MCL (mg/l)	6/11/2019	8/10/2010	8/9/2006	9/24/2003
Primary Substances					
Antimony (Sb)	0.006	0.0001	<0.005	<0.0050	<0.0050
Arsenic (As)	0.01	0.003	0.0034	<0.0020	0.0126
Barium (Ba)	2	0.0504	0.049	0.032	0.035
Beryllium (Be)	0.004	0.0001	<0.0002	<0.0002	<0.0002
Cadmium (Cd)	0.005	0.0001	<0.0003	<0.0003	<0.0003
Chromium (Cr)	0.1	0.0011	<0.0047	<0.0047	<0.0047
Copper (Cu)*	1.3	0.0004	<0.002	<0.0020	<0.0020
Cyanide (HCN)	0.2	0.01	<0.01	<0.0100	<0.0100
Fluoride (F)	4	0.34	0.45	0.52	0.53
Lead (Pb)*	0.015	0.0001	<0.0005	<0.0005	<0.0005
Mercury (Hg)	0.0020	0.0002	<0.0003	<0.0003	<0.0003
Nickel (Ni)	0.1	0.0002	<0.01	<0.0100	<0.0100
Nitrate (as N)	10	8.8	6.28	1.53	2.89
Nitrite (as N)	1	0.05	<0.05	<0.0500	<0.0500
Selenium (Se)	0.05	0.0012	<0.005	<0.0050	<0.0050
Sodium (Na)*	20	25.5	24.9	41.6	38.2
Thallium (Tl)	0.002	0.0003	<0.001	<0.0010	<0.0010
Secondary Substances					
Chloride (Cl)	250	19	15.3	8.57	11
Fluoride (F)	2	0.34	0.45	0.52	0.53
Iron (Fe)	0.3	0.0097	<0.0097	<0.0097	0.109
Manganese (Mn)	0.05	0.0011	0.0024	0.0104	0.0163
Silver (Ag)	0.1	0.0001	<0.0047	<0.0047	<0.0047
Sulfate (SO_4)	250	53.2	47.4	29.9	38.6
Zinc (Zn)	5	0.0091	0.0205	<0.0200	0.0281
Color	15 Color Units	4	<4	<4.0000	<4.0000
Specific Conductivity	700 umhos/cm	622	551	353	412
Total Dissolved Solids (TDS)	500	378	374	240	258
* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium					

TABLE 3-17 INORGANIC CHEMICAL ANALYSIS RESULTS FOR PECAN B (S18)				
Chemical or Physical Characteristics	MCL (mg/l)	7/23/2013	6/4/2010	6/14/2006
Primary Substances				
Antimony (Sb)	0.006	<0.0001	0.005	<0.0050
Arsenic (As)	0.01	0.00288	0.0034	0.0053
Barium (Ba)	2	0.01267	0.013	0.018
Beryllium (Be)	0.004	<0.0001	0.0002	<0.0002
Cadmium (Cd)	0.005	<0.0001	0.0003	<0.0003
Chromium (Cr)	0.1	0.00089	0.0047	<0.0047
Copper (Cu)*	1.3	0.00295	0.002	<0.0020
Cyanide (HCN)	0.2	<0.01	0.01	<0.0100
Fluoride (F)	4	0.47	0.46	0.44
Lead (Pb)*	0.015	0.00015	0.0005	<0.0005
Mercury (Hg)	0.0020	<0.0002	0.0003	<0.0003
Nickel (Ni)	0.1	<0.0001	0.01	<0.0100
Nitrate (as N)	10	2.56	2.55	2.48
Nitrite (as N)	1	<0.05	0.05	<0.0500
Selenium (Se)	0.05	0.00207	0.005	<0.0050
Sodium (Na)*	20	15.9	15.5	17.5
Thallium (Tl)	0.002	0.00014	0.001	<0.0010
Secondary Substances				
Chloride (Cl)	250	9.83	9.34	9.63
Fluoride (F)	2	0.47	0.46	0.44
Iron (Fe)	0.3	<0.0097	0.0097	<0.0097
Manganese (Mn)	0.05	0.00023	0.002	<0.0020
Silver (Ag)	0.1	<0.0001	0.0047	<0.0047
Sulfate (SO_4)	250	29.7	30.1	35.2
Zinc (Zn)	5	0.00138	0.005	<0.0200
Color	15 Color Units	<4	4	<4.0000
Specific Conductivity	700 umhos/cm	352	351	349
Total Dissolved Solids (TDS)	500	202	250	238

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium

Arsenic Monitoring: The maximum contaminant levels (MCL) for arsenic is 0.010 mg/l. Current testing results from Grandview's wells show arsenic concentrations to be below the standard of 0.010 mg/l. However, past samples have tested above the MCL including South Willoughby well (S13) which had an arsenic concentration of 0.0127 mg/l from a sample collected in February 2007, and Olmstead B well (S16) which had a concentration of 0.0126 mg/l from a sample collected in September 2003. Arsenic monitoring requirements are consistent with IOC monitoring at all wells except for Olmstead A, which requires quarterly arsenic sampling.

Nitrate/Nitrite Monitoring: The City of Grandview conducts annual monitoring for Nitrate and Nitrite on all well sources, and quarterly monitoring on three of its wells. The maximum contaminant levels (MCL) for Nitrate and Nitrite are 10.0 mg/l and 1.0 mg/l, respectively. Nitrates exceeding this concentration in drinking water can be a health hazard, especially to infants below six months of age.

Test results for the period 2016 through 2021, summarized in Table 3-18, show the City in compliance with State standards. A copy of Nitrate/Nitrite analysis test results are provided in CHAPTER 10.

As mentioned previously, all source wells are tested individually, though some sources are blended prior to entering the distribution system. Blending allows wells with higher nitrate concentrations to combine with wells having lower nitrate concentrations to meet MCL standards. Blending occurs at Sources S07 Olmstead A and S16 Olmstead B, and previously at Sources S10 North Willoughby and S13 South Willoughby. S13 South Willoughby is an emergency source, and has not been used since early 2012, so currently no blending occurs at this location. These source wells are plumbed with isolation valves to allow individual and blended testing. Table 3-19 shows the blended nitrate concentrations at these wells.

TABLE 3-18 NITRATE / NITRITE CHEMICAL ANALYSIS RESULTS						
	2021	2020	2019	2018	2017	2016
West Main (S01)						
Nitrate (NO_3-N)	7.52	7.98	7.32	6.70	5.76	6.66
Nitrite (NO_2-N)	<0.05	<0.07	<0.1	<0.1	<0.1	<0.1
Total Nitrate/Nitrite	7.52	7.98	7.32	6.70	5.76	6.66
Balcom & Moe (S02)						
Nitrate (NO_3-N)	4.91	0.40	5.14	5.16	4.86	5.06
Nitrite (NO_2-N)	<0.05	<0.07	<0.05	<0.05	<0.05	<0.05
Total Nitrate/Nitrite	4.91	0.40	5.14	5.16	4.86	5.06
Velma (S03)						
Nitrate (NO_3-N)	4.56	4.87	4.72	4.84	4.74	4.66
Nitrite (NO_2-N)	<0.05	<0.07	<0.05	<0.05	<0.05	<0.05
Total Nitrate/Nitrite	4.56	4.87	4.72	4.84	4.74	4.66
Olmstead A (S07)						
Nitrate (NO_3-N)	8.81	8.28	8.17	8.08	7.32	8.26
Nitrite (NO_2-N)	<0.07	<0.1	<0.17	<0.1	<0.1	<0.07
Total Nitrate/Nitrite	8.81	8.28	8.17	8.08	7.32	8.26
North Willoughby (S10)						
Nitrate (NO_3-N)	9.25	8.86	9.01	9.06	8.52	9.32
Nitrite (NO_2-N)	<0.05	<0.1	<0.07	<0.1	<0.1	<0.07
Total Nitrate/Nitrite	9.25	8.86	9.01	9.06	8.52	9.32
Highland (S11)						
Nitrate (NO_3-N)	7.80	7.63	6.98	7.06	7.21	6.96
Nitrite (NO_2-N)	<0.05	<0.07	<0.05	<0.10	<0.07	<0.1
Total Nitrate/Nitrite	7.80	7.63	6.98	7.06	7.21	6.96
South Willoughby (S13)						
Nitrate (NO_3-N)	---	---	<0.05	<0.05	<0.05	<0.07
Nitrite (NO_2-N)	---	---	<0.05	<0.05	<0.05	<0.07
Total Nitrate/Nitrite	---	---	0.00	0.00	0.00	0.00
Butternut (S14)						
Nitrate (NO_3-N)	<0.05	0.87	<0.07	<0.05	<0.05	<0.07
Nitrite (NO_2-N)	<0.05	<0.07	<0.07	<0.05	<0.05	<0.07
Total Nitrate/Nitrite	0.00	0.87	0.00	0.00	0.00	0.00
Olmstead B (S16)						
Nitrate (NO_3-N)	0.60	0.88	0.89	0.90	0.90	0.68
Nitrite (NO_2-N)	<0.05	<0.05	<0.07	<0.05	<0.05	<0.07
Total Nitrate/Nitrite	0.60	0.88	0.89	0.90	0.90	0.68
Pecan B (S18)						
Nitrate (NO_3-N)	2.56	2.56	2.54	2.58	2.57	2.40
Nitrite (NO_2-N)	<0.05	<0.05	<0.10	<0.05	<0.05	<0.1
Total Nitrate/Nitrite	2.56	2.56	2.54	2.58	2.57	2.40

TABLE 3-19 NITRATE / NITRITE CHEMICAL ANALYSIS BLENDED RESULTS						
	2021	2020	2019	2018	2017	2016
Olmstead A (S07) and Olmstead B (S16) Blend						
Nitrate (NO_3-N)	7.42	7.04	6.93	7.16	6.06	7.25
Nitrite (NO_2-N)	<0.05	<0.1	<0.07	<0.10	<0.10	<0.07
Total Nitrate/Nitrite	7.42	7.04	6.93	7.16	6.06	7.25
North Willoughby (S10) and South Willoughby (S13) Blend						
Nitrate (NO_3-N)	---	---	---	---	6.68	---
Nitrite (NO_2-N)	---	---	---	---	<0.10	---
Total Nitrate/Nitrite	---	---	---	---	6.68	---

Volatile Organic Chemical Monitoring: Volatile Organic Chemical (VOC) monitoring is required once every year for the first three years of sampling, per 40 CFR 141.24. Samples are to be taken following water treatment. If no VOCs are detected during the first three years of testing, future monitoring shall be at least once every compliance period. The DOH may grant waivers for monitoring requirements. Grandview conducted VOC testing on its source wells as shown in Table 3-20.

TABLE 3-20 SOURCE WELL VOC TESTING					
Source	Month/Year				
West Main (S01)	Waiver	Apr-21	Apr-09	Jul-07	Aug-04
Balcom & Moe (S02)	Waiver	Apr-21	Apr-09	Jul-07	Aug-04
Velma (S03)	Waiver	Apr-21	Apr-09	Apr-07	Apr-03
Olmstead A (S07)	Oct-21	-	Apr-09	May-06	-
North Willoughby (S10)	Oct-21	Oct-17	Oct-14	Jun-06	Nov-04
Highland (S11)	Waiver	Apr-21	Apr-09	Dec-06	Aug-02
South Willoughby (S13)	Quarterly	Apr-21	May-09	Jun-06	Aug-04
Butternut (S14)	Waiver	Apr-21	Apr-09	Aug-04	Apr-97
Olmstead B (S16)	Quarterly	Apr-21	Apr-09	Dec-06	Sep-06
Ashael Curtis (S17)	Mar-25	Mar-19	-	-	-
Pecan B (S18)	Apr-25	Apr-19	Apr-13	Oct-07	Sep-07

Test results show the City in compliance with State standards. The City tests for trihalomethanes (TTHM) along with VOC testing, and test results showed no presence of any of these substances in the water from the City's wells. Copies of the VOC and trihalomethanes test results are provided in CHAPTER 10.

Synthetic Organic Chemical (SOC) Monitoring: SOC monitoring is required once every year for the first three years of sampling, per 40 CFR 141.24. Samples are to be taken following water treatment. If no SOCs are detected during the first three years of testing, future monitoring shall be at least once every compliance period. The DOH may grant waivers for monitoring requirements. Grandview conducted SOC testing on its source wells as shown in Table 3-21.

TABLE 3-21 SOURCE WELL SOC TESTING				
Source	Month/Year			
West Main (S01)	07/2007			
Balcom & Moe (S02)	04/2013	03/2008	06/2001	12/1998
Velma (S03)	03/2008	06/2007		
Olmstead A (S07)	09/2007	12/1998	10/1995	
North Willoughby (S10)	07/2007	12/1998		
Highland (S11)	04/2012	03/2008	06/2007	12/2006
South Willoughby (S13)	09/2009	12/1998		
Butternut (S14)	04/2009	12/1998		
Olmstead B (S16)	09/2007			
Pecan B (S18)	03/2007			

Test results show the City to be in compliance with State standards and showed no presence of any of these substances in the water from the City's wells. A copy of the SOC analysis test results is provided in CHAPTER 10.

Radionuclide Monitoring: For the City of Grandview, radionuclide sampling from each source is generally required once every three years. However, the DOH may reduce monitoring requirements to once every six or nine years based on criteria set forth in 40 CFR 141.26. Grandview has completed radionuclide testing on its source wells as shown in Table 3-22.

TABLE 3-22 SOURCE WELL RADIONUCLIDE TESTING				
Source	Month/Year			
West Main (S01)	06/2010	10/2007	09/2007	10/2005
Balcom & Moe (S02)	04/2011	04/2009	10/2007	09/2007
Velma (S03)	05/2009	10/2007	09/2007	05/2007
Olmstead A (S07)	04/2012	09/2009	12/2007	09/2007
North Willoughby (S10)	06/2014	04/2012	09/2009	10/2007
Highland (S11)	04/2011	11/2009	09/2007	06/2007
South Willoughby (S13)	11/2009	11/2005	05/2005	05/2003
Butternut (S14)	04/2010	12/2005	06/2005	05/2003
Olmstead B (S16)	08/2012	05/2010	12/2005	07/2005
Pecan B (S18)	06/2010	09/2007	06/2006	

Test results show the City in compliance with State standards. A copy of the radionuclide analysis test results is provided in CHAPTER 10.

3.2.2 Distribution System Sampling and Testing

Bacteriological: Drinking water samples are required to be collected monthly at various locations throughout the water distribution system for bacteriological analysis in accordance with the City's *Coliform Monitoring Plan*. The minimum number of samples required for collection by a water utility is based on the population served. The DOH regulations require water systems serving a population of 8,501 to 12,900 to take a minimum of ten (10) samples per month when no samples with a coliform presence are collected previous month. The City of Grandview is required to sample a minimum of ten (10) locations within the distribution system. The *Coliform Monitoring Plan* and representative copies of bacteriological analysis results are provided in CHAPTER 10.

Disinfection Byproducts (DBPs): Grandview adds chlorine to its drinking water to kill or inactivate harmful organisms that may cause various diseases, and this process is known as disinfection. However, chlorine is a very active substance, and it reacts with naturally occurring substances to form compounds known as disinfection byproducts. The most common disinfection byproducts formed when chlorine is used are trihalomethanes (TTHMs) and haloacetic acids (HAA5).

In 2006, EPA enacted new rules for disinfection byproducts monitoring, known as the Stage 2 Rule. Under the Stage 2 Rule, water systems must monitor at locations with the highest averages of total trihalomethanes (TTHMs) and haloacetic acids (HAA5). To determine these locations, the Stage 2 Rule required many systems to complete an Initial Distribution System Evaluation (IDSE). However, the City of Grandview was exempt from the IDSE requirement as its 40/30 certification was approved by EPA, demonstrating low historical TTHM and HAA5 distribution system concentrations. Two dual sample sets of TTHM and HAA5 samples are required at each of two locations annually to meet Stage 2 Rule standards. The City has identified the sampling locations and schedules in the *Stage 2 DBP Monitoring Plan* provided in CHAPTER 10. The compliance determination for the Stage 2 Rule is based on a locational running annual average (LRAA), meaning compliance must be met at each monitoring location instead of the system-wide running annual average (RAA) used under the Stage 1 Rule.

Results from the latest (2014) monitoring indicated that none of the samples exceeded the federal action levels of 0.080 mg/l for TTHMs and 0.060 mg/l for HAA5 under the Stage 1 DBP Rule. Table 3-23 provides a summary of the 2012 and 2011 TTHMs and HAA5 monitoring results, which are also provided in CHAPTER 10.

TABLE 3-23 TTHM AND HAA5 PROGRAM SUMMARY OF RESULTS
(all values are in milligrams per liter)

Year	Sample Locations	TTHM	HAA5
2014	1260 Appleway Road	0.0123	0.0013
	940 East Wine Country Road	0.0405	0.0034
2013	1260 Appleway Road	0.0053	0.0011
	940 East Wine Country Road	0.0285	0.0045
	2013 Hill Drive	0.0061	ND
	207 West 2nd Street	0.0069	ND
	1005 Grandridge Road	0.0100	0.0014
	308 Westridge Road	0.0032	ND
	546 Woodall Road	0.0074	0.0014
* ND means not detected			

Lead and Copper: Lead and copper sampling is required once every three years as approved by the DOH, per 40 CFR 141.86. In 1992, Grandview began a tap water lead and copper monitoring program to determine the lead and copper concentrations in drinking water to which its customers may be exposed. In 2014, thirty (30) samples were collected from various locations throughout the water system and tested for concentrations of lead and copper. Results from the latest (2014) monitoring indicated that none of the samples exceeded the federal action levels of 1.3 mg/l for copper and 0.015 mg/l for lead. Table 3-24 provides a summary of the 2020 copper and lead monitoring results, which are also provided in CHAPTER 10. Test results from the 1998, 2000, 2005, 2008, 2011, and 2014 are also provided in CHAPTER 10.

TABLE 3-24 LEAD AND COPPER MONITORING PROGRAM SUMMARY OF RESULTS
(all values are in milligrams per liter)

Sample Number	Sample Location	Year 2020	
		Copper (Federal Action Level 1.3 mg/l)	Lead (Federal Action Level 0.015 mg/l)
1	701 Washington #10	0.0260	0.00041
2	1005 Monty Python	0.0406	0.00069
3	218 Jackson	0.0226	0.00041
4	702 Larson	0.0201	0.00224
5	403 Westridge	0.00804	0.00014
6	209 West Bonnieview	0.00434	0.00036
7	1810 Young Street	0.00488	0.00052
8	701 Washington #16	0.0491	0.00077
9	308 Westridge	0.0373	0.00270
10	212 Jackson	0.0380	0.000410
11	214 Jackson	0.0333	0.00081
12	701 Washington #1	0.0197	0.00031
13	306 Westridge	0.0728	0.00079
14	1816 W 2nd	0.0372	0.00026
15	100 W 2nd	0.00850	0.00033
16	1806 W 2nd	0.0198	0.00011
17	207 Westridge	0.0783	0.00035
18	202 Westridge	0.00936	0.00055
19	207 Madison	0.0304	0.00083
20	219 Jackson	0.0118	0.00039
21	701 Washington #15	0.0112	0.000027
22	1800 W 2nd	0.0116	0.00049
23	912 Carriage	0.00157	0.00047
24	1105 Apache	0.0279	0.00091
25	516 Satterfield	0.0273	0.00050
26	601 Washington #1	0.0271	0.00061
27	305 E 2nd	0.0444	0.00199
28	700 Washington #2	0.00855	0.00041
29	602 Washington #9	0.00811	0.00074
30	1911 Queen Street	0.00432	0.00022

3.2.3 Future Source Water and Distribution System Sampling and Testing

A summary of future source and distribution system monitoring requirement frequencies, dates and sample status, as provided in the City's *Water Quality Monitoring Report for the Year 2015* (WQMR), is provided below in Table 3-25 and Table 3-26, respectively. A copy of the City's 2015 WQMR is provided in CHAPTER 10.

TABLE 3-25 FUTURE SOURCE WATER SAMPLING REQUIREMENTS				
Sample Type	Frequency	Last Sample	Next Sample	Status
West Main (S01)				
Nitrate/Nitrite	Once/Year	May 2021	May 2022	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	May 2019	May 2028	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2021	April 2027	Within MCLs
Herbicides	Once/9 Years	July 2016	July 2025	Within MCLs
Pesticides	Once/9 Years	July 2016	July 2025	Within MCLs
Gross Alpha	Once/6 Years	May 2020	June 2023	Within MCLs
Radium 228	Once/3 Years	May 2020	June 2023	Within MCLs
Balcom & Moe (S02)				
Nitrate/Nitrite	Once/Year	April 2021	June 2022	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	April 2018	April 2027	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2021	April 2027	Within MCLs
Herbicides	Once/9 Years	April 2017	April 2026	Within MCLs
Pesticides	Once/9 Years	April 2013	April 2022	Within MCLs
Gross Alpha	Once/6 Years	May 2020	May 2023	Within MCLs
Radium 226 + 228	Once/6 Years	May 2020	May 2023	Within MCLs
Velma (S03)				
Nitrate/Nitrite	Once/Year	May 2021	May 2022	Within MCLs
Inorganic Chemicals (IOCs)*	Once/9 years	April 2019	April 2018	Within MCLs
Volatile Organic Chemicals (VOCs)*	Once/6 Years	April 2021	April 2027	Within MCLs
Herbicides	Once/9 Years	June 2016	June 2025	Within MCLs
Pesticides	Once/9 Years	June 2016	June 2025	Within MCLs
Gross Alpha	Once/6 Years	June 2020	June 2026	Within MCLs
Radium 228	Once/6 Years	June 2020	May 2026	Within MCLs
Olmstead A (S07)				
Nitrate/Nitrite	Once/Quarter	November 2014	February 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	September 2007	September 2016	Within MCLs
Arsenic	Once/Quarter	November 2014	February 2015	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2009	April 2015	Within MCLs
Herbicides	Once/9 Years	September 2007	September 2016	Within MCLs
Pesticides	Once/9 Years	September 2007	September 2016	Within MCLs
Gross Alpha	Once/3 Years	April 2012	October 2016	Within MCLs
Radium 226 + 228	Once/6 Years	May 2009	May 2015	Within MCLs
North Willoughby (S10)				
Nitrate/Nitrite	Once/Quarter	September 2021	February 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	September 2016	September 2025	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/3 Years	October 2017	**October 2021**	Within MCLs
Herbicides	Once/9 Years	July 2016	July 2016	Within MCLs
Pesticides	Once/9 Years	July 2016	July 2016	Within MCLs
Gross Alpha	Once/6 Years	May 2020	May 2026	Within MCLs
Radium 228	Once/6 Years	May 2020	May 2026	Within MCLs
Highland (S11)				
Nitrate/Nitrite	Once/Quarter	July 2021	October 2021	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	April 2016	April 2025	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2016	April 2022	Within MCLs
Herbicides	Once/3 Years	April 2021	April 2030	Within MCLs
Pesticides	Once/9 Years	May 2015	May 2024	Within MCLs
Gross Alpha	Once/3 Years	May 2020	May 2023	Within MCLs
Radium 228	Once/3 Years	May 2020	May 2023	Within MCLs
Butternut (S14)				
Nitrate/Nitrite	Once/Year	June 2021	June 2022	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	September 2018	September 2018	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2009	April 2015	Within MCLs
Herbicides	Once/9 Years	April 2009	April 2018	Within MCLs
Pesticides	Once/9 Years	April 2009	April 2018	Within MCLs
Gross Alpha	Once/6 Years	April 2010	April 2016	Within MCLs
Radium 228	Once/6 Years	April 2010	April 2016	Within MCLs
Olmstead B Well (S16)				
Nitrate/Nitrite	Once/Quarter	November 2014	November 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	August 2010	August 2019	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2009	April 2015	Within MCLs
Herbicides	Once/3 Years	September 2007		Within MCLs
Pesticides	Once/9 Years	September 2007		Within MCLs
Gross Alpha	Once/6 Years	August 2012	July 2015	Within MCLs
Radium 226 + 228	Once/6 Years	August 2012	July 2015	Within MCLs
Pecan B (S18)				
Nitrate/Nitrite	Once/Year	September 2014	September 2015	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	July 2013	July 2022	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	April 2013	April 2019	Within MCLs
Herbicides	Once/3 Years	March 2007		Within MCLs
Pesticides	Once/9 Years	March 2007		Within MCLs
Gross Alpha	Once/6 Years	June 2010	June 2016	Within MCLs
Radium 226 + 228	Once/6 Years	June 2010	June 2016	Within MCLs

TABLE 3-26 FUTURE DISTRIBUTION SYSTEM SAMPLING REQUIREMENTS				
Sample Type	Frequency	Last Sample	Next Sample	Status
Coliform Bacteria	10/Month	January 2015	January 2015	Within MCLs
Disinfection Byproducts*	2 dual sample sets/Year	October 2014	October 2015	Within MCLs
Lead & Copper	1 set of 30 samples/3 Years	September 2014	September 2017	No Exceedance
Asbestos	1/9 Years	September 2009	September 2018	Within MCLs
* Two dual sample sets of TTHM and HAA5 samples are required at each of two locations annually, Stage 2 Rule.				

Future sampling requirements are discussed further in CHAPTER 6. The City's 2015 and future WQMRs should be consulted regarding the dates for future testing.

3.3 DESIGN STANDARDS

Standardized performance and design criteria are essential for the efficient evaluation, construction, and operation of a water utility. Establishing minimum criteria assures a base level of system reliability and enhances the utility's ability to assess system deficiencies and to plan for future improvements. The City of Grandview has established the following performance and design criteria for their water system:

TABLE 3-27 SYSTEM DESIGN STANDARDS

Parameter	Design Standard	Regulatory Reference
Water Quality	The quality of water supplied to the system shall meet or exceed the requirements of the latest edition of the DOH publication entitled *State Board of Health - Drinking Water Regulations*.	Chapter 246-290 WAC, Part 3
Average Daily Demand (ADD)	This demand shall be equivalent to the daily consumption per service in a user category averaged for the period 2015-2021, except as otherwise adjusted to account for recent changes in demand trends. The ADD values for Grandview are presented in Table 2-7.	WAC 246-290-221
Maximum Daily Demand (MDD)	This demand shall be equivalent to the maximum day of consumption per service in a user category, as calculated using the volume of water from the maximum day of production. The MDD values are presented in Table 2-10. MDD/ERU = 273.7 gallons/day	WAC 246-290-221
Peak Hourly Demand (PHD)	This demand shall be equivalent to the peak hour consumption per service in a user category, as calculated using a conservative estimate of 1.8 times the MDD as shown in Table 2-8. PHD/ERU = 0.34 gpm.	WAC 246-290-221
Storage Requirements	Storage requirements shall be based on providing minimum operational, equalizing, standby, and fire suppression storage for the entire water system as calculated using the *DOH Water System Design Manual* equations. The specific storage requirements for the City of Grandview are presented later in this chapter.	WAC 246-290-235
Fire Suppression Storage (FSS) and Fire Flow	Storage requirements for fire flow shall be based on providing 6,000 gpm for a 4-hour duration (the minimum flow required by the Grandview Fire Department for the largest facility), which equals 1,440,000 gallons. Additional fire suppression storage and fire flow capacity requirements are discussed later in this chapter.	WAC 246-290-221(5)
Flow Rates and Velocities	Pipelines shall be sized for a maximum allowable water flow velocity of eight feet per second (fps) for system demands, which equals the maximum instantaneous demand (PHD). Pipeline velocities for fire flow conditions shall be permitted to exceed eight fps. The basis for pipe size design shall be per computer model analysis.	2019 DOH Water System Design Manual
System Pressures	The City of Grandview water system currently has one pressure zone. The minimum service pressure under maximum instantaneous domestic demand conditions shall be 30 pounds per square inch (psi). Under fire flow conditions, the minimum fire hydrant flow pressure shall be 20 psi. Additional information regarding system pressure requirements under specific hydraulic analysis scenarios is presented later in this chapter.	WAC 246-290-230(5) and WAC 246-290-230(6)
Minimum Pipe Sizes	The minimum pipe size allowed within the system shall be eight-inch diameter. Where fire flow requirements exceed 1,000 gpm, the minimum pipeline size shall be determined by hydraulic analysis.	City of Grandview Design and Construction Standards

Additional design standards and requirements for water main construction in the City of Grandview are included in the City's Design and Construction Standards provided in CHAPTER 10.

3.4 CAPACITY ANALYSIS

Review and analysis of the capacity of all system components, including water sources, treatment systems, storage facilities, and distribution components described in Section 3.1, is important to maintain the City's level of service and ensure the current and future system satisfies the requirements of WAC 246-290-100(4)(e).

3.4.1 Source Reliability

Existing source well production is summarized in Table 3-28, along with projections of future water system demand and ERUs. It is crucial to compare existing and future demand trends with the water supply capacities summarized in Section 3.1 and DOH recommended reliability criteria summarized in Section 3.10.5 of the 2020 Water System Design Manual. The following are the applicable water source reliability recommendations:

- Two or more supply sources are available.
- Permanent and seasonal sources are capable of replenishing depleted fire suppression storage within 72 hours while concurrently supplying the MDD for the water system.
- Permanent and seasonal source capacity is enough to supply MDD in a pumping period of 20 hours or less.
- With the largest source out of service, the remaining permanent and seasonal source(s) can provide a minimum of ADD for the water system.
- Source of supply pump stations have power connections to two independent primary public power sources, have in-place auxiliary power available (auto transfer capable), and/or maintain adequate gravity standby storage.
- A factor of safety is applied to well pumping test safe yield determinations.

A summary of the City's total well source capacity compared to the DOH reliability recommendations is provided in Table 3-28. A factor of safety (10% contingency) is included in all demand projections that are used to calculate the reliability criteria demands provided in Table 3-28.

TABLE 3-28 WATER SUPPLY RELIABILITY SUMMARY			
DOH Water Supply Reliability Criteria	2022	2032	2042
MDD + FSS[a] in 72 hours (gpm)	3,553	4,122	4,400
Source Well Capacity Existing (gpm)[b] With proposed improvements (gpm)[c]	3,299	3,299 5,299	3,299 5,299
Meets Reliability Criteria?	Yes, w/Improv.	Yes, w/Improv.	Yes, w/Improv.
MDD in 20 hours (gpm)	3,864	4,547	4,880
Source Well Capacity Existing (gpm)[b] With proposed improvements (gpm)[c]	3,299	3,299 5,299	3,299 5,299
Meets Reliability Criteria?	Yes, w/Improv.	Yes, w/Improv.	Yes, w/Improv.
ADD (gpm)	1,393	1,726	1,853
Source Well Capacity With largest source (Well No. S14) out of service (gpm)	2,024	2,024	2,024
Meets Reliability Criteria?	Yes	Yes	Yes

[a] Refer to Section 3.6 for FSS requirements. FSS converted to 72 hours of pumping = 333 gpm (1,440,000 gallons/4,320 minutes).
[b] Current well capacity is 3,529 gpm including emergency well sources.
[c] Proposed improvements include adding 2,000 gpm of well capacity to the system through a combination of existing well rehabilitation and new well construction.

Power supply reliability is also an important factor in the source of supply reliability analysis. The City of Grandview has in-place auxiliary back-up power generators, with automatic transfer switch capability at source well S01, S12/S18, and S13. The city also has engine-driven pump capability at S10 but the well pump has to be manually switched from electric motor power to the gas engine power source. The total current capacity of wells with auxiliary power sources is 1,620 gpm.

The condition and age of existing water system facilities and equipment such as pumps, motors, and valves can also have an impact on water supply reliability. A summary of the age and status of major water supply components is summarized in Section 3.1. Grandview properly operates and maintains its water system facilities and equipment. The City will continue routine maintenance on system equipment as discussed in CHAPTER 6. Recommended O&M improvements related to well pump rehabilitation and replacement will be as described in CHAPTER 8.

3.4.1.1 Alternative Sources of Supply

As system demands continue to increase, the City may need to pursue alternative sources of supply to supplement groundwater source well supply and increase system reliability. Alternative sources of supply may include irrigation supply sources, water reuse, and water system interties.

Pursuing and developing seasonal water sources to offset high peak demands in the summer months may be a viable option for the City. Seasonal irrigation demand can have a significant impact on the City's water system supply capacity. Expansion of existing irrigation systems to serve more customers is an option to consider in the future.

Water reuse options could be considered by the City to provide additional water supply. The primary source for reclaimed or reused water within or near the City of Grandview includes the City's wastewater treatment plant. Grandview currently discharges treated wastewater to the Department of Fish and Wildlife's non-overflow pond system located south of the City's wastewater treatment facility. This activity which occurs on a limited basis each year during the months of February and March is permitted under the City's NPDES wastewater discharge permit.

Another possible use of reclaimed water from the City's wastewater treatment facility is to irrigate City parks and/or school athletic fields. This would require upgrading Grandview's wastewater treatment facility to Class A reclaimed water standards plus costs associated with construction of a separate reclaimed water transmission and distribution system (pumps and pipeline) to deliver reclaimed water to various parks and school fields throughout the City. Grandview's wastewater treatment facility is located is approximately two miles south of the City on the south side of the Yakima River.

Water system interties with neighboring water purveyors can be a possible option for an emergency or supplemental source of supply. In some circumstances pursuing a water system intertie can be more cost-effective than new source development. The nearest large municipal water purveyors to the City of Grandview are the City of Sunnyside, City of Prosser, and City of Mabton. No plans are in place to construct an intertie between Grandview and any of these purveyors at this time but may be a viable option in the future. An intertie with the City of Sunnyside may be the most feasible option as their water service elevations (reservoir overflow elevations) are nearly identical at 938 feet for Sunnyside and 941.6 feet for Grandview.

If an intertie is proposed, the City will need to develop an agreement with the other purveyor, obtain approval of the intertie from the DOH and the Ecology, modify appropriate water rights to reflect the intertie, and incorporate the intertie into the Water System Plan. The intertie agreement would include the following:

- A discussion on the place of use as authorized in appropriate water rights documents;
- Identification of the specific time period(s) in which water will be provided;
- Quantification of the amount of water available for use;
- A discussion on seasonal or other restrictions on water availability; and
- A discussion of how water conservation programs, data collection and other operational matters will be conducted and coordinated.

3.4.2 Water Right Self-Assessment

The City of Grandview currently maintains certificated and permitted water rights from Ecology for the appropriation of ground water from each of its wells. A copy of the City's water right certificates, permits, and claims, and any associated reports of examination (ROE) and water right correspondence documents are provided in CHAPTER 10 of the Plan.

In 2011, the City completed a water right consolidation project, providing them the flexibility in utilizing their water rights throughout their wellfield. The City's water rights are divided into two aquifer groups based upon the depths of existing source wells – the deeper Wanapum Basalt Aquifer (WBA) and the shallower Saddle Mountain Basalt Aquifer (SMBA). A summary of the City's water right status following the consolidation project, and a copy of the same body of public groundwater and impairment analysis are provided in CHAPTER 10 of the Plan.

Within the WBA, the City is authorized to pump a total of 1,700 gpm and 1,994 afy from any combination of the three existing and two future source wells, plus any water pumped from WBA source wells under permit G4-27784P (up to 2,500 gpm and 1,742 afy). There is no limitation on instantaneous withdrawal from any individual WBA source.

Within the SMBA, the City is authorized to pump a total of 2,755 gallons per minute (gpm) and 904 acre-feet per year (afy) from any combination of the 12 existing and two future source wells, plus any water pumped under permit G4-27784P (up 1,000 gpm and 1,613 afy) from future source wells completed in the SMBA, and source S10 (North Willoughby). Each SMBA source well is also limited to its historical instantaneous production rate. Provided in Table 3-29 is a summary of the maximum authorized instantaneous withdrawal rates from each SMBA well.

TABLE 3-29 INSTANTANEOUS PRODUCTION WATER RIGHT SUMMARY

Aquifer	Well Source No.	Historic Instantaneous Production Limit
SMBA	S01 – West Main	400 gpm
	S03 – Velma	1,000 gpm
	S04 – Orchard Tracts	600 gpm
	S06 – Euclid	240 gpm
	S07 – Olmstead A	325 gpm
	S08 – Appleway	200 gpm
	S10 – North Willoughby	500 gpm
	S11 – Highland	300 gpm
	S12 – Pecan A	190 gpm
	S16 – Olmstead B	325 gpm
	S17 – Ashael Curtis	600 gpm
	S18 – Pecan B	190 gpm
	Future Well A	250 gpm
	Future Well B	250 gpm

Grandview's water rights status as compared to its existing and future water system demands are shown in Table 3-30. The excess and/or deficiencies in the City's water rights are also shown in these tables.

TABLE 3-30 WATER RIGHT SELF ASSESSMENT

Water Right Permit, Certificate, or Claim #	WFI Source # (Aquifer)	Existing Water Rights				Current Source Production (2022)				10-Year Forecasted Source Production (2032)				20-Year Forecasted Source Production (2042)			
		Primary Q_i (gpm)	Non-Additive Q_i (gpm)	Primary Q_a (acre-feet)	Non-Additive Q_a (acre-feet)	Total Q_i (gpm)	Current Excess (Deficiency)	Total Q_a (acre-feet)	Current Excess (Deficiency)	Total Q_i (gpm)	10-Year Forecasted Excess (Deficiency)	Total Q_a (acre-feet)	10-Year Forecasted Excess (Deficiency)	Total Q_i (gpm)	20-Year Forecasted Excess (Deficiency)	Total Q_a (acre-feet)	20-Year Forecasted Excess (Deficiency)
1. 791-A	S02, S13, S14, 2 Future Wells (WBA)	1,000		1,210													
2. G3-20381[c]		700		784													
3. 1338-A	S01, S03, S04, S06, S07, S08, S10, S11, S12, S16, S17, S18, 2 Future Wells (SMBA)	600		0													
4. 4455-A		240		384													
5. 4456-A		325		520													
6. G3-20382		200		0													
7. G3-20383		300		0													
8. G3-20384		400		0													
9. G4-24086		190		0													
10. G4-25570		500		0													
11. G4-27784	S02, S13, S14, 2 Future Wells (WBA/SMBA)	2,500		1,613 / 1,742													
SUBTOTAL (WBA)		4,200		3,736		2,543	1,657	282.8	3,453.2	4,200	0	442.5	3,293.5	4,200	0	521.4	3,214.6
SUBTOTAL (SMBA)		3,755		2,517		756	2,999	120.9	2,396.1	1,099	2,656	189.6	2,327.4	1,099	2,656	223.5	2,293.5
TOTAL		6,955		4,640		3,299	3,656	403.7	1,350.40	5,299	1,656	632.1	1,122	5,299	1,656	744.9	1,009.20

Pending Water Right Applications

Application #	Applicant and Source Name	Application Type	Date Submitted	Quantities Requested			
				Primary Qi (gpm)	Non-Additive Qi (gpm)	Additive Qa (acre-feet)	Non-Additive Qa (acre-feet)
1. G4-29972	City of Grandview	New		1,600	–	–	–

[a] Permit G4-27784 authorizes use at all WBA source wells plus SMBA wells S10, Future Well A, and Future Well B. The permit authorizes annual withdrawals of up to 1,742 afy, however, due to limits on instantaneous withdrawals from approved SMBA source wells the maximum that could be exercised from the SMBA aquifer under this permit is 1,000 gpm and 1,613 afy.

[b] The existing instantaneous consumption is based upon the existing combined maximum well pump capacities and the existing annual consumption is based upon the combined 2020 annual volume pumped from each source well.

3.4.3 Storage Analysis

Reservoir facilities are necessary in a water utility's system to provide required storage in three critical areas:

1. Standby Storage: Adequate water reserves need to be maintained to meet the system's average daily demand in the event the largest water supply source is out of service. Standby storage may be "nested" within the fire suppression storage volume. Standby storage must be provided at a minimum pressure of 20 psi through the distribution system.

2. Fire Suppression Storage: Adequate water reserves need to be maintained to meet the system's highest fire flow requirement with no assistance from existing water supply sources and at a minimum pressure of 20 psi throughout the distribution system. Fire suppression storage may be "nested" within the standby storage volume.

3. Equalizing Storage: Adequate water reserves need to be maintained to meet that portion of the system's maximum instantaneous demand (peak hour), which exceeds the existing water supply source capacity. Equalizing storage must be available to all service connections at a minimum pressure of 30 psi.

Storage facilities also provide a volume of water for supply to the system between source pumping operations. This "operational" volume is established by each utility and is generally based on limiting, as much as practical, the number of pump cycles per hour.

Standby Storage: The purpose of standby storage is to provide a measure of reliability should sources fail or unusual conditions impose higher demands than anticipated. The DOH defines standby storage as the volume of stored water available for use during a loss of source capacity, power, or similar short-term emergency.

For communities with multiple sources of supply such as the City of Grandview, the DOH 2020 *Water System Design Manual* recommends the volume of standby storage should be calculated based upon the following equation:

Equation:

$$SB = (N)(SB_i)(T_d) \qquad (\textit{2020 Water System Design Manual,}\ \text{Equation 7-2})$$

Where,

SB = Total standby storage component (gallons, minimum recommended)
N = Number of ERUs based on the ERU_{MDD} value (gpd)
SB_i = Locally adopted unit SB volume in $\frac{gal}{(day)(ERU)}$ (ERUs based on the ERU_{MDD} value
T_d = No. of days selected to meet water system determined standard of reliability

DOH recommends standby storage be not less than 200 gallons times the number of ERUs, based on MDD (*2020 Water System Design Manual*, Page 103). However, for Grandview it is recommended that standby storage be calculated based the ADD number of ERUs because of the City's unique condition of industrial and residential peak demands occurring in different seasons. As can be seen in the data presented in Section 2.2.3 through 2.2.5, if the number of MDD ERUs is calculated during the industrial peak demand period (October), the demand per ERU will be artificially low at 274 gpd/ERU because residential demand is low, resulting in an excessively high number of ERUs and total required standby storage volume. Conversely, if the number of MDD ERUs is calculated during the residential peak (July), the demand per ERU will be reasonable at 538 gpd/ERU, but the calculated number of ERUs will be too low because

industrial demand is down, resulting in an unreasonably low standby storage volume. Standby storage in the City's previous WSP update was calculated based on 200 gallons per ERU because the City's well source capacity exceeded the volume required to serve two days of ADD with the largest pump out of service. The City's water system has multiple sources of supply, including sources with backup power capability, improving system reliability in an extended power outage condition. It should also be noted that industrial users will likely not be operating at peak capacity during an extended power outage. Therefore, when applying a recommended volume of 200 gallons per ADD ERU, the resulting standby storage requirements are as shown in Table 3-31.

TABLE 3-31 EXISTING AND FUTURE STANDBY STORAGE REQUIREMENTS

	2022	2032	2042
N **SB_i** x **T_d**	9,020 ERUs 200 gpd/ERU x 1 Day	11,182 ERUs 200 gpd/ERU x 1 Day	12,001 ERUs 200 gpd/ERU x 1 Day
Total Standby Storage Required	1,804,000 Gallons	2,236,400 Gallons	2,400,200 Gallons

Fire Suppression Storage: The DOH defines fire suppression storage as the volume of stored water available during fire suppression activities to satisfy minimum pressure requirements per WAC 246-290-230. A volume of storage for fire suppression has been established based on fire flow ratings of various structures within Grandview. The storage required is 1,440,000 gallons, which will allow a demand of 6,000 gpm for a 4-hour duration. The fire suppression demand was established by the Grandview Fire Department due to building type and size and assumes the City will utilize generators if sources should lose power. A letter from the Grandview Fire Department approving this demand is in CHAPTER 10. The DOH minimum fire flow requirement for industrial areas is 1,000 gpm for 60 minutes. The volume of storage necessary to maintain a flow of 6,000 gpm for a 4-hour duration for fire protection is 1,440,000 gallons, which exceeds the DOH industrial requirement of 1,000 gpm for 60 minutes, or 60,000 total gallons (*WAC 246-293-640*) and will, therefore, be used for fire suppression storage planning purposes.

Equalizing Storage: The DOH defines equalizing storage as the volume of storage needed to supplement supply to consumers when the peak hourly demand exceeds the total source pumping capacity. The DOH design method for calculating equalizing storage is 150 times the difference between the system's peak hour demand (PHD) in gpm and the total source production rate in gpm. Based on this method, the current and future equalizing storage requirements for Grandview are as shown in Table 3-32.

TABLE 3-32 EXISTING AND FUTURE EQUALIZING STORAGE REQUIREMENTS

	Year 2022	Year 2032	Year 2042
Peak Hour Demand (gpm)	5,702	6,664	7,152
Total Source Capacity (gpm)	3,299	5,299	5,299
Subtotal (gpm)	2,403	1,365	1,853
DOH Multiplier (minutes)	x 150	x 150	x 150
Total Equalizing Storage Required (MG)	0.360	0.205	0.278

Operational Storage: The DOH defines operational storage as the volume of distribution storage associated with source or booster pump normal cycling times under normal operating conditions and is additive to the equalizing and standby storage components, and to fire flow storage if this storage component exists for any given tank. Currently, the City of Grandview operates its lead source within the upper 5 feet of the water level in the reservoirs. This corresponds to a volume of approximately 250,600 gallons, or 30 gallons per ERU_{ADD} (8,336 for year 2022) for normal operational storage. The operational storage volume required to avoid excessive pump cycling only needs to be enough to limit the number of pump starts to six per hour. Considering 2022 MDD, the source pumps would turn on only once every 115 minutes, and once every 198 minutes during ADD. The same operational storage levels will be sufficient to meet 20-year MDD projections, while keeping source pump start cycles within an appropriate range of approximately 40 minutes.

If the City were to use the upper 3 feet for operational storage, the storage volume would be 150,336 gallons, or 18 gallons per ERU_{ADD} (8,336 for year 2022) for normal operational storage. Considering 2022 MDD, the source pumps would turn on only once every 51 minutes, and once every 119 minutes during ADD.

Total Storage: Table 3-33 summarizes the year 2022 and future storage requirements for the water system. The City's existing storage capacity is sufficient to meet current and projected storage requirements for year 2022. However, the future total storage requirement for the years 2032 and 2042 exceeds the current storage capacity above the required minimum service pressure 20 psi. Table 3-33 shows that the storage capacity above the minimum required 20 psi is sufficient for the current year through year 2042.

TABLE 3-33 CURRENT AND FUTURE STORAGE REQUIREMENTS
(all storage values are in millions of gallons)

	Year 2022 Requirements	Year 2032 Requirements	Year 2042 Requirements
Standby Storage* (MG)	1.804	2.236	2.400
Fire Suppression Storage* (MG)	1.44	1.44	1.44
Equalizing Storage (MG)	0.360	0.205	0.278
Operational Storage (MG)	0.251	0.251	0.251
Total Storage Required (MG)	2.415	2.692	2.929
Total Storage Capacity Above 20 psi (MG)	2.474	2.474	2.474
Total Storage Capacity Above 30 psi (MG)	1.619	1.619	1.619
Storage Excess/Deficiency (MG)	0.058	-0.219	-0.456
* Standby Storage will be nested with Fire Suppression Storage.			

Further evaluation of storage is recommended in the future to determine when/if additional volume is required.

3.4.4 Fire Flow

The demand fire flows place upon a water system is typically the most significant element when analyzing the piping network. Every water system which is required to have a Water System Plan must address fire flow. At a minimum, a water utility must comply with fire flow standards shown in Table 3-34, established by the DOH. A community may, however, develop its own standards as long as they exceed the DOH minimum requirements.

TABLE 3-34 DOH MINIMUM FIRE FLOW REQUIREMENTS	
Land Use Type	Flow Requirement
Residential	500 gpm for 30 minutes
Commercial and Multi-Family	750 gpm for 60 minutes
Industrial	1,000 gpm for 60 minutes
Source: *WAC 246-293-640*	

The City of Grandview has developed desired fire flows for major structures within the City based on the standards of the Washington Survey and Rating Bureau and the Insurance Services Office (ISO) peak fire flow guidelines. In addition, the Grandview Fire Department analyzed fire flow requirements of select buildings based on the *2012 International Fire Code*. Results of the analysis have been used to generate desired fire flow capacities for areas within the City.

In Grandview, the greatest fire flow requirements are within industrial areas, with isolated large demands at locations such as the Kenyon Zero Storage Facility. Fire flow requirements were used to develop Figure 3-4, which shows the locations of required minimum fire flow and the actual calculated fire flow capacity at selected locations within those areas. The Grandview Fire Department has requested that all locations without a specified minimum fire flow range have a minimum fire flow capacity of 1,000 gpm.

A computer hydraulic analysis was used to determine the existing fire flow capacities at certain locations shown in Figure 3-4. The hydraulic analysis parameters are discussed later in Section 3.6. As can be seen in Figure 3-4, the greatest fire flow requirements are within the industrially and commercially zoned areas and at public schools. It can be seen in Figure 3-4 that most all locations throughout the distribution system are able to provide the required minimum fire flow capacities. Recommended system improvements to correct any fire flow deficiencies are discussed further in CHAPTER 8.

CITY OF GRANDVIEW

Water System Plan Update

YEAR 2022 MAX DAY DEMAND FIRE FLOW CAPACITIES MAP

N
W E
S

0 750 1500

LEGEND

CITY LIMITS

FUTURE SERVICE AREA

FIRE FLOW RANGE	EXISTING CAPACITY	REQUIRED FLOW
≤ 500 GPM	⊗	
500-1000 GPM	●	MINIMUM 1000 GPM
1000-2000 GPM	●	
2000-3000 GPM	●	
3000-4000 GPM	●	
4000-5000 GPM	●	
5000-6000 GPM	●	
6000-7000 GPM	●	
≥ 7000 GPM	●	

CITY OF GRANDVIEW

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FIGURE 3-4

3.4.5 Hydraulic Analysis

A hydraulic analysis of a water utility system is a method of calculating pressures and flows throughout the distribution network under various conditions of demand at a given instant. Since the advent of personal computers, hydraulic analyses are typically performed by utilizing computer programs which model the piping, reservoir, pumps and specialty valves of a given water system.

Numerous computer programs have been developed for performing network analyses. The program utilized for the modeling and analysis of the City of Grandview water system is called WaterCAD (Version 10.00.18.22), distributed by Bentley Systems, Inc. WaterCAD can perform instantaneous and extended period simulations of complete distribution networks including reservoirs, source pumps, booster pumps, pressure reducing valves, pressure sustaining valves, check valves, flow control valves, pressure switches, and up to 1,000 pipes and 1,000 nodes (pipe junctions).

The program utilizes Genetic Algorithm calculations (Darwin modules) to solve the pressure networks. All water system components are entered into the computer, supply rates and user demand inputs, and reservoir water levels are established. Once this base information has been loaded, various options such as increasing system demand, lowering reservoir levels, shutting off source pumps, adding system improvements, and simulating fire flow conditions can be analyzed for their impact on the system.

3.4.5.1 Assumptions

To analyze the water system at a given moment in time, it is necessary to assume certain existing conditions and to program the status of key system components. The following general assumptions have been made for the hydraulic analysis of the City of Grandview water system:

- Roughness coefficients (C values) for most eight-inch or larger pipes were assumed to be 120. Pipes six-inch or smaller were assumed to have a C value equal to 110. Known old or poor condition pipes were assumed at C=100.
- Nominal pipe diameters were input for inside pipe diameters.
- Node elevations are based on available contour and topographic survey elevations.

Table 3-35 identifies the specific parameters used in the hydraulic analysis performed for existing and future peak hour demand (PHD) and for existing and future fire flow capacities at 20 psi residual pressure during maximum day demand (MDD) conditions. The PHD hydraulic analysis assumes that all primary source wells are operating, and the equalizing storage volume has been depleted from all tanks. The fire flow analysis, during MDD, assumes that the starting elevation in all tanks is with equalizing and fire suppression storage depleted. The fire flow analysis also assumes that all source wells are operating.

Initial elevations for the hydraulic analysis are calculated from the current and future reservoir pump-off elevations to represent current and future maximum storage conditions. The operational storage range and volume can be operator-adjusted based upon current demand, but the elevations (volumes) used represent normal operating conditions. Lower or higher initial water elevations could affect the calculated results.

TABLE 3-35 HYDRAULIC ANALYSIS PARAMETERS

Water System Feature	Hydraulic Analysis Scenario			
	Year 2022 Fire Flow w/MDD [a] (2,556 gpm)	Year 2022 Peak Hour Demand [b] (5,702 gpm)	Year 2042 Fire Flow w/MDD [a] (3,786 gpm)	Year 2042 Peak Hour Demand [b] (7,152 gpm)
3.017 MG Reservoir Levels				
Maximum Elevation	941.6 Ft.	941.6 Ft.	941.6 Ft.	941.6 Ft.
Initial Elevation	898.4 Ft.	929.4 Ft.	916.6 Ft.	933.6 Ft.
Floor / Minimum Elevation	855.0 Ft.	855.0 Ft.	855.0 Ft.	855.0 Ft.
0.544 MG Reservoir Levels				
Maximum Elevation	941.6 Ft.	941.6 Ft.	941.6 Ft.	941.6 Ft.
Initial Elevation	916.6 Ft.	933.6 Ft.	916.6 Ft.	933.6 Ft.
Floor / Minimum Elevation	906.0 Ft.	906.0 Ft.	906.0 Ft.	906.0 Ft.
Source Well Status				
West Main (S01)	135 gpm	135 gpm	135 gpm	135 gpm
Balcom (S02)	268 gpm	268 gpm	268 gpm	268 gpm
Velma (S03)	102 gpm	102 gpm	102 gpm	102 gpm
Euclid (S06)	30 gpm (Off)	30 gpm (Off)	30 gpm (Off)	30 gpm (Off)
Olmstead A (S07)	180 gpm (Off)	180 gpm (Off)	180 gpm (Off)	180 gpm (Off)
Appleway (S08)	0 gpm	0 gpm	0 gpm	0 gpm
North Willoughby (S10)	315 gpm	315 gpm	315 gpm	315 gpm
Highland (S11)	42 gpm	42 gpm	42 gpm	42 gpm
Pecan A (S12)	0 gpm	0 gpm	0 gpm	0 gpm
South Willoughby (S13)	1,000 gpm	1,000 gpm	1,000 gpm	1,000 gpm
Butternut (S14)	1,275 gpm	1,275 gpm	1,275 gpm	1,275 gpm
Olmstead B (S16)	40 gpm (Off)	40 gpm (Off)	40 gpm (Off)	40 gpm (Off)
Ashael Curtis (S17)	92 gpm	92 gpm	92 gpm	92 gpm
Pecan B (S18)	70 gpm	70 gpm	70 gpm	70 gpm
Future Wells	N/A	N/A	2,000 gpm	2,000 gpm
Total Supply	3,299 gpm	3,299 gpm	5,299 gpm	5,299 gpm

[a] Equalizing and Fire Suppression Storage depleted.
[b] Equalizing Storage depleted.

3.4.5.2 Analysis Scenarios

The existing water system was first analyzed considering a present peak hour demand of 4,771 gpm, based on the total calculated peak hourly flow on October 21, 2014. All nodes providing domestic service within the system did so with a minimum residual pressure of 30 psi or greater with all source pumps in operation. Pipe velocities remained below the eight (8) feet per second (FPS) maximum velocity design parameter. A copy of the computer printouts of this scenario and all other hydraulic analyses results discussed in this section are provided in CHAPTER 10. Map B, in CHAPTER 10, shows the computer model with the pipe and node numbers for identification.

A future PHD analysis was run on the system using the PHD for the year 2042 of 6,520 gpm. This scenario was conducted with the year 2042 equalizing storage volume depleted. All service pressures were greater than 30 psi and pipe velocities were below eight (8) FPS with all source pumps in operation.

Fire flows were considered at all hydrant locations throughout the pipe network while assuming year 2022 system consumptive demand of 2,650 gpm, based on the total calculated MDD on October 21, 2014. The computer hydraulic model was used to calculate the maximum flow attainable at designated hydrant nodes while providing a positive pressure of 20 psi. Equalizing and fire suppression storage were depleted at the start of the fire flow analysis. The resulting fire flow capacities are shown in Figure 3-4, along with the fire district requested fire flow capacities as previously discussed. Several locations were calculated to be deficient in meeting the specified fire flow capacities, as shown in Figure 3-4. A future fire flow analysis was performed on the system with the 2042 maximum day demands to verify adequate fire flow capacity is available. Again, the same locations were calculated to be deficient in meeting the current fire flow requirements.

3.4.5.3 Model Calibration

The City of Grandview has performed fire flow tests at fire hydrants in several different areas of the City under normal operating conditions. These fire flow tests were compared to the computer model under an average day demand scenario with the initial reservoir levels listed in Table 3-35. Ideally, the pressure test results would be compared to a computer model under average day demand with reservoir levels set to the actual reservoir levels at the time of testing, but reservoir levels from the time of testing were not available. Pressures from fire hydrant nodes in the model were generally within five psi of the test pressure readings, verifying that actual system pressures are comparable to the calculated pressures of the computer model. Samples of fire flow test results are compared with fire flow model results shown in Table 3-36.

Available Fire flow was calculated using the measured pressures and flows from the field tests. Fire flow in gpm at 20 psi of residual pressure was calculated using the following equation (simplified Hazen Williams):

$$\text{Available Fire Flow @ 20 psi Residual} = \text{Total Fire Flow} \times \sqrt{\frac{\text{Static Pressure} - 20\ \text{psi}}{\text{Static Pressure} - \text{Residual Pressure}}}$$

It is recommended that updated pressure and flow tests be conducted in the future by the City Fire Department at representative locations throughout the distribution system including noting reservoir levels, to calibrate future system models and provide updated system information for future fire insurance assessments more accurately.

TABLE 3-36 FIRE FLOW MODEL CALIBRATION RESULTS

Flow Test No.	Test Year	Location		Field Test Results			Model Results		
			Node No.	Static Pressure (psi)	Residual Pressure (psi)	Fire Flow @ 20 psi (gpm)	Static Pressure (psi)	Residual Pressure (psi)	Fire Flow @ 20 psi (gpm)
1	2009	501 Stover Rd.	J-9	86	78	4,228	78.2	76.6	3,888
2	2011	2200 Hill Dr.	J-493	62	54	2,431	56.9	52.2	2,214
3	2011	509 Meadowlark Rd.	J-438	58	54	3,666	53.6	51.7	3,547
4	2011	Missouri & W. Concord	J-408	44	34	1,142	40.3	35.1	1,062
5	2010	Nicka & Broadview Dr.	J-308	65	48	1,554	60.5	55.9	1,526

[a] At 20 psi residual pressure.
Note: See Map B for Junction Node Locations.

3.4.6 Capacity Analysis Summary

Provided in Table 3-37 is a summary of the year 2022, 2032, and 2042 projected water system demands for the City of Grandview, including ERUs for ADD and MDD. The values in Table 3-37 are calculated from the forecasted water system demands provide in Section 2.4. All values include a 10% contingency.

TABLE 3-37 CURRENT AND FUTURE WATER SYSTEM DEMAND SUMMARY

Year	$ERUs_{ADD}$	$ERUs_{MDD}$	Total Annual Demand (MG/Year)	ADD (MGD)	MDD (MGD)	PHD (gpm)
2022	9,020	17,030	665.393	1.823	4.216	5,702
2032	11,182	20,030	824.748	2.260	4.960	6,664
2042	12,001	21,498	893.917	2.425	5.324	7,152

The system's current and future physical capacity (ERUs), in terms of water rights, source capacity, and storage capacity is summarized in Table 3-38.

The water rights physical capacity in Table 3-38 is based on comparing the ADD per ERU to the current and/or future total annual (Q_a) water right quantity and the MDD per ERU to the current and/or future total instantaneous (Q_i) water right quantity. Similarly, source physical capacity is based on comparison of the MDD per ERU to the current well pump capacity.

The storage physical capacity in Table 3-38 is based on two of the primary storage components, equalizing storage (ES) and standby storage (SB). Physical capacity of the City's reservoirs is not based upon operational storage (OS) or fire suppression storage (FSS) because these normally do not change with the number of ERUs. DOH equations were used to determine ES and SB storage ERU physical capacity, except for the SB storage equation, which is based on the ERU_{ADD} value instead of ERU_{MDD} value, as described in Section 3.4.3. Current and future ES and SB storage capacities are calculated from the following equations:

Equation:

$$ES = [PHD - Q_s](150\ min.) \qquad (\textit{2020 Water System Design Manual}, \text{Equation 7-1})$$

Where,

ES = Equalizing storage component (gallons)
PHD = Peak hourly demand per ERU (0.34 gpm, see Table 2-10)
Qs = Total flow of all permanent sources (gpm)

Equation:

$$SB = (N)(SB_i)(T_d) \qquad (\textit{2020 Water System Design Manual}, \text{Equation 7-2})$$

Where,

SB = Total standby storage component (gallons, minimum recommended)
N = Number of ERUs based on the ERU_{ADD} value
SB_i = Locally adopted unit volume in $\frac{gal}{(day)(ERU)}$ (ERUs based on ERU_{ADD} value, $SB_i = 200$)
T_d = No. of days selected to meet water system − determined std. of reliability ($T_d = 2$)

Since *N* and *ES* are unknown, the above equations were rearranged and the equation for total storage (TS = OS+ES+SB+FSS) and 0.34 for PHD per ERU were used to yield the following equation which solves for the existing and/or future ERU capacity (N):

Equation:

$$N = \frac{TS - OS + 150Q_S - FSS}{260}$$

Where,

TS = Total Storage (gallons)
OS = Operational Storage (gallons)
FSS = Fire Suppression Storage (gallons)
N = Number of ERUs
Q_s = Total flow of all permanent sources (gpm)

Water systems can exclude the SB or FSS component, whichever is smaller, from a water system's total storage requirement if the local fire authority approves "nesting," and Grandview's Fire Department has elected to do so. Because Grandview has a very high FSS volume requirement (1,440,000 gallons), the SB volume was initially nested within the FSS volume. However, as service demands increase, the SB becomes the controlling storage volume required. When nesting the SB volume within FSS volume (*SB* + *FSS* = *FSS*), the ERU capacity equation is reduced to the following:

$$N = \frac{TS - OS + 150Q_S - FSS}{60}$$

When nesting the FSS volume within SB volume (*SB* + *FSS* = *SB*), the ERU capacity equation is reduced to the following:

$$N = \frac{TS - OS + 150Q_S}{260}$$

Table 3-38 summarizes the water system capacity, in ERUs, based on current supply (water rights), source, and storage capacity. Projected system demands and calculated system capacities shown in other tables are based on demand per service and do not directly correlate to the calculated demand per ERU for all service categories under different demand conditions (e.g. ADD, MDD, PHD). Values shown in Table 3-38 are therefore, only estimates based upon calculated demands per ERU for ADD, MDD, and PHD from historical source and supply meter records. Further system analysis should be performed to determine the system's available capacity with regard to proposed development type (i.e. type of service category) to account for variations in average and peak demands of individual service categories.

TABLE 3-38 ERU PHYSICAL CAPACITY SUMMARY (DOH WORKSHEET 4-1)

Water System Connections Correlated to ERUs

Service Classification	Total for the classification (gpd)		Total # Connections in the classification	$ERUs_{ADD}$	$ERUs_{MDD}$
	ADD	MDD			
Residential					
Single-Family Residential	508,194	627,231	2,289	2,289	2,289
Single-Family Residential - Outside	21,153	25,616	89	98	89
Mobile Home Units	75,818	113,099	419	335	419
Apartment Units	99,997	134,611	481	433	481
Nonresidential					
Commercial	93,035	173,254	237	427	712
Industrial	955,367	3,017,916	39	4,305	11,023
Government	69,428	123,862	78	312	469
DSL (10%)[a]	182,299	421,559	N/A	821	1,548
Total 2022 ERUs (Residential + Nonresidential) =				9,020	17,030

Physical Capacity as ERUs

Water System Component (Facility)	Current Maximum System Capacity	Required Capacity			Calculated ERU Capacity for Each Component
		2022	2032	2042	
Sources All sources = 3,299 gpm w/largest source out of service = 2,024 gpm	4.751 MGD 2.915 MGD	4.216 MGD 2.380 MGD	4.960 MGD 3.124 MGD	5.324 MGD 3.488 MGD	17,338 ERU_{MDD} 13,129 ERU_{ADD}
Equalizing Storage (ES)[c]	0.369 MG	0.360 MG	0.205 MG	0.278 MG	17,242 ERU_{MDD}
Standby Storage (SB)[c]	1.846 MG	1.804 MG	2.236 MG	2.400 MG	9,281 ERU_{ADD}
Water Rights Q_a = 4,640 ac-ft Qi = 6,955 gpm	 1,511.8 MG 10.015 MGD	 131 MG 1.040 MGD	 206 MG 1.247 MGD	 243 MG 1.467 MGD	 18,657 ERU_{ADD} 36,552 ERU_{MDD}

Water System Physical Capacity (ERU_{ADD}) = 9,281 ERUs, limited by standby storage capacity[b]

[a] 10% shown because 3-yr average for the City is negative as described in Section 2.3.
[b] Grandview is limited by source capacity not meeting minimum reliability criteria as discussed in Section 3.4.1. Following rehabilitation of existing sources and development of new sources, the water system physical ERU capacity will be limited by Standby Storage (SB). Fire suppression storage is nested within SB storage.
[c] MDD per ERU for October 2014 = 274 gallons. ADD per ERU = 222 gallons. Total of 0.058 MG storage available until current system maximum capacity reached.
Water system physical capacity (ERU_{ADD}) = 9,281 ERUs, limited by standby storage.

Table 3-38 shows that of the existing system components, well capacity and water storage are the limiting factors in determining the physical capacity of the City of Grandview water system. Well capacity and water storage improvements are addressed in CHAPTER 8.

3.5 SUMMARY OF SYSTEM DEFICIENCIES

The following is a listing and brief description of deficiencies which have been identified in the present water system. The deficiencies have been grouped within three system categories (supply, storage, and distribution) and are generally placed in order of their importance. The deficiencies may be operational in nature (which have been identified by the City's Water Department personnel) or maintenance related, inadequate present or future capacities, and/or system hydraulics problems.

3.5.1 Supply

Water Quality – Grandview currently adds chlorine for treatment of its groundwater sources. The water quality monthly analysis results for the years 2015 through 2021 were reviewed to determine exceedances of the Maximum Contaminant Level (MCL) for the primary and secondary drinking water standards. In general, the City's water quality complies with State standards, except for nitrate levels in Sources S07 and S10. As mentioned previously, all source wells are tested individually, though some sources are blended prior to entering the distribution system. Blending allows wells with higher nitrate concentrations to combine with wells having lower nitrate concentrations to meet MCL standards. Blending occurs at Sources S07 Olmstead A and S16 Olmstead B, and at Sources S10 North Willoughby and S13 South Willoughby. These source wells are plumbed with isolation valves to allow individual and blended testing. Recently the capacity of S16 has diminished to the point that blending with S07 does not bring nitrate levels below the MCL. Rehabilitation of S16 to increase its capacity is recommended as the initial step to continue blending these sources to maintain acceptable nitrate levels. If rehabilitation of S16 is not successful, the City may want to consider construction of a transmission main to blend S07/S16 with S10 and S13.

The City also has a history of iron bacteria and similar organisms that cause severe biofouling and encrustation of pumping equipment, well screens, and casings, leading to taste and odor issues and declines in well performance and pumping capacity. Routine chemical cleaning, redevelopment, and rehabilitation of the City's wells and pumping equipment is essential to maintaining reliable source well capacity and acceptable water quality.

Water Rights – Currently, Grandview has annual rights (Q_a) of 4,640 acre-feet per year and instantaneous rights (Q_i) of 6,955 gpm. As discussed in Section 3.4 , current water rights are adequate to supply existing and projected year 2042 demands. Should population trends and demand projections change, the water rights may be exceeded by year 2042.

Industrial water consumption is still the highest among all user categories and projected future demands will need to be closely monitored by the City.

Source Well Capacity – Grandview's source wells have decreased in capacity since original construction and previous rehabilitation projects. If all source wells were to operate at original capacity, total production would equal 5,420 gpm. However, the current system source well capacity is 3,299 gpm. Well performance issues due to water quality and biofouling issues are the primary causes of the decline in well capacity. The year 2022 source capacity is adequate to meet current and anticipated average day and maximum day demands. Rehabilitation of existing wells and construction of new wells will both be necessary within plan approval period to increase the total system pumping capacity.

Source Well Reliability – The DOH *Water System Design Manual* recommends on-site back-up power equipment be installed at the water system sources to improve system reliability. The City of Grandview currently has back-up power equipment at four of its existing source wells (S01, S10, S12/S18, and S13). The source wells with back-up power can deliver 1,620 gpm, which equates to approximately 2.33 MGD in the event of a long-term power outage. Back-up power at additional water system sources should be considered to increase the capacity of water supplied in an extended power outage. New well sources are anticipated to be equipped with back-up power equipment.

Protective Covenants – Though the City owns all its well sites, not all source wells have a "Declarations of Covenant" establishing the required 100-foot sanitary radius of protection around the well. Well sources still needing "Declarations of Covenants" established are: S02 (Balcom & Moe), S06 (Euclid), S10 (North Willoughby), S11 (Highland), S13 (South Willoughby), S14 (Butternut), and S18 (Pecan B). The City needs to execute and record "Declarations of Covenant" for each of the source wells.

3.5.2 Storage

Storage Capacity – The City's reservoir storage capacity sufficient for current demands, but inadequate to meet projected demand. Based on projected growth, additional water storage capacity will be needed to meet year 2032 system demands and associated storage requirements.

Reservoir Cleaning and Maintenance – Both City reservoirs should be inspected and cleaned, based on a five-year maintenance cycle. The standpipe reservoir was last cleaned and inspected in 2019. The tank interior was last painted in 1989 and the exterior was last painted in 1995. During inspection, signs of severe corrosion and rusting were observed on the tank interior and the exterior coating is showing signs of weathering. The standpipe reservoir coating is beyond its expected useful life of 20 to 30 years and should be recoated within the next few years to prevent structural damage and extend the life of the tank. The elevated reservoir was last rehabilitated in 2007, including interior and exterior painting, new hatch, catwalk, and overflow modifications.

3.5.3 Distribution

Fire Flow Capacity – Figure 3-4 identifies existing system fire flow capacities along with the minimum fire flow requirements for regions within the City. As shown on the figure, some locations are deficient based on the computer hydraulic model. Refer to Figure 8-1 for suggested improvements to address deficiencies.

Water Main Upsizing and Replacement – Most of the fire flow deficiencies identified in Figure 3-4 can be addressed by upsizing water mains. Suggested Improvements for water main upsizing are shown in Figure 8-1.

3.5.4 Telemetry

Grandview's telemetry control system software and human machine interface (HMI) computer was last updated in 2015. The telemetry control system programmable logic controllers (PLCs) and radios were installed in 2005 and have not been updated since their original installation. The expected useful life of telemetry control system computers and software is five to seven years, and the expected useful life of PLCs and radios is 10 to 15 years. It is recommended that the City's telemetry system be updated in the next few years to maintain system reliability. Improvements will be as discussed in CHAPTER 8.

3.6 SELECTION AND JUSTIFICATION OF PROPOSED IMPROVEMENT PROJECTS

The following discussion identifies recommended system improvements proposed to eliminate or reduce deficiencies described in the previous section. References to prioritized improvements specified in Section 8.2 and Section 8.3 are provided. Further description of the water system improvements is provided in CHAPTER 8 of the Plan.

3.6.1 Supply

Source Well Capacity/Quality – Most of the source wells are operating at a lower capacity than when originally constructed. The wells drawing from the Wanapum aquifer have experienced a greater reduction in capacity than those drawing from the Saddle Mountain aquifer. Rehabilitating or reconstructing the wells will improve the capacity and quality of water entering the water system. The City's water rights allow for future wells, which will add to the capacity as well. **[O&M Improvement Nos. 2, 3, 4, 6, 7, 8, 10, 11, 13 through 17, and Capital Improvement Nos. 1, 4, 5, 6, 20, 21]**

3.6.2 Storage

Reservoir Cleaning and Maintenance – Routine cleaning and inspection of the City's water storage reservoirs are necessary to maintain water quality and monitor structural integrity. The City's 3.0 MG reservoir is in need of recoating to address signs of corrosion on the interior coating and weathering on the exterior coating. The existing reservoir coating is beyond its expected useful life of 20 to 30 years and is in need of recoating to preserve water quality and structural integrity. The 0.5 MG reservoir is due for cleaning and inspection. **[O&M Improvement Nos. 1, 5, 9, and 18]**

Storage Capacity – To meet the 20-year projected demand, additional storage capacity is necessary. A new reservoir including transmission main is necessary to meet projected demands and associated storage volumes. **[Capital Improvement No. 2]**

3.6.3 Distribution

Water Main Upsizing and Replacement – As shown in Figure 3-4, there are multiple locations where the required fire flow is not met. Upsizing water mains in these locations will improve fire flow and water pressure. Although there are several additional locations in the City in need of water main replacements due to leakage and corrosion, the improvement locations were limited to critical improvements for fire flow requirements. **[Capital Improvement Nos. 3, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 18]**

Fire Flow Capacity – As shown in Figure 3-4, there are multiple locations where the required fire flow is not met. Looping water mains at dead ends in these locations will improve fire flow and water quality. **[Capital Improvement Nos. 16, 17, and 19]**

CHAPTER 4 -

WATER USE EFFICIENCY (WUE) PROGRAM

HLA
Engineering and Land Surveying, Inc.

4.1 WATER USE EFFICIENCY PROGRAM (WUE)

4.1.1 Planning Requirements

In 2003, the Washington State Legislature passed the Municipal Water Supply-Efficiency Requirements Act (commonly called the Municipal Water Law) as part of a multi-year effort to reform the state's water laws. The act requires all municipal water suppliers to use water more efficiently in exchange for water right certainty and flexibility to meet future water demands. The Legislature directed the DOH to adopt a rule that establishes water use efficiency requirements for all municipal suppliers. The Water Use Efficiency (WUE) Rule, which became effective on January 22, 2007, includes the following key items:

- WUE Program – This element of the rule requires the collection of water production and consumption data, forecast of future water demands, evaluation of system leakage, evaluation of water rate structures, and the implementation of WUE measures. This Program is a required element of all Water System Plans prepared after January 22, 2008.

- Distribution System Leakage (DSL) Standard – Municipal water suppliers with 1,000 or more connections are required to satisfy a DSL standard equal to 10% or less of total production by July 1, 2010.

- WUE Goal Setting and Performance Reporting – Municipal water suppliers are required to set WUE goals through a public process and report annually on their performance to customers and to DOH. For water systems with 1,000 or more connections, the deadline for establishing systems goals was July 1, 2009. WUE goals must be established through a public process for a six-year period and should be re-evaluated each cycle.

The rule requirements and compliance deadlines are shown in Table 4-1.

TABLE 4-1 WATER USE EFFICIENCY RULE REQUIREMENTS

Requirement	Deadlines	
	1,000 or more Connections	Under 1,000 Connections
Begin Production & Consumption Data Collection	January 1, 2007	January 1, 2008
Establish WUE Goals	July 1, 2009	July 1, 2010
Include WUE Program in Planning Documents	January 22, 2008	January 22, 2008
Submit First Annual Performance Report	July 1, 2008	July 1, 2009
Submit Service Meter Installation Schedule	July 1, 2008	July 1, 2009
Meet DSL Standard	July 1, 2010	July 1, 2011
Complete Installation of all Service Meters	January 22, 2017	January 22, 2017

A WUE Program is one requirement of the WUE Rule. All Water System Plans submitted to the DOH after January 22, 2008, are required to include a WUE Program. WAC 246-290-810(4) requires municipal water suppliers to include the following items in their WUE program:

- Description of the current water conservation program including an estimation of water saved through program implementation over the last six years;
- Description of the chosen WUE goals;
- Evaluation and implementation of WUE measures;
- Projected water savings;
- Customer education;
- WUE program effectiveness; and
- DSL evaluation.

4.1.2 Current Water Conservation Program

Grandview's current Water Conservation Program, or Water Use Efficiency (WUE) Program, was prepared in November 2015. As part of this *Water System Plan*, the City's current WUE Program was expanded and restructured in accordance with WAC 246-290-810(4) and consists of the following elements:

- Water Use Efficiency Goals
- Evaluation and Implementation of Water Use Efficiency Measures
- WUE Measure Implementation
- Customer Education
- Water Use Efficiency Program Effectiveness
- Distribution System Leakage (DSL) Evaluation

Provided in Table 4-2 is a summary of the population, number of water services, water consumption, and per capita water consumption from 2014 to 2020. Further information on historical water use is provided in (Table Below). Since 2014, total system annual water consumption has increased by approximately 2.5%. Annual residential demand and demand per service per day shows a decreasing trend from 2014 to 2017, and an increasing trend from 2017 to 2020.

TABLE 4-2 WATER CONSUMPTION INFORMATION 2014-2020							
Year	Population[a]	Total Water Services[b]	Annual Water Production (MG)	Annual Water Consumption (MG)	Annual Residential Consumption (MG)	Residential Water Services	Residential Avg. Day Consumption per service (gal/service/day)
2014	11,170	2,904	633.19	630.50	255.35	2,609	221
2015	11,200	2,744	645.00	603.29	253.77	2,515	216
2016	11,160	2,761	617.36	595.41	247.68	2,533	206
2017	11,170	2,750	611.53	616.15	239.29	2,533	200
2018	11,180	2,759	578.48	663.61	250.56	2,542	210
2019	11,200	2,837	613.87	673.94	252.20	2,581	211
2020	11,230	2,889	641.31	634.19	259.89	2,607	220

Note: Residential water services represents Single-Family Residential user category only.
[a] From Washington State OFM population estimates.
[b] City began recording total accounts vs accounts with consumption in 2015.

The City's 2008 *Water Use Efficiency Program* included a goal to reduce total water consumption from 2015 to 2021 by 10 million gallons. The City's goal was first met in 2016 and since, the City has sustained the 25-million-gallon reduction from the 2008. Since producing 672.29 MG in 2008, annual production has decreased to 641.31 MG in 2020, an overall decrease of 4.8%. It should be noted that from 2017 to 2020, source meter issued developed in South Willoughby (Well S13) resulting in greater consumption than production.

Since 2015, the City has replaced several water service lines, valves, and distribution mains that were suspected to be leaking. These efforts have assisted in reducing the difference between water production and consumption volumes.

4.1.3 Water Use Efficiency Goals

WUE goals are an integral component of the WUE program, setting the groundwork for more efficient use of water. The City of Grandview has observed reductions in single-family residential consumption per service through past conservation measures, resulting in less production. Therefore, the City of Grandview has proposed the following WUE goals for their water system:

1. The City of Grandview's water system will work towards reducing total consumption by 2% during the 10-year reporting period of 2022 - 2032.

The WUE goals will be presented at a public study session to be adopted by City Council. Documentation of the public forum is included in CHAPTER 10. Adoption of the above WUE goal is expected to improve system performance and consequently reduce water production volumes.

4.1.4 Evaluation and Implementation of Water Use Efficiency Measures

Water use efficiency (WUE) measures are necessary actions taken to attain a water system's established efficiency goals. Measures are intended to support the WUE program and should address both supply and demand efficiencies. For this reason, the WUE measures that have been evaluated and/or implemented are separated into two primary categories, demand side and supply side measures. All the selected WUE measures pertaining to Grandview's WUE goals were presented to the public during the goal setting process.

Demand Side Measures

Municipal water systems are required to evaluate or implement a specified number of demand side water use efficiency (WUE) measures based upon the size of the water system. Table 4-3 shows the minimum number of measures required to be evaluated or implemented by the City of Grandview.

TABLE 4-3 WATER USE EFFICIENCY MEASURES

Number of Service Connections	Number of Water Use Efficiency Measures to be Evaluated
Less than 500	1
500 - 999	4
1,000 – 2,499	5
2,500 – 9,999	6 (Grandview's current requirement)
10,000 – 49,999	9
Greater than 50,000	12

A discussion of the demand side measures that the City of Grandview has evaluated to achieve its specified efficiency goal are provided below, along with the estimated costs to implement the measures and the projected water savings. Evaluation of the following measures for cost-effectiveness is primarily based upon the overall implementation costs as compared to the amount of potential water savings.

Water Conservation School Career Days Outreach Program – Once a year, the City of Grandview's Water System Operator will attend the local school's Career Day and teach children about the many ways to protect and conserve the City's water resource. This activity involves preparation of educational programs for school children targeted to increase awareness of local water resources and encourage water conservation practices, and includes school presentations, preparation of curriculum material, and tours of water system facilities. Costs associated with this measure would primarily be in preparation of curriculum material, and time involved in working with the school district for the presentation of the program.

WUE Measure Cost Estimate: $1,500 for preparation of curriculum materials.

Estimated Water Savings: 150,000 gallons over 10-year reporting period.

WUE Measure Action Status: Scheduled annually.

Irrigation Run Time Reduction – Grandview owns and operates a pressurized irrigation system that supplies pressurized irrigation water to approximately 500 residences. The remaining 1,727 single-family residential customers within the City utilize potable water for irrigating lawns, gardens, and other landscaping. The City of Grandview will prepare water wise guidelines and water conservation pamphlets and distribute to customers in promoting reduction of irrigation run times, ultimately reducing potable water consumption.

WUE Measure Cost Estimate: $800 for preparation of materials

Estimated Water Savings: 1.4 million gallons over 10-year reporting period.

WUE Measure Action Status: Scheduled for implementation in 2023.

Customer Leak Detection – Grandview Public Works staff will work closely with utility billing staff in identifying high water usage customers. When high usage is revealed, Public Works staff will contact the customer in a timely manner. Staff will provide leak detection services to customers and offer solutions for leak repairs. Following inspections, customers will receive DOH pamphlets promoting water conservation and tips toward consumption reduction.

WUE Measure Cost Estimate: $800 for printing materials

Estimated Water Savings: 800,000 gallons over 10-year reporting period.

WUE Measure Action Status: Scheduled for implementation in 2023.

DOH Publication Distribution – Grandview Public Works staff will print and deliver DOH publications to customers. This will be accomplished through door-to-door communication. The City has found face to face interaction as the most effective means of communicating with customers.

WUE Measure Cost Estimate: $800 for printing materials

Estimated Water Savings: 800,000 gallons over 10-year reporting period.

WUE Measure Action Status: Scheduled for implementation in 2024.

Water Conservation Devices – Grandview Public Works staff will inform customers about available water saving devices and effects of utilizing such devices. Example water conservation devices include:

- Water saving shower heads
- Toilet Tank Bank
- Rain sensors
- Irrigation timers

WUE Measure Cost Estimate: No cost.

Estimated Water Savings: 1.4 million gallons over 10-year reporting period.

WUE Measure Action Status: Scheduled for bi-annual implementation starting in 2022.

City Webpage Additions – The City's current webpage includes a page devoted to the Public Works department, which includes a link to the City's *Water Quality Report* annual publication. The Report describes the quality of Grandview's drinking water, sources, and programs in place to protect water quality. The City plans to add a specific webpage devoted to the City's Water Use Efficiency Program. Information will include conservation tips.

WUE Measure Cost Estimate: $1,500 for updating webpage.

Estimated Water Savings: 150,000 gallons over 10-year reporting period.

WUE Measure Action Status: Scheduled for implementation in 2024.

Advertising – During the 2022-2032 reporting period, the City of Grandview will publish water conservation advertisements in the local newspaper (the Grandview Herald). These advertisements will include tips and strategies for conserving water during high usage seasons, from April – November. The advertisements will be published at the beginning of each high usage season, typically April.

WUE Measure Cost Estimate: $800 annually.

Estimated Water Savings: 150,000 gallons over 10-year reporting period.

WUE Measure Action Status: Scheduled for annual implementation beginning in 2023.

Consumer Consumption History – The monthly utility statements that the City sends out to its customers indicate monthly water consumption. Customers may request a more detailed breakdown of water consumption history, allowing customers to track and compare their usage. Citizens can be informed of their own water use trends. The City normally contacts a customer that has had a couple of months of higher-than-normal bills. The awareness can allow them to evaluate their individual water conservation needs and alert them of potential leaks. This measure is implemented across all user categories.

WUE Measure Cost Estimate: $200 per category, annually.

a. Single-Family Residential
b. Outside Residential
c. Multi-Family Residential
d. Mobile Home Residential

Estimated Water Savings: Unknown but anticipated to continue reducing consumption through customer awareness.

WUE Measure Action Status: City to schedule implementation.

It should be noted that water savings attributable to public information activities are difficult to quantify because they are not directly linked to physically saving water. Although these measures cannot be specifically quantified, they are an integral part of the WUE Program, raising awareness of the importance of water conservation and increasing community participation in other conservation activities.

A summary of the estimated costs to implement the selected measures, their estimated water savings, and overall cost-effectiveness are provided in Table 4-4.

TABLE 4-4 SUMMARY OF DEMAND SIDE WUE MEASURES			
Measure Description	Implementation Cost	Year of Implementation	Estimated Water Savings, 10-year period, MG
Water Conservation School Career Days Outreach Program	$1,500	Annually	0.15
Irrigation Run Time Reduction	$800	2023	1.4
Customer Leak Detection	$800	2023	0.80
DOH Publication Distribution	$800	2024	0.80
Water Conservation Devices	None	Bi-Annually	1.4
Customer Consumption History – Single-Family Res.	$200	Annually	9.0
Customer Consumption History – Outside Residential	$200	Annually	0.30
Customer Consumption History – Multi-Family Residential	$200	Annually	0.30
Customer Consumption History – Mobile Home Res.	$200	Annually	1.0
City Webpage Additions	$1,500	2024	0.15
Advertising	$800	Annually	0.15

The above measures are planned to be implemented as shown in Table 4-6. The City will reevaluate the effectiveness of the measures during each program update to determine its potential for future implementation. Costs to implement these measures are included in the City's water operations budget.

Supply Side Measures

Supply side measures are essential to control distribution system leakage (DSL), improve supply efficiency, and overall system performance. The following are discussions of supply side WUE measures that have already or will be implemented within the next ten years to satisfy the City's WUE Program objective. The estimated cost of these measures and anticipated water savings are also provided.

Reservoir Cleaning and Inspection – The City periodically cleans and inspects its reservoirs for leaks and any other deficiencies. Corrosion causes unnecessary leakage directly contributing to distribution system losses (DSL). The City's reservoirs should be cleaned and inspected every five (5) years to identify any corrosion and potential DSL. The approximate cost of inspecting and cleaning each reservoir is generally $12,000, assuming no significant repairs are necessary.

WUE Measure Cost Estimate: Approximately $20,000 per reservoir.

Estimated Water Savings: Unknown.

WUE Measure Action Status: Annual budgeting and inspection schedule.

Source Meter Calibration – The City must calibrate and maintain source meters and large service meters (4-inch and larger) based on generally accepted industry standards and manufacturer information. Compliance will be maintained by the City by performing maintenance on the source and service meters every two (2) years as recommended by DOH. Actual water savings from meter calibration is unknown, but if the accuracy of all source meters is improved by 0.5%, the resulting water savings could be as much as 3,205,000 gallons, considering that approximately 641 million gallons were pumped into the system in 2020. It should be noted that the opposite of water savings could result, therefore, it is unknown if distribution system leakage (DSL) will be reduced or how much water could be saved through meter calibration.

WUE Measure Cost Estimate: $2,000 annually for calibration of one source meter and half of the larger service meters.

Estimated Water Savings: Unknown, could potentially reduce DSL by 0.5%.

WUE Measure Action Status: City to schedule implementation.

Table 4-5 is a summary of supply side measures implemented by the City.

TABLE 4-5 SUMMARY OF SUPPLY SIDE WUE MEASURES

Measure Description	Implementation Cost	Year of Implementation	Projected Water Savings, MG
Reservoir Cleaning and Inspection	$20,000 per reservoir	City Option	Unknown
Source Meter Calibration	$2,000 annually	City Option	3.21

4.1.5 WUE Measure Implementation

A summary of the WUE program measures that are planned for implementation is provided in Table 4-6, including measure description, implementation cost, and year of implementation. All the implemented measures support the system's WUE goals to reduce distribution system leakage and single-family residential consumption.

TABLE 4-6 SUMMARY AND PROJECTED SAVINGS OF WATER USE EFFICIENCY MEASURES

Measure Description	Implementation Cost	Year of Implementation	Projected Water Savings, MG
Water Conservation School Career Days Outreach Program	$1,500	Annually	0.15
Irrigation Run Time Reduction	$800	2023	1.4
Customer Leak Detection	$800	2023	0.80
DOH Publication Distribution	$800	2024	0.80
Water Conservation Devices	None	Bi-Annually	1.4
Customer Consumption History – Single-Family Res.	$200	Annually	9.0
Customer Consumption History – Outside Residential	$200	Annually	0.30
Customer Consumption History – Multi-Family Residential	$200	Annually	0.30
Customer Consumption History – Mobile Home Res.	$200	Annually	1.0
City Webpage Additions	$1,500	2024	0.15
Advertising	$800	Annually	0.15
Reservoir Cleaning and Inspection	$20,000 per reservoir	City Option	Unknown
Source Meter Calibration	$2,000 annually	City Option	3.21

The City plans to budget funds each year for the next ten-year period to fund the WUE measures listed above in Table 4-6. These budget amounts are reflected in the proposed City of Grandview financial plan in CHAPTER 9. as part of the general operational budget and/or O&M improvement costs.

4.1.6 Customer Education

Customer education is intended to inform citizens about the need for, and the methods to achieve water conservation. Customer education involves publicizing and promoting the need for water conservation to all classes of customers. Grandview currently publicizes water conservation information in its annual *Water Quality Report* to inform customers of the City's conservation efforts. In the future, the City plans to provide additional conservation information to customers on their website, to further educate the public on the purpose of using water more efficiently.

Customer education programs that Grandview has considered for further evaluation include the following:

- Program Promotion – Program promotion can include public service announcements, news articles, information provided in the City's annual *Water Quality Report*, bill inserts, providing water use history as part of utility bills, and distribution of inexpensive, easily installed water-saving devices such as shower flow restrictors, toilet tank water displacement bags, and leak detection dye tablets. As previously discussed, Grandview intends to initiate program promotion in 2022 using its annual *Water Quality Report* and water bill notifications.

- Speaker's Bureaus – Speaker's bureaus involve identifying water conservation speaking opportunities appropriate to various civic, service, community, and other groups. Such speaking opportunities focus on increasing public awareness of water resource and conservation issues and may involve the use of audio and visual aids.

- Theme Shows and Fairs – This activity involves preparation of a portable display of water conservation devices and selected written materials for display at local area theme festivals and activities.

- School Outreach – School outreach involves preparation of educational programs for school children targeted to increase awareness of local water resources and encourage water conservation practices. These may include school presentations, preparation of curriculum material, and tours of water system facilities. As previously discussed, representatives of Grandview's Public Works Department will attend a Career Day at the local schools and teach children about the many ways to protect and conserve the City's water source.

Grandview has identified some of these customer education programs as evaluated WUE measures. Besides those identified, Grandview does not plan to further evaluate or implement any of the additional customer education programs listed above.

4.1.7 Water Use Efficiency Program Effectiveness

The Water Use Efficiency Rule requires the completion of annual performance reporting to system customers and to the DOH. The City will use preparation of the Annual WUE Performance Report as an opportunity to review the effectiveness of the WUE measures and determine if established goals require revision. The annual effectiveness evaluation and the Annual WUE Performance Report will include the following elements:

- Calculation of distribution system leakage in terms of volume and percent of total water production.

- Identification of WUE goals.

- Evaluation of established WUE goals, including estimating water savings achieved through implemented measures and progress towards satisfying goals.

Grandview will submit its Annual WUE Performance Report to DOH by July 1st of each year. Information contained in the Annual WUE Performance Report will also be included in the City's *Water Quality Report*, which will be published on the City's website. WUE Program effectiveness will also be evaluated every ten years when the Water System Plan is updated again. At this time both goals and measures will be reevaluated to determine the most cost-effective method to achieve the updated goals.

4.1.8 Water Use Efficiency Savings

To quantify the reduction in water supply requirements expected due to implementing WUE measures identified in Section 4.1.5, estimates of water use savings have been calculated. Provided in Table 4-7 is a summary of the water demand projections for years 2032 and 2042, with and without WUE measures implemented.

TABLE 4-7 DEMAND FORECAST WITH AND WITHOUT PROJECTED WUE SAVINGS

Year	Total Annual Demand (MG/Year)		ADD (MGD)		MDD (MGD)	
	Without WUE	With WUE	Without WUE	With WUE	Without WUE	With WUE
2032	824.75	808.26	2.486	2.436	5.456	5.346
2042	893.92	876.04	2.667	2.613	5.856	5.738

CITY OF GRANDVIEW

CHAPTER 5 -

SOURCE WATER PROTECTION

HLA Engineering and Land Surveying, Inc.

5.1 WELLHEAD PROTECTION PROGRAM

In 2000, Grandview completed and implemented a wellhead protection plan. The purpose of the plan was to:

- Identify potential sources of contamination near the City's ground water supplies;
- Implement management strategies to prevent contamination of those supplies; and
- Develop a contingency plan for contamination mitigation if ground water does become contaminated.

The City of Grandview's *Wellhead Protection Plan*, prepared in accordance with the DOH requirements, consists of the following chapters:

1. Introduction
2. Hydrology
3. Identification of the Wellhead Protection Areas
4. Potential Contaminant Source Inventory
5. Management Strategy
6. Contingency Planning
7. Figures
8. Appendix
9. Well Logs
10. Resource Contact List

The City of Grandview's *Wellhead Protection Plan* is considered a companion document to the City's *Water System Plan*, and should be consulted for specific details and information regarding Grandview's wellhead protection program.

5.2 EXEMPT WELLS

The City of Grandview allows drilling and use of exempt wells within its service area only if the property to be served is located outside of the existing area served by the City's water system. Exempt wells are defined in state law (RCW 90.44.050) as:

> "*. . . any withdrawal of public ground waters for stock-watering purposes, or for the watering of a lawn or of a noncommercial garden not exceeding one-half acre in area, or for a single or group domestic uses in the amount not exceeding five thousand gallons a day, or for an industrial purpose in the amount not exceeding five thousand gallons a day, is and shall be exempt from the provisions of this section . . .*"

The City requires those areas served by exempt wells to connect to the City's water system when it extends to the property. At that time, any exempt wells on the property shall either be decommissioned in accordance with the applicable Washington Administrative Code (WAC) requirements or taken over by the City to become part of the City's water system.

5.3 UPDATES AND MODIFICATIONS TO THE WELLHEAD PROTECTION PLAN

As part of this *Water System Plan* update, the Potential Contaminant Source List and the Notification Source List have been updated and are presented as Table 5-1 and Table 5-2, respectively. The potential contaminant source locations are shown on Figure 5-1. The 6-month, 1-year, 5-year, and 10-year travel time zones for each source well (as specified on the Ground Water Contamination Susceptibility Assessment Survey forms) are summarized in Table 5-2 and shown on Figure 5-1. Copies of the Ground Water Contamination Susceptibility Assessment Survey forms for each source well are provided in CHAPTER 10.

TABLE 5-1 POTENTIAL CONTAMINANT SOURCE LIST				
Map No.	Property Owner	Address	Description	Rank
1	7 Eleven Store	226 W Main St	Gas Station	H
2	Anderson Motor Co	115 W Main	Auto Repair	H
3	Ameristar Car Wash	501 W. Main St.	Car Wash	M
4	Ameri-Star Store #8	1005 Wallace Way	Gas Station	
5	Auto Mania	602 E. Wine Country Rd.	Auto Body	H
6	Bleyhl Farm Service Grandview	213 Wine Country Rd	Petroleum, Fertilizer, Gas	H
7	Bleyhl Farm Service Inc Birch St	108 N Birch Ave	Petroleum, Fertilizer, Gas	H
8	Bleyhl Farm Service Inc Grandview	119 E Main	Petroleum, Fertilizer, Gas	H
9	Bleyhl Farm Service Inc.	940 E. Wine Country Rd.	Petroleum, Fertilizer, Gas	H
10	Bobs Full-Service Center	917 W 5th	Auto Repair	H
11	Chevron USA Inc Grandview Bulk	500 W Main	Gas Station	H
12	Conrad & Adams Fruit LLC	601 W. Wine Country Rd.	Food Processing	
13	Conrad Gilbert Grandview 2	614 W. Wine Country Rd.	Cold Storage Ammonia	
14	Cromwell Radiator & Automotive Repair	127 W. Wine Country Rd.	Auto Repair	
15	Debock's Auto Repair	100 W. Wine Country Rd.	Auto Repair	H
16	Donald E Golladay	Rte 1 Box 1920	Underground Storage Tank	
17	Fruitsmart, Inc.	201 N. Euclid	Food Processing	
18	Grandview Laundromat & Cleaners	202 Grandridge Rd.	Dry Cleaners	
19	Grandview Cemetery	N. Elm Rd.	Cemetery	M
20	Grandview Medical Center	208 Euclid Rd.	Medical	M
21	Grandview Market	100 Wine Country Rd.	Gas Station	H
22	Grandview Mufflers	710 E. Wine Country Rd.	Auto Repair	H
23	Grandview Public Works Department	303 W Main St	City Operations	L
24	Grandview School Bus Garage	1107 W. 2Nd St.	Bus Maintenance	M
25	Grandview School District Maintenance Building	707 W Main St	Maintenance Shop	M
26	Grandview School District	1601 W 5Th	Parking Lot	L
27	Grandview Tire Center	805 W. Wine Country Rd.	Tire Sales	M
28	Harvest Valley Cleaners	144 W. 2Nd St.	Dry Cleaners	H
29	J.M. Smucker Co.	Forsell & Euclid	Food Processing	M
30	Jp Body & Fender	710 E. Wine Country Rd.	Auto Body	M
31	Juan’s Automotive	712 E. Wine Country Rd.	Auto Repair	H
32	Kenyon Zero Storage, Inc.	717 S. Division St.	Cold Storage Ammonia	M
33	Kenyon Zero Storage Inc Kenyon Bldg.	230 Avenue A	Cold Storage Ammonia	M
34	Kenyon Zero Storage Inc Of Grandview	505 S Division	Cold Storage Ammonia	M
35	Lamplighter Village Inc	300 Wilson Hwy	Mobile Home court	M
36	Lechuga's Tire	716 E. Wine Country Rd.	Tire Sales	M
37	Leinad Resources Inc. (Sunfair Marketing)	400 Grandridge	Cold Storage Ammonia	M
38	Les Schwab Tires	812 W. Main St.	Tire Sales	L
39	Lower Valley Machine Shop	104 W. Fifth St.	Auto Repair	M
40	Manuel S. Auto Repair	710 E. Wine Country Rd.	Auto Repair	M
41	Mary’s Mini Mart	210 W 2Nd St	Gas Station	M
42	Olsen Brothers Ranches Inc.	171 Forsell Rd.	Cold Storage Ammonia	M
43	Patnode Hops Inc	117 E Main	Cold Storage Ammonia	
44	Petrosun 1070	100 E Wine Country Rd	Gas Station	M
45	R.E. Powell Distributing	501 E. Wine Country Rd.	Fuel Distribution	H
46	R.H. Smith Distributing	315 E. Wine Country Rd.	Fuel Distribution	H
47	Ross Mellor Ellis Daily	401 Division	Underground Storage Tank	
48	Safeway Fuel Station #1593	608 E. Wine Country Rd.	Gas Station	
49	Sam’s Cycle Service	695 Wallace Way	Cycle Repair	H
50	Shonan (USA) Inc.	702 Wallace Way	Food Processing	
51	Simplot	Ave A	Ag Service	H
52	Smith Funeral Home	512 E. Fourth St.	Funeral Home	H
53	Smitty Service Center	608 W. Wine Country Rd.	Gas Station	M
54	Snokist Grandview Ust 4746	614 Hwy 12	Underground Storage Tank	M
55	Sons of Thunder Auto Sales LLC	600 W. Wine Country Rd.	Auto Sales	M
56	Sprint Communications Co Grandview	500 W 5Th St	Operations Building	L
57	Stegeman Electric Parking Lot	125 W 2Nd St	Underground Storage Tank (LUST)	M
58	Steve Mobil Service	304 E Main	Auto Repair	H
59	Sunshine Car Wash	304 E. Wine Country Rd.	Car Wash	M
60	Swift Transportation Company, Inc.	545 Bethany Rd.	Truck Maintenance & Repair	M
61	SVID Canal	120 S. 11Th St.	Ag Service	H
62	Uprr Grandview Section Tool House	W Wine Country Rd & Grandridge Rd	Railroad Service	M
63	Valley Auto Parts Inc	229 Division	Auto Repair	H
64	Valley Ready Mix Concrete Company	503 W Main	Underground Storage Tank (LUST)	M
65	Valley Spray LLC	697 Wallace Way	Ag Service	H

TABLE 5-1 POTENTIAL CONTAMINANT SOURCE LIST (CONTINUED)				
Map No.	Property Owner	Address	Description	Rank
66	Valley Tire N Rim	304 E. Wine Country Rd.	Tire Sales	M
67	Walker's Auto Body	806 W. Wine Country Rd.	Body Shop	H
68	Walker's Cars & Trucks	804 W. Wine Country Rd.	Auto Sales	M
69	Welch Food Inc.	401 Grandridge Rd.	Food Processing	M
70	Welch Food Inc. Plant #1	504 Birch Ave.	Food Processing	M
71	Welch Food Inc. Plant #2	401 Avenue B	Food Processing	M
72	Wilbur Ellis Co., Inc.	1303 Wine Country Rd.	Farm Chemicals	H
73	Williams Gas Pipeline West	606 S. Oregon Ave. Pasco	Gas Produces	H

Rank:
H = High
M = Moderate
L = Low

TABLE 5-2 NOTIFICATION SOURCE LIST			
No.	Name	Address	Phone
1	Emergency (Hazardous Spill) Response		(800) 424-8802
2	Washington Department of Ecology, Central Regional Office	15 W. Yakima Ave. Suite 200 Yakima, WA 98902	(509) 575-2490
3	The Office of Drinking Water, Eastern Drinking Water Operations	16201 East Indiana Avenue, Suite 1500 Spokane Valley, WA 99216	(509) 329-2100
4	Grandview Police Department	201 W. 2nd St. Grandview, WA 98930	(509) 882-9223
5	Grandview Fire Department	110 Avenue A Grandview, WA 98930	(509) 882-9224
6	Yakima Co. Sheriff's Department	1822 S. 1st St. Yakima, WA 98907	(509) 865-6695
7	Washington State Patrol	2715 Rudkin Road Union Gap, WA 98903	(509) 575-2320
8	Yakima County Fire District	110 Avenue A Grandview, WA 98930	911
9	Yakima Health District	1210 Ahtanum Ridge Dr. Union Gap, WA 98903	(509) 575-4040
10	Washington St. Dept. of Transportation	1816 N. 4th Pasco, WA 99301	(509) 545-2202

TABLE 5-3 CALCULATED FIXED RADIUS TRAVEL TIMES					
Source No.	Source Name	6-Month	1-Year	5-Year	10-Year
S01	West Main	360 ft.	510 ft.	1,140 ft	1,610 ft.
S02	Balcom & Moe	250 ft.	360 ft.	800 ft.	1,140 ft.
S03	Velma	620 ft.	880 ft.	1,970 ft.	2,780 ft.
S07	Olmstead A	440 ft.	620 ft.	1,390 ft.	1,970 ft.
S10	North Willoughby	360 ft.	510 ft.	1,140 ft.	1,610 ft.
S11	Highland	250 ft.	360 ft.	800 ft.	1,140 ft.
S13	South Willoughby	360 ft.	510 ft.	1,140 ft.	1,610 ft.
S14	Butternut	250 ft.	360 ft.	800 ft.	1,140 ft.
S16	Olmstead B	700 ft.	980 ft.	2,200 ft.	3,110 ft.
S18	Pecan B	360 ft.	510 ft.	1,140 ft.	1,610 ft.

CITY OF GRANDVIEW

Water System Plan Update

POTENTIAL SOURCE OF CONTAMINATION TRAVEL TIME ZONES

SOURCE S16

SOURCE S07

SOURCE S10

SOURCE S13

SOURCE S01

SOURCE S03

SOURCE S14

SOURCE S02

SOURCE S11

SOURCE S18

N W E S

0 1500 3000

LEGEND

- RETAIL SERVICE AREA (CITY LIMITS)
- FUTURE SERVICE AREA (URBAN GROWTH AREA)
- SOURCE WELL
- 6- MONTH TIME OF TRAVEL
- 1-YEAR TIME OF TRAVEL
- 5-YEAR TIME OF TRAVEL
- 10-YEAR TIME OF TRAVEL

POTENTIAL CONTAMINANT LIST

1	7 Eleven Store	25	Lamplighter Village Inc
2	Anderson Motor Co	26	Leinad Resources Inc. (Sunfair Marketing)
3	Ameristar Car Wash	27	Lower Valley Machine Shop
4	Bleyhl Farm Service Grandview	28	Marys Mini Mart
5	Bleyhl Farm Service Inc Birch St	29	Patnode Hops Inc
6	Bleyhl Farm Service Inc Grandview	30	Petrosun 1070
7	Bobs Full Service Center	31	Ross Mellor Ellis Daily
8	Chevron Usa Inc Grandview Bulk	32	Simplot
9	Conrad & Adams Fruit LLC	33	Smith Funeral Home
10	Conrad Gilbert Grandview 2	34	Smitty Service Center
11	Cromwell Radiator & Automotive Repair	35	Snokist Grandview Ust 4746
12	Debock's Auto Repair	36	Son'S Of Thunder Auto Sales Llc
13	Donald E Golladay	37	Sprint Communications Co Grandview
14	Grandview Laundromat & Cleaners	38	Stegeman Electric Parking Lot
15	Grandview Cemetary	39	Steve Mobil Service
16	Grandview Medical Center	40	Svid Canal
17	Grandview Market	41	Uprr Grandview Section Tool House
18	Grandview Public Works Department	42	Valley Auto Parts Inc
19	Grandview School Bus Garage	43	Valley Ready Mix Concrete Company
20	Grandview School Dist Maintenance Bldg	44	Welch Food Inc.
21	Grandview School Dist	45	Welch Food Inc. Plant #1
22	Harvest Valley Cleaners	46	Welch Food Inc. Plant #2
23	Kenyon Zero Storage Inc Kenyon Bldg	47	Williams Gas Pipeline West
24	Kenyon Zero Storage Inc Of Grandview		

CITY OF GRANDVIEW

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FIGURE 5-1

CHAPTER 6 -

OPERATION AND MAINTENANCE PROGRAM

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6.1 WATER SYSTEM MANAGEMENT AND PERSONNEL

The purpose of this section is to identify personnel responsible for the day-to-day operation of the water system and those positions responsible for development and/or approval of the operating budget and capital improvement program.

Water System Management Structure

Figure 6-1 Water System Organizational Chart, is a flow chart which depicts the management hierarchy of Grandview's water system. Brief descriptions of the general responsibilities of each position identified in Figure 6-1 are listed below:

Mayor and City Council: Responsible for establishing all water system policies, including service area boundaries, user rate structures, water system personnel salaries, Water Department budget, and capital improvements. Approves all expenditures.

City Administrator: Reviews all water system policy changes and expenditures, approves all personnel hiring, and advises Public Works Director on general Water Department operation.

Public Works Director: Responsible for the direct coordination of all day-to-day water system operation and maintenance tasks. Reports on the status and needs of the water system to the City Administrator, Mayor and City Council. Prepares annual water department budget. Reviews all water system policy changes and expenditures. Establishes staff job descriptions and requirements and recommends hiring of personnel. Serves as public and press contact regarding water system information.

Assistant Public Works Director: Under the general supervision of the Public Works Director, assists in the management, planning, and organization of the Public Works Department. Provides information on the status and needs of the water system to the Public Works Director. Work requires considerable professional judgment and initiative within the framework of established regulations, policies, and keeps the Water Department in compliance with DOH rules and regulations. In the absence of the Public Works Director, this position may assume the duties of the Public Works Director when assigned.

City Treasurer: Responsible for supervision of utility billings and budgeting preparation. Allocates funds for approved expenditures.

Utility Clerk: Responsible for entering water meter reading data into the computer, generating monthly water billings, and maintaining water consumption records.

Consulting Engineer: Assists City in long-range planning; aids Public Works Director in technical aspects of water system; and provides design engineering and construction services for capital improvements.

Water Plant Operator: Under the general supervision of the Assistant Public Works Director and, at times, may serve in a lead capacity. Responsible for water quality testing as required by the Safe Drinking Water Act and the Washington DOH. Independently and collaboratively monitors and researches federal and state regulations that will impact operations and/or compliance.

Code Enforcement Officer/Building Inspector/Cross Connection Manager: Under the general supervision of the Assistant Public Works Director, determine cross-connection hazards, collect, and analyze data, and complete annual summary report. Consult with, and explain cross connection control requirements to property owners, managers, contractors, government agencies and the public. Coordinate Cross Connection Control Program activities with other City departments. Prepare and maintain records and files including field test data, surveys, cross connection locations, and approved backflow assembly inventories. Compose correspondence, prepare forms, and write reports relating to the Cross Connection Control Program. Issue written warnings to customers as necessary. Oversee certified testers and perform other related duties as assigned.

Public Works Foremen: Under the direction of the Public Works Director, is responsible for supervising, scheduling, and training public works personnel, meeting the public, and assisting in water system planning. Must possess and maintain a valid Washington State Water Distribution Manager 2 Certificate.

Public Works Maintenance Technicians: Responsible for maintaining a complete knowledge of all aspects of the operation, maintenance, preventive maintenance, policies, procedures, and safety aspects of water system facilities. Must be capable of performing all duties required, operating, or learning to operate every tool, piece of machinery and equipment within the Water Department and must have a working knowledge of all types of materials, i.e., pipes, valves, and pumps. Must maintain or be capable of obtaining a valid Washington State Water Distribution Specialist Class 1 Certificate or better.

6.1.1 Operator Certification

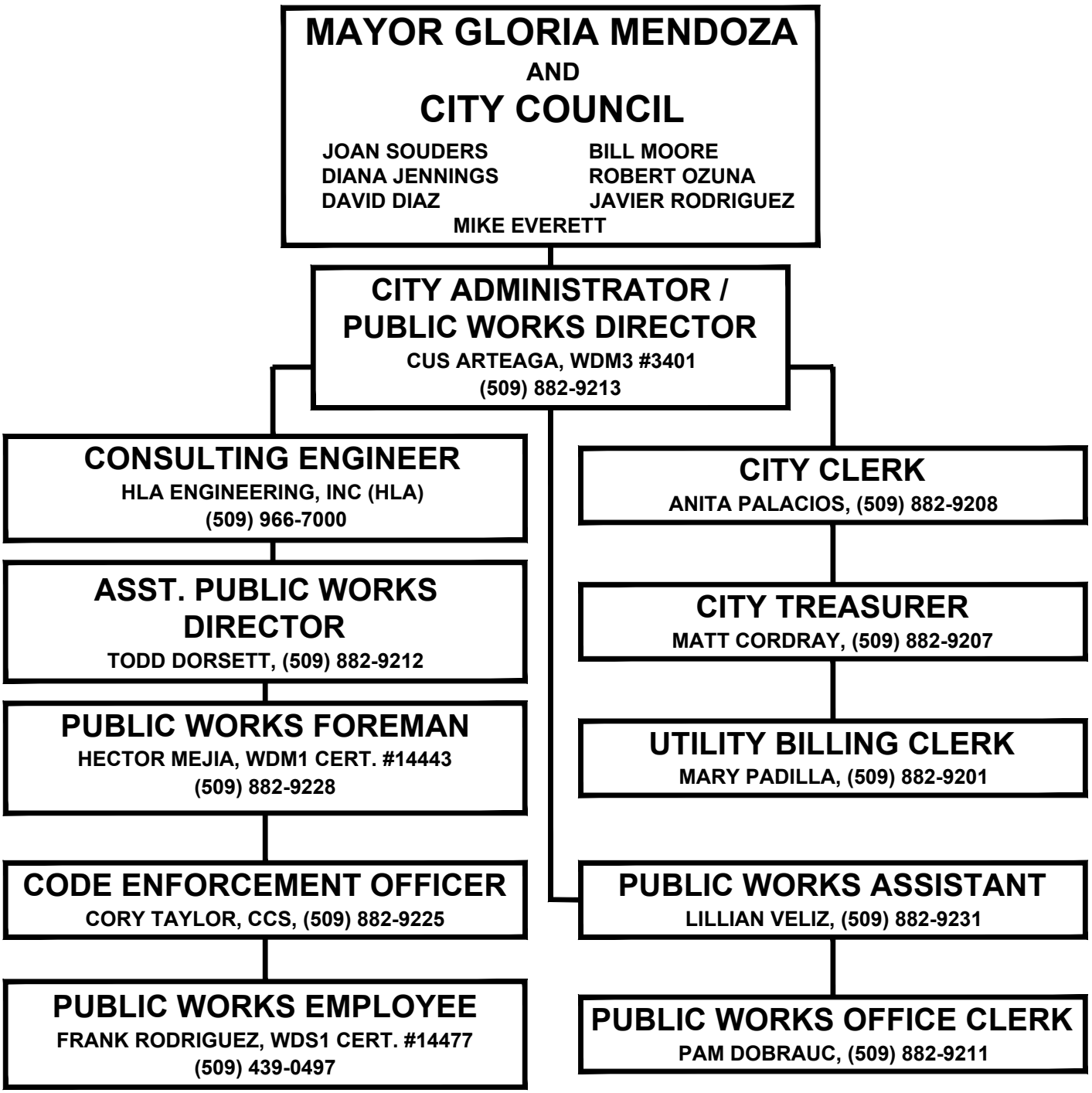
All Group A water systems within the State of Washington are classified according to the population they serve and are required by state regulation to have a certified operator in charge of system operation. Operators are required to be certified at or above the certification level of the distribution system. Grandview's water distribution system, which serves 1,501 to 15,000 persons, is considered a Class 2 system and is, therefore, required to have a Class 2 (or greater) Water Distribution Manager (WDM) responsible for system operation. Grandview is also required to have a Cross-connection Control Specialist (CCS) responsible for the system's cross-connection control program and is required to have a Backflow Assembly Tester (BAT) responsible for monitoring backflow prevention assemblies.

Included within Figure 6-1 are the water certifications of the various Public Works employees responsible for the operation and maintenance of Grandview's water system. Grandview currently has one public works employee with a Water Distribution Manager certification at the Class 3 level, and one public works employee with Water Distribution Manager certification at the Class 1 level. In addition, Grandview currently has one public works employee with Cross-Connection Control Specialist certifications. Figure 6-1 provides the current certifications of all of Grandview's water system employees who work in and have water system responsibilities.

CITY OF GRANDVIEW

Water System Plan Update

WATER SYSTEM ORGANIZATIONAL CHART



LEGEND

WDS1 = WATER DISTRIBUTION SPECIALIST CLASS 1
WDM1 = WATER DISTRIBUTION MANAGER CLASS 1
WDM2 = WATER DISTRIBUTION MANAGER CLASS 2
WDM3 = WATER DISTRIBUTION MANAGER CLASS 3
CCS = CROSS CONNECTION SPECIALIST

CITY OF GRANDVIEW

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FIGURE 6-1

6.2 SYSTEM OPERATION AND PREVENTATIVE MAINTENANCE

Section 3.3 System Description and Analysis, provides a detailed description of the various water system components and their interrelationship. This interrelationship is depicted in Figure 3-1 and Map A CHAPTER 10. It is important that Water Department personnel fully understand the system to evaluate its operation and maintenance requirements.

Routine System Operation and Preventative Maintenance

An outline of routine operational tasks for the various major system components is provided below:

A. Source Wells and Pumps

1. Daily Tasks

   a. Check all well facilities visually.
   b. Maintain oil levels for well pumps.
   c. Check packing glands.
   d. Check chlorination systems.
   e. Check telemetry system.
   f. Record flow meter totalizer readings.

2. Monthly Tasks

   a. Check and grease well pump packing and pump motor seal bearings.
   b. Check oil level in pump bearing reservoir and fill, if necessary.
   c. Check floor drains and clean, if necessary.
   d. Clean pumphouse floors.
   e. Monitor and record well draw down levels.

3. Seasonal Tasks

   a. Winterize or de-winterize pumphouse facilities.
   b. Check heating and A/C equipment and thermostats, adjust as necessary.
   c. Clean chlorination system equipment.

4. Yearly Tasks

   a. Summarize flow meter totalizer records.
   b. Change oil in motors using DTE Light.
   c. Maintain chlorine detectors.

5. Every Three Years Task

   a. Take sample of raw water from each well and submit to the Washington State DOH Lab for an Inorganic Chemical and Physical (IOC) Analysis, Volatile Organic Chemical (VOC) Analysis, and Synthetic Organic Chemical (SOC) Analysis, unless sources have been granted a waiver under the susceptibility waiver program.
   b. Take sample of raw water from each well and submit to a state certified laboratory for required lead and copper analysis, as directed by the DOH.

6. Every Four Years Task

a. Conduct sampling for required radionuclides testing and submit to the DOH Lab.

B. Reservoirs

1. Daily Tasks

a. Visually inspect reservoir exteriors.
b. Check pressure transmitter and level controls at Velma Well for 0.5 MG Reservoir.
c. Clear any vegetation near reservoir base.

2. Monthly Tasks

a. Check the hatches and the screens on the vent and overflow pipes on all reservoirs.

3. Yearly Tasks

a. Inspect reservoir interiors as possible without removing from service.

4. Every Five Years Task

a. Empty reservoirs individually and inspect interiors. Clean, refill, and chlorinate reservoir before removing the next one from service.

5. As Required Tasks

a. Inspect and video record reservoir interiors using diver, and vacuum remove accumulated debris.

C. Distribution System

1. Weekly Tasks

a. Conduct free and total chlorine count tests at random sites within the distribution system. Report test results to Public Works and submit to the DOH at month end.

2. Monthly Tasks

a. Take required number of water samples from various representative sites within the distribution system and submit them to a certified laboratory for bacteriological analysis in accordance with the *Coliform Monitoring Plan*.
b. Flush selected fire hydrants in various areas within the water system.

3. Seasonal Tasks

a. Insulate service meters.

4. Yearly Tasks

    a. Operate all valves through their full range and listen for leaks
    b. Operate and flush all fire hydrants. Lubricate hydrant caps and threads. Touch-up paint as required.
    c. Inspect all cross-connection control devices.
    d. Take required number of water samples from various representative sites within the distribution system and submit them for disinfection byproducts analysis in accordance with the *Stage 2 DBP Monitoring Plan*.

5. As Required Tasks

    a. Flush low velocity water mains as required to remove sedimentation.
    b. Review plans for installation of cross-connection control devices on proposed new construction.
    c. Inspect installation of required devices on new construction.
    d. Repair and/or replace service meters.

D. Telemetry System

1. Daily Tasks

    a. Observe telemetry system operation and alarms.

2. Weekly Tasks

    a. Check automatic dialer status.

3. Monthly Tasks

    a. Check total well production and compare to recorded consumption.
    b. Check telemetry system alarms.

4. As Required Tasks

    a. Make any required changes to pump Start / Stop settings.

6.3 COMPREHENSIVE WATER QUALITY MONITORING

The City of Grandview monitors its system's water quality in accordance with the requirements of WAC 246-290-300, 246-290-310, and 246-290-320, which define the minimum monitoring requirements, maximum contaminant levels (MCLs) and maximum residual disinfectant levels (MRDLs), and follow-up action requirements for public water systems. The following summarizes the requirements as they pertain to the City of Grandview:

6.3.1 Monitoring Requirements, Location, and Frequency

Bacteriological Analysis: Bacteriological analysis is conducted in accordance with the procedures and locations specified in Grandview's *Coliform Monitoring Plan*, a copy of which is provided in CHAPTER 10. The minimum number of bacteriological samples required per month within the distribution system is based upon the population served and is shown in part in Table 6-1 below:

TABLE 6-1 MINIMUM MONTHLY COLIFORM SAMPLING REQUIREMENTS	
Permanent Population Served	Minimum Number of Samples per Month
4,901 - 5,800	6
5,801 - 6,700	7
6,701 - 7,600	8
7,601 - 8,500	9
8,501 - 12,900	10 (Grandview's current requirement)
12,901 - 17,200	15
17,201 - 21,500	20
21,501 - 25,000	25

Disinfection Byproducts (DBPs): Samples are to be collected from two locations within the distribution system identified in the City's *Stage 2 DBP Monitoring Plan*. For Stage 2 monitoring, two dual sample sets of TTHM and HAA5 samples are required at each of two locations annually. These locations must have the highest averages of total trihalomethanes (TTHMs) and haloacetic acids (HAA5).

Inorganic Chemical and Physical Analyses: Generally, a minimum of one sample from each source well is required per compliance period as a result of the IOC waivers. The samples shall be collected from a point representative of the source, after treatment, and prior to entry into the distribution system.

Nitrate/Nitrite Monitoring: Nitrate and Nitrite samples from each source are generally required once annually and quarterly at three of its wells. The samples generally shall be collected from a point representative of the source, after treatment, and prior to entry into the distribution system. Sources S07, S10, S13, and S16 shall be collected from a point representative of the source prior to treatment.

All source wells shall be tested individually, though some sources are blended prior to entering the distribution system. In addition to the individual tests at blended source locations, a sample shall be taken beyond the blending point, prior to entering the distribution system.

Radionuclides: Radionuclide samples from each source are generally required once every three years. However, the DOH may reduce monitoring requirements to once every six or nine years. The samples shall be collected from a point representative of the source, after treatment, and prior to entry into the distribution system.

Volatile Organic Chemicals (VOCs): VOC samples shall be taken at each source once every 3 months for the first 12 months of operation, or as directed by the DOH. If no VOCs are detected in the first 12 months from a ground water source, only one annual sample will be required for the first three years of sampling, per 40 CFR 141.24. If no VOCs are detected during the first three years of testing, future monitoring shall be at least once every compliance period. The DOH may grant waivers for monitoring requirements. The samples shall be collected from a point representative of the source, after treatment, and prior to entry into the distribution system.

Synthetic Organic Chemicals (SOCs): SOC samples shall be taken at each source once every 3 months for the first 12 months of operation, or as directed by the DOH. If no SOCs are detected in the first 12 months from a ground water source, only one annual sample will be required for the first three years of sampling, per 40 CFR 141.24. If no SOCs are detected during the first three years of testing, future monitoring shall be at least once every compliance period. The DOH may grant waivers for monitoring requirements. The samples shall be collected from a point representative of the source, after treatment, and prior to entry into the distribution system.

Lead and Copper: A minimum of 30 samples at targeted sample tap locations throughout the distribution system are required every three years for lead and copper monitoring. The water system must provide individual sampling results to the persons at each sample location no later than 30 days after receiving the results. Additionally, the water system must complete and submit the signed *Lead and Copper Consumer Notice Certification Form* (CHAPTER 10) and a sample copy of one consumer notice to the DOH within 90 days after the end of the monitoring period.

Asbestos: One asbestos sample shall be taken from the water distribution system at one of the City's routine coliform sampling sites that is known to have asbestos concrete (AC) pipe.

Other Substances: Monitoring of other substances in the future will be as required by the DOH.

6.3.2 Testing Laboratories

Samples which have been collected must be transported and analyzed in accordance with DOH requirements. The analyses must be done by a state public health laboratory or a state certified private laboratory.

The City of Grandview routinely delivers bacteriological samples to Cascade Analytical, Inc. on the same day they are taken. Sample bottles are obtained from the laboratory.

Samples for other required tests, e.g., Inorganic Chemical and Physical Analysis, are delivered to Cascade Analytical, Inc., of Union Gap, WA on the same day they are taken. As with the bacteriological samples, sample bottles are obtained from the laboratory.

6.3.3 Violation Procedures

The City of Grandview is responsible for complying with the standards of water quality identified in WAC 246-290-310. If any substance exceeds its maximum contaminant level (MCL) and/or maximum residual disinfectant levels (MRDLs), the City shall take follow-up action as outlined under WAC 246-290-320.

Maximum Contaminant Levels (MCLs) and Maximum Residual Disinfectant Levels (MRDLs)

Bacteriological – If any coliform bacteria are present in any sample, follow-up action as described under WAC 246-290-320(2) shall be taken in accordance with the City's Coliform Monitoring Plan and the Groundwater Rule (GWR) requirements.

Disinfection Byproducts (DBPs) and Residuals – MCLs and MRDLs for disinfection byproducts and residuals are as shown in Table 6-2.

TABLE 6-2 DISINFECTION BYPRODUCTS AND RESIDUALS

DISINFECTION BYPRODUCT	MCL (mg/l)
Total Trihalomethanes (TTHMs)	0.080
Haloacetic acids (HAA5)	0.060
Bromate	0.010
Chlorite	1.0
DISINFECTION RESIDUAL	**MRDL (mg/l)**
Chlorine	4.0 (as $C1_2$)
Chloramines	4.0 (as $C1_2$)
Chlorine Dioxide	0.8 (as $C1O_2$)

Inorganic Chemical and Physical (IOC) – MCLs for inorganic chemical and physical properties are as shown in Table 6-3.

TABLE 6-3 INORGANIC CHEMICAL MCLS

Chemical or Physical Characteristics	MCL (mg/l)
Primary Substances	
Antimony (Sb)	0.006
Arsenic (As)	0.010
Asbestos	7 million fibers/liter
Barium (Ba)	2.0
Beryllium (Be)	0.004
Cadmium (Cd)	0.005
Chromium (Cr)	0.1
Copper (Cu)*	1.3
Cyanide (HCN)	0.2
Fluoride (F)	4.0
Lead (Pb)*	0.015
Mercury (Hg)	0.0020
Nickel (Ni)	0.10
Nitrate (as N)	10.0
Nitrite (as N)	1.0
Selenium (Se)	0.05
Sodium (Na)*	20
Thallium (Tl)	0.002
Secondary Substances	
Chloride (Cl)	250.0
Fluoride (F)	2.0
Iron (Fe)	0.3
Manganese (Mn)	0.05
Silver (Ag)	0.1
Sulfate (SO_4)	250.0
Zinc (Zn)	5.0
Color	15 Color Units
Specific Conductivity	700 umhos/cm
Total Dissolved Solids (TDS)	500
* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.	

Radionuclides – MCLs for Radionuclides are as shown in Table 6-4.

TABLE 6-4 RADIONUCLIDE MCLS	
RADIONUCLIDE	MCL
Combined Radium-226 and Radium-228	5 pCi/l
Gross alpha particle activity (excluding uranium and radon)	15 pCi/l
Beta particle and photon radioactivity	4 mrem/year
Uranium	30 µg/l

Volatile Organic Chemicals (VOCs) – MCLs for VOCs are as shown in Table 6-5.

TABLE 6-5 VOLATILE ORGANIC CHEMICAL MCLS	
VOLATILE ORGANIC CHEMICAL	MCL (mg/l)
Benzene	0.005
Carbon Tetrachloride	0.005
para-Dichlorobenzene	0.075
Trichloroethylene	0.005
Vinyl Chloride	0.002
1,1,1-Trichloroethane	0.2
1,1-Dichloroethylene	0.007
1,2 Dichloroethane	0.005
cis-1,2-Dichloroethylene	0.07
Ethylbenzene	0.7
Monochlorobenzene	0.1
o-Dichlorobenzene	0.6
Styrene	0.1
Tetrachloroethylene	0.005
Toluene	1
Trans-1,2-Dichloroethylene	0.1
Xylenes	10
1,2-Dichloropropane	0.005
Dichloromethane	0.005
1,1,2-Trichloroethane	0.005
1,2,4-Trichlorobenzene	0.07

Synthetic Organic Chemicals (SOCs) – MCLs for SOCs are as shown in Table 6-6.

TABLE 6-6 SYNTHETIC ORGANIC CHEMICAL MCLS

SYNTHETIC ORGANIC CHEMICAL	MCL (mg/l)
Alachlor	0.002
Atrazine	0.003
Carbofuran	0.04
Chlordane	0.002
EDB	0
DBCP	0.0002
Heptachlor	0.0004
Heptachlor Epoxide	0.0002
Lindane	0.0002
Methoxychlor	0.04
Toxaphene	0.0003
PCBs	0.0005
Pentachlorophenol	0.001
2,4-D	0.07
2,4,5-TP	0.05
PAHs (Benzo(a)pyrene)	0.0002
Dalapon	0.2
Di(ethylhexyl)-Adipate	0.4
Di(ethylhexyl)-Phthalate	0.006
Dinoseb	0.007
Diquat	0.1
Endothall	0.1
Endrin	0.002
Glyphosate	0.7
Hexachlorobenzene	0.001
Hexachlorocyclo-Pentadiene	0.05
Oxymal	0.2
Picloram	0.5
Simazine	0.004
2,3,7,8-TCDD (Dioxin)	0

6.3.4 Follow-up Action

1. General:

   a. If water quality exceeds any MCL or MRDL listed in WAC 246-290-310, the purveyor shall notify the DOH and take follow-up action as described in this section.
   b. When a primary MCL violation occurs, the purveyor shall:
      i. Notify the DOH within 48 hours in accordance with WAC 246-290-480;
      ii. Notify the public according to the procedures outlined under WAC 246-290-71001;
      iii. Determine the cause of the contamination; and
      iv. Take corrective action as required by the DOH.
   c. When a secondary MCL violation occurs, the purveyor shall notify the DOH and take corrective action as directed by the DOH.

2. Bacteriological:

   a. When coliform bacteria are present in any sample and the sample is not invalidated under e. of this subsection, the purveyor shall ensure the following actions are taken:

      i. The sample is analyzed for fecal coliform or E. coli. When a sample with a coliform presence is not analyzed for E. coli or fecal coliforms, the sample shall be considered as having a fecal coliform presence for MCL compliance purposes;
      ii. Repeat samples are collected in accordance with b. of this subsection;
      iii. Collect triggered source samples in accordance with c. of this subsection and have them tested for E. coli.
      iv. The DOH is notified in accordance with WAC 246-290-480; and
      v. The cause of the coliform presence is determined and corrected.

   b. Repeat samples: The purveyor shall collect and submit for analysis a set of repeat samples for every sample in which the presence of coliforms is detected in accordance with the following:

      i. A set of three (3) repeat coliform samples is required for Group A systems collecting more than one routine coliform sample each month and shall be collected at the following locations:

         (1) At the site of the previous sample with a coliform presence.
         (2) Within five active services upstream of the site of the sample with a coliform presence.
         (3) Within five active services downstream of the site of the sample with a coliform presence.

      ii. For Group A systems, all samples in a set of repeat samples shall be collected on the same day and submitted for analysis within 24 hours after notification by the laboratory of a coliform presence. If the purveyor can demonstrate, to the satisfaction of the DOH, that logistical problems beyond the purveyor's control make analysis of the samples in the repeat sample set impractical because the time between sample collection and analysis will exceed 30 hours, then the purveyor shall collect the required set of repeat samples as directed by the DOH.
      iii. When repeat samples have coliform presence, the purveyor shall:

         (1) Contact the DOH and collect a minimum of one additional set of repeat samples as directed by the DOH: or
         (2) Collect one additional set of repeat samples for each sample where coliform presence was detected.

iv. If a sample with a coliform presence was collected from the first two or last two active services, the purveyor shall monitor as directed by the DOH.
v. The purveyor may change a previously submitted routine sample to a sample in a set of repeat samples when the purveyor:

(1) Collects the sample within five adjacent service connections of the location from which the initial sample with a coliform presence was collected;
(2) Collects the sample after the initial sample with a coliform presence was submitted for analysis;
(3) Collects the sample on the same day as other samples in the set of repeat samples, except under b. ii. of this subsection; and
(4) Requests and receives approval from the DOH of the change.

vi. The DOH may waive the requirement to collect sets of repeat samples under this subsection during a month when a non-acute coliform MCL violation is determined for the system.

c. Triggered Source Sampling: In accordance with the Groundwater Rule (GWR) requirements, triggered source samples must be collected and tested for E. coli when coliform bacteria are present in any routine distribution sample. Triggered source sampling shall be conducted as follows:

i. Triggered source samples must be collected within 24 hours of notification of the total coliform positive result.
ii. Each source that was in operation at the time the routine sample was collected must be tested prior to treatment.
iii. If one of the triggered source samples is E. coli positive, corrective action shall be taken as directed by the DOH, or five additional source samples must be taken within 24 hours.
iv. If any of the five additional source samples is E. coli positive, one or more of the following corrective actions may need to be taken, as directed by the DOH:

(1) Provide an alternate source of water.
(2) Eliminate the source of contamination.
(3) Provide 4-log treatment.

v. Customers must be notified within 24 hours of receiving an E. coli positive triggered source sample.

d. Monitoring frequency following a coliform presence: Group A systems having one or more coliform presence samples that were not invalidated during the previous month shall collect and submit for analysis the minimum number of routine samples shown in Table 6-1.

i. The DOH may waive the monitoring frequency requirement when one or more samples with a coliform presence were collected during the previous month, if the purveyor proves to the satisfaction of the DOH:

(1) The cause of the sample with a coliform presence; and
(2) The problem is corrected before the end of the next month the system provides water to the public.

ii. If the DOH waives this monitoring frequency requirement:

(1) The purveyor shall collect and submit at least the minimum number of samples required when no samples with a coliform presence were collected during the previous month; and
(2) The DOH shall make available a written description explaining:

(a) The specific cause of the coliform presence; and
(b) Action taken by the purveyor to correct the cause of coliform presence.

e. Invalid samples.

i. The DOH shall consider coliform samples with no coliform presence detected invalid when:

(1) A certified laboratory determines that the sample results show:

(a) Multiple tube technique cultures are turbid without appropriate gas production;
(b) Presence-absence technique cultures are turbid in the absence of an acid reaction;
(c) There are confluent growth patterns or growth of TNTC (too numerous to count) colonies without a surface sheen using a membrane filter analytic technique;
(d) There is excess debris in the sample; or
(e) That improper sample collection and analysis occurred.

ii. The DOH may also invalidate a coliform sample when:

(1) The DOH determines a nondistribution system problem occurred as indicated by:

(a) All samples in the set of repeat samples collected at the same location as the original coliform presence sample also have coliform presence; and
(b) All other samples in the set of repeat samples are free of coliform.

(2) The DOH determines a coliform presence result is due to a circumstance or condition which does not reflect water quality in the distribution system. In this case when the DOH invalidates a sample:

(a) The purveyor shall collect a set of repeat samples following the sample invalidation in accordance with 2.b. above, and
(b) The DOH rationale for invalidating the sample shall be documented in writing and made available to the public. The documentation shall state the specific cause of the coliform presence and what action the purveyor has taken or will take.

iii. When a coliform sample is determined invalid, the purveyor shall collect and submit for analysis:

(1) An additional coliform sample from the same location as each invalid sample within 24 hours of notification of the invalid sample; or
(2) If determined that invalid sample resulted from circumstances not reflective of distribution system water quality, collect a set of samples as outlined in section b. i. of this subsection; and
(3) Additional coliform samples as directed by the DOH.

iv. When the DOH or laboratory invalidates a sample, the sample shall not count towards the purveyor's minimum coliform monitoring requirements.

3. Inorganic Chemical and Physical (IOC): When an initial analysis of any substance exceeds the MCL, the purveyor shall take the following action:

    a. For nitrate, immediately take one additional sample from the same sampling point. If the average of the two samples exceeds the MCL, a violation is confirmed, or
    b. For all other inorganic chemical and physical substances, within 30 days take three additional samples from the same sample point. If the average of all four samples exceeds the MCL, a violation is confirmed.

4. Inorganic Turbidity: When the turbidity exceeds the maximum allowable limit identified under WAC 246-290-310 for longer than one hour monitored continuously, the purveyor shall report to the DOH within 48 hours. When the results of a manual turbidity analysis exceeds the maximum allowable limit, another sample shall be collected within one hour. When the repeat sample confirms the maximum allowable limit has been exceeded, the purveyor shall notify the DOH.

5. Volatile Organic Chemicals (VOCs): The purveyor shall be responsible for the following follow-up actions:

    a. After the purveyor's receipt of the first VOC analysis results from the laboratory, the purveyor shall provide notice to persons served by the system as described under WAC 246-290-71001.
    b. When a List 1 VOC is verified at a concentration above the detection limit, the purveyor shall, at a minimum:

        i. Sample the source once every three months for at least three years; and
        ii. Make analysis results available to consumers within three months of receipt from the laboratory as described under WAC 246-290-71006.

    c. When a List 1 VOC is verified at a concentration greater than an MCL, and the level will not cause the running annual average to exceed the MCL, the purveyor shall repeat sample the source as soon as possible. If a concentration greater than an MCL is confirmed, the purveyor shall:

        i. Notify the DOH within seven days of receipt of the repeat sample analysis results;
        ii. Provide consumer information in accordance with WAC 246-290-71006;
        iii. Submit documentation to the DOH describing the water system's strategy for gathering and analyzing additional data, and identify plans for keeping the public informed; and
        iv. Sample the source a minimum of once every three months for at least three years.

    d. When the running annual average of a List 1 VOC is greater than an MCL, or one sample analysis result causes the annual average to exceed an MCL, the purveyor shall:

        i. Notify the DOH within seven days of receipt of analysis results;
        ii. Notify the public as described under WAC 246-920-71006, including mandatory health effects language;
        iii. Submit an action plan to the DOH for approval addressing follow-up activities, including corrective action. The purveyor shall submit the action plan within four months of receipt of DOH notice that the annual average exceeds the MCL. The purveyor's action plan shall, at a minimum, contain:

(1) Tabulation of VOC sample analysis results, including the location where VOCs were detected;
(2) Description of monitoring plans for system sources;
(3) Strategy for informing the public of monitoring results and investigations; and
(4) Description of short and long-term plans to minimize exposure and/or eliminate the source of contamination.

iv. Implement the action plan within one year of the DOH's approval. The DOH may require the purveyor's earlier compliance, if necessary, to eliminate an immediate health threat, or may require a revision of the action plan based upon additional sample results. The DOH may extend the purveyor's period of compliance when the DOH determines:

(1) Substantial construction is required; and
(2) The purveyor has taken all appropriate measures to protect the health of consumers served by the public water system.

If the DOH grants the purveyor an extension, the purveyor shall issue a notice identifying the MCL exceeded and the amount by which the repeat sample analysis results exceeded the MCL. The purveyor shall include the notice in all bills mailed to affected customers until the DOH determines that the purveyor complies with the MCL.

v. Sample the source a minimum of once every three months for at least three years.

e. When a List 2 or List 3 VOC is verified at a concentration above the detection limit, the purveyor shall:

i. Submit the sample analysis results to the DOH within seven days of receipt from the laboratory; and
ii. Sample the source a minimum of once every three months for one year, and then annually thereafter during the three-month period when the highest previous measurement occurred.

f. If the DOH determines that a List 2 or List 3 VOC is verified at a level greater than a state advisory level (SAL), the DOH shall notify the purveyor in writing. The purveyor shall repeat sample the source as soon as possible after initial DOH notice that an SAL has been exceeded. The purveyor shall submit the analysis results to the DOH within seven days of receipt from the laboratory. If any repeat sample confirms that an SAL has been exceeded, the purveyor shall:

i. Provide consumer information in accordance with WAC 246-290-71006;
ii. Sample the source a minimum of once every three months for at least three years; and
iii. Submit documentation to the DOH listing VOC analysis results, describing the water system's strategy for gathering and analyzing additional data, and identifying plans for keeping the public informed. The purveyor shall submit this information to the DOH within six months of the date of the first notice from the DOH that an SAL has been exceeded.

g. The DOH may reduce the purveyor's monitoring requirement for a source detecting a List 1 VOC if, after three years of quarterly monitoring, all analysis results are less than the MCL. The purveyor's reduced monitoring frequency shall be no less than one sample per year.
h. The DOH may reduce the purveyor's monitoring requirement for a source detecting a List 2 or List 3 VOC if the source has been monitored annually for at least three years, and all analysis results are less than the SAL.

i. In establishing SAL's for List 2 and List 3 VOCs, the DOH shall use the most recent edition of the DOH document titled "Procedures and References for Determination of State Advisory Levels for Drinking Water Contaminants" which has been approved by the State Board of Health. Copies are available from the DOH upon request.
j. When List 1, List 2 (exclusive of TTHMs), or List 3 VOCs are verified in well fields, the purveyor shall repeat sample individual wells within the well field.
k. When the sum of all trihalomethanes detected exceeds 0.100 mg/L, the purveyor shall sample within three months for total trihalomethanes as required under WAC 246-290-300(5).
l. The DOH may collect samples from a water system or may require that specified quality assurance techniques be used to collect samples.

6. For any additional substance exceeded, follow-up action shall be determined by the DOH when the MCL violation occurs.

Public Notification

1. Responsibility: The purveyor of a Group A water system shall notify the water system users and the DOH for any of the following conditions:

   a. Exceedances of maximum contaminant levels (MCLs) or maximum residual disinfectant levels (MRDLs);
   b. Violation of treatment techniques;
   c. Monitoring and testing procedure violations;
   d. Failure to comply with the schedule of a variance or exemption;
   e. Operation under a variance or exemption;
   f. Occurrence of a waterborne disease outbreak or other waterborne emergency;
   g. Exceedance of the secondary maximum contaminant level for fluoride; and
   h. Availability of unregulated contaminant monitoring results.

   These conditions are grouped into three categories, and require public notification in English and in Spanish within different time periods as described below:

   a. Tier 1 Conditions require public notification within 24 hours. Such conditions include:

      i. Violation of the MCL for total coliform, when fecal coliform or E. coli are present in the water distribution system, or failure to test for fecal coliform or E. coli when any repeat sample tests positive for coliform;
      ii. An E. coli positive groundwater source sample;
      iii. Violation of the MCL for nitrate, nitrite, or total nitrate and nitrite; or when a confirmation sample is not taken within 24 hours of the system's receipt of the first sample showing exceedance of the nitrate or nitrite MCL;
      iv. Violation of the turbidity MCL of 5 NTU, where the primary agency determines after consultation that a Tier 1 notice is required or where consultation does not occur in 24 hours after the system learns of violation;
      v. Violation of the treatment technique requirement resulting from a single exceedance of the maximum allowable turbidity limit, where the primary agency determines after consultation that a Tier 1 notice is required or where consultation does not take place in 24 hours after the system learns of violation;
      vi. Occurrence of a waterborne disease outbreak, as defined in 40 CFR 141.2, or other waterborne emergency; and
      vii. Other violations or situations with significant potential to have serious adverse effects on human health as a result of short-term exposure, as determined by the primary agency, either in its regulations or on a case-by-case basis.

b. Tier 2 conditions require public notification within 30 days. Such conditions include:

   i. All violations of the MCL, MRDL, and treatment technique requirements except where Tier 1 notice is required;
   ii. Violations of the monitoring requirements where the primary agency determines that a Tier 2 public notice is required, taking into account potential health impacts and persistence of the violation; and
   iii. Failure to comply with the terms and conditions of any variance or exemption in place.

c. Tier 3 conditions require public notification within one year. Such conditions include:

   i. Monitoring violations, except where Tier 1 notice is required or the primary agency determines that the violation requires a Tier 2 notice;
   ii. Failure to comply with an established testing procedure, except where Tier 1 notice is required or the primary agency determines that the violation requires a Tier 2 notice;
   iii. Operation under variance granted under §1415 or exemption granted under §1416 of the Safe Drinking Water Act;
   iv. Availability of unregulated contaminant monitoring results; and
   v. Exceedance of the secondary maximum contaminant level for fluoride.

2. Content: Notices in English and in Spanish shall provide:

   a. A clear, concise, and simple explanation of the violation;
   b. Discussion of any potential adverse health effects and any segment of the population which may be at higher risk;
   c. Mandatory health effects information in accordance with subsection (4) of this section;
   d. A list of steps the purveyor has taken or is planning to take to remedy the situation;
   e. A list of steps the consumer should take including advice on seeking an alternative water supply if necessary; and
   f. The purveyor's name and phone number.

   The purveyor may provide additional information to further explain the situation.

3. Distribution:

   a. Public notice of a Tier 1 condition shall occur within 24 hours after learning of the condition by placing notices on the front door of every system user. The public notice shall be written in both English and in Spanish.
   b. Public notice of a Tier 2 condition shall occur within 30 days after learning of the condition and shall be provided in both English and in Spanish.
   c. Public notice of a Tier 3 condition shall occur within 1 year after learning of the condition and shall be provided in both English and in Spanish.
   d. The purveyor of a COMMUNITY water system shall give a copy of the most recent public notice for all outstanding violations to all new billing units or new hookups before or at the time water service begins.
   e. The purveyor shall provide the DOH with a copy of the public notification at the time the purveyor notifies the public.

4. Mandatory Language:

   a. The purveyor shall provide specific health effects language in English and Spanish in the notice when a violation involves:

      i. A primary VOC MCL;
      ii. A secondary fluoride MCL;
      iii. An acute coliform MCL;
      iv. A non-acute coliform MCL;
      v. Granting or continuation of exemption or variance; or
      vi. Failure to comply with a variance or exemption schedule.

   b. Required specific language is contained in the DOH guideline titled “Health Effects Language for Drinking Water Public Notification.”

5. VOC Notification Procedure:

   a. Availability of results: After receipt of the first analysis results, the purveyor of a COMMUNITY or NTNC water system shall notify persons served by the system of the availability of results and shall supply the name and telephone number of a contact person.

      i. The purveyor shall initiate notification within three months of the purveyor's receipt of the first VOC analysis results. This notification is only required one time.
      ii. Notification shall occur by:

         (1) Inclusion in the first set of water bills issued after receipt of the results;
         (2) Newspaper notice which shall run at least one day each month for three consecutive months;
         (3) Direct mail;
         (4) Posting if NTNC system; or
         (5) Any other method approved by the DOH.

      iii. Within three months of receipt of analysis results, purveyors selling water to other public water systems shall provide copies of the analysis results to the purchasing system.
      iv. Within 30 days of receipt of analysis results, purveyors purchasing water shall make results available to their customers. The purveyor's notification shall occur by the method outlined under (a)(i) of this subsection.

   b. Consumer information:

      i. The purveyor shall provide consumer information within 21 days of receipt of confirmation sample results when:

         (1) A List 1 VOC is confirmed at a concentration greater than an MCL, and the level will not cause the running annual average to exceed the MCL; or
         (2) The DOH determines a List 2 or List 3 VOC is confirmed at a level greater than an SAL.

ii. Consumer information shall include:

(1) Name and level of VOC detected;
(2) Location where the VOC was detected;
(3) Any health effects the VOC could cause at its present concentration;
(4) Plans for follow-up activities; and
(5) Phone number to call for further information.

iii. Consumer information shall be distributed by any of the following methods:

(1) Notice placed in the major newspaper in the affected area;
(2) Direct mail to customers;
(3) Posting if NTNC system; or
(4) Any other method approved by the DOH.

6. Fluoride Notification Procedure: When a secondary MCL violation occurs, the purveyor of a community water system shall send notice to:

a. The DOH annually;
b. Water system users annually; and
c. New billing units added while the violation exists.

7. When circumstances dictate the purveyor give a broader or more immediate notice to protect public health, the DOH may require the purveyor's notification by whatever means necessary.

8. When the State Board of Health grants a public water system a waiver, the purveyor shall notify customers and new billing units or new hookups before water service begins. The purveyor shall provide a notice annually and send a copy to the DOH.

9. The DOH may give notice to the water system users as required by this section on behalf of the water purveyor. However, the purveyor remains responsible for ensuring the DOH requirements are met.

6.4 EMERGENCY PREPAREDNESS AND RESPONSE

On June 12, 2002, the Public Health Security and Bioterrorism Preparedness and Response Act (PL 107-188, referred to as the Bioterrorism Act) was signed into law. The law specifies actions a community water system must take to improve the security of its drinking water infrastructure. In addition, the operations and maintenance section of the WAC Chapter 246-290-415 (2)(d) requires public water systems to have an emergency response plan as part of a water system plan. It also requires that public water systems employ reasonable security measures to protect the raw water intake facilities, water treatment processes, storage facilities, pump houses, and distribution systems from possible damage or intruders.

Grandview's *Emergency Response Program* is a plan addressing the City's response to and operation of the water system during unplanned emergency events. The *Emergency Response Program* consists of the following elements:

- System Information
- Chain of Command
- Emergency Events
- Severity of Emergencies
- Emergency Notification
- Water Quality Sampling
- Response Actions for Specific Events
- Alternative Water Sources
- Returning to Normal Operations

6.4.1 System Information

The following is current information pertinent to the Grandview Water System:

System Name:	City of Grandview Water System
System Identification Number:	28970J
System Address:	207 West Second Street Grandview, WA 98930
System Phone Number:	(509) 882-9200
City Mayor:	Gloria Mendoza
Public Works Director/Water System Manager:	Cus Arteaga
System Consulting Engineer:	HLA Engineering, Inc. 2803 River Road Yakima, WA 98902 (509) 966-7000 Justin L. Bellamy, PE
System Service Population:	11,010
System Service Connections:	2,986
Emergency Plan Responsible Party:	Cus Arteaga, (509) 882-9211

6.4.2 Chain of Command

When an emergency occurs, there can be confusion, lack of coordination, and poor communication. Timely and effective response can minimize the effects of an emergency. Often, the initial response sets the tone for how the entire emergency is handled.

Having a chain of command that defines clear lines of authority and responsibilities for system personnel during an emergency speeds up response time and helps eliminate confusion. Water system personnel need to know who to report the emergency to, who manages the emergency, who makes decisions, and what their own responsibilities are.

The first step in any emergency is to notify the person at the top of the chain of command - the person responsible for managing the emergency and making key decisions. This lead person will assess the situation and initiate a series of response actions based on the type and severity of emergency. In addition to an individual having the lead responsibility, other key duties that should be assigned to system personnel include the following:

- Handling incoming phone calls and administrative support.
- Providing information to the public and the media.
- Contacting and providing information to system customers.
- Assessing the water system's facilities, condition, and ability to operate.
- Organizing and completing system repairs.

Table 6-7 shows the Grandview Water System's emergency chain of command and responsibilities of individuals during water system emergencies:

TABLE 6-7 EMERGENCY CHAIN-OF-COMMAND AND RESPONSIBILITIES		
Name / Title	Responsibilities	Contact Numbers
Gloria Mendoza Mayor	Is the lead person for providing information to the public and the media.	Phone: 882-9200
Cus Arteaga WDM 3 City Administrator	Coordinates responses and actions of the PWD, and assists the Mayor as requested.	Phone: 882-9200 Cell: 830-9213
Cus Arteaga WDM3 Public Works Director (PWD)	Overall management and decision making for the water system. Managing emergencies and providing information to regulatory agencies. Operation of the water system, performing inspections, maintenance, and sampling, and relaying critical information, and assessing facilities.	Phone: 882-9200 Cell: 830-9213
Lillian Veliz Public Works Assistant	Administrative functions including receiving phone calls and keeping a log of events.	Phone: 882-9211
Pam Dobrauc Public Works Office Clerk	Administrative functions including receiving phone calls and keeping a log of events.	Phone: 882-9211
Todd Dorsett Assistant Public Works Director	Operation of the water system, performing inspections, maintenance, and sampling, and relaying critical information, and assessing facilities.	Phone: 882-9211 Cell: 830-1060
Hector Mejia WDM1 Public Works Foreman (PWF)	Operation of the water system, performing inspections, maintenance, and sampling, and relaying critical information, and assessing facilities.	Phone: 882-9228 Cell: 305-1472
Cory Taylor Code Enforcement Officer CCS	Perform duties, functions, and activities as directed by the PWD or PWF. Coordinate cross connection control program.	Phone: 882-9211 Cell: 830-0311
Frank Rodriguez P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Phone: 882-4735 Cell: 305-7948
Victor Ledesma P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 439-0612
Albert Rodriguez P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 840-5358
Orlando Santos P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 305-6188
Blas Cantu P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 840-0503
Rich Asher P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 830-5383
Jason Villanueva P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 203-5236
Scott Smotherman P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 831-4153
Cory Taylor P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 832-3264
Carlos Granados P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 305-4821
Pedro Reyes P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 391-0254
Virgilio Herrera P.W. Maintenance Technician	Perform duties, functions, and activities as directed by the PWD or PWF.	Cell: 831-7748

6.4.3 Emergency Events

Emergencies happen for a variety of reasons including:

- Natural disasters including high winds, excessive snowfall and ice storms, floods, drought, well contamination, landslides and earthquakes, and volcanic eruptions.
- Accidents.
- Deliberate acts of vandalism or terrorism.
- System neglect, poor operation, or deferred maintenance.

6.4.4 Severity of Emergencies

Emergencies usually have a wide range of severity. Defining categories of severity can significantly aid in determining appropriate response actions. Knowing the severity of the emergency and being able to communicate it to others will help system personnel keep their response balanced and effective.

Making a decision on severity should be collaborative among system personnel but is ultimately made by the person in charge of the emergency. The person in charge may also choose to coordinate with external parties, especially if partnerships have been formed in advance of the event. The information for making the decision will accumulate over time, and may result in the level of severity being changed.

An assessment of severity, once determined, must be communicated immediately to all those dealing with the emergency. Make sure staff have cell phones, pagers, and/or radios when they are in the field. Remember to have an alternate method of communicating if cell phones and pagers won't work.

The following is a four-level emergency severity classification system for the Grandview Water System.

A. Level 1 - Routine Emergencies

Routine emergencies are normally resolved within 24 hours, and with minimal outside assistance. The Grandview Water System considers the following to be Level 1 emergencies:

- Short power outages.
- Minor mechanical problems in pumphouses and booster stations.
- Distribution line breaks.
- Other minor situations where it is not likely that public health will be jeopardized.

B. Level 2 - Minor Emergencies

Minor emergencies are those where the water system experiences minor disruption in supply, or has indications of possible contamination. In these types of emergencies, public health may be jeopardized, the system may need to coordinate with DOH, and the City may consider issuing a health advisory to customers. It is important for water system personnel to be on alert and to initiate a quick response. Minor emergencies can usually be resolved within 72 hours. The Grandview Water System considers the following to be Level 2 emergencies:

- Disruption of supply such as a transmission line break, pump failure with a potential for backflow, and loss of pressure.
- Storage is not adequate to handle disruption in supply.
- An initial positive coliform or E. coli sample test result.
- An initial primary chemical sample test result above the DOH standard.
- A disruption in chlorine feed to the water supply.
- A minor act of vandalism.

C. Level 3 - Significant Emergencies

The system experiences a significant mechanical or contamination problem where disruption in supply is inevitable, and issuance of a health advisory is necessary to protect public health. Significant emergencies should be reported to DOH as soon as possible to determine the best available means to protect the health of the system users. Resolution of the emergency may require the aid and assistance of outside entities, and may take longer than 72 hours to resolve. The Grandview Water System considers the following to be Level 3 emergencies:

- A verified sample test result above a DOH standard requiring immediate consideration of a health advisory notice to customers.
- A loss or failure of a major water system component resulting in a water shortage or requiring system shutdown.
- An act of vandalism or terrorist threat such as intrusion or damage to a major water system component.

D. Level 4 - Catastrophic Disasters/Major Emergencies

The water system experiences major damage or contamination from a natural disaster, an accident, or an act of terrorism. Such incidents usually require immediate notification of local law enforcement and local emergency management services. Immediate issuance of health advisories and declaration of water supply emergencies are critical to protect public health. These events often take several days or weeks to resolve before the system returns to normal operation. The Grandview Water System considers the following to be Level 4 emergencies:

- An earthquake or landslide that shuts down the system or impacts sources, lines, etc.
- An act of terrorism possibly contaminating the water system with biological or chemical agents.
- A significant chemical spill in close proximity to one of the system's sources.
- A storm that significantly damages system facilities.

6.4.5 Emergency Notification

During most emergencies, it will be necessary to quickly notify a variety of parties. Preparation for such notification has the following three essential components:

- Assigning responsibility to oversee and carry out the notifications.
- Assembling comprehensive call-up lists with names and contact numbers.
- Writing out procedures for quickly disseminating information to appropriate parties.

Valuable response time can be lost without readily available notification information or the means to deliver it. Having well-formed partnerships will help during these times.

In addition to phone, email, and media (radio, television, newspaper) for notification, the water system may consider forming partnerships with local community groups to assist in delivering information to customers when needed.

Call-up lists should be comprehensive, including local law enforcement, Yakima County Emergency Management, Yakima County Health District, DOH Drinking Water, WDOE, county and neighboring city officials, service and repair providers, and water testing laboratories. A list of priority customers, such as nursing homes, medical clinics, and schools should also be maintained for immediate notification. Provided in Table 6-8, Table 6-9, Table 6-10, and Table 6-11 are notification lists to be used during emergency situations.

TABLE 6-8 LOCAL NOTIFICATION LIST

Entity	Contact Numbers
Grandview Public Works (Water) Department	daytime phone: 882-9211
Grandview City Hall	daytime phone: 882-9200
Grandview Police Department	daytime phone: 882-2000 24-hour phone: 882-9223
Yakima County Sheriff's Office	daytime phone: 574-2500 24-hour phone: 574-2500
Yakima County Office of Emergency Management	daytime phone: 574-1900 24-hour phone: 574-2500
Yakima Health District	daytime phone: 575-4040 24-hour phone: 575-4040
Yakima County Public Works Department	daytime phone: 574-2300 24-hour phone: 574-2300
City of Prosser Water Department	daytime phone: 786-2332 24-hour phone: 786-2112
City of Sunnyside Water Department	daytime phone: 837-3782 24-hour phone: 836-6200
Water Testing Laboratory: Cascade Analytical, Inc.	 daytime phone: 452-7707
Newspaper: Yakima Herald Republic Grandview Herald	 daytime phone: 248-1251 daytime phone: 882-3712
Radio Stations: KIT - 1280 AM	 daytime phone: 972-5481
Television Stations: KAPP KNDO KIMA	 daytime phone: 453-0351 daytime phone: 225-2300 daytime phone: 575-0029

TABLE 6-9 STATE NOTIFICATION LIST	
Entity	Contact Numbers
Department of Health (DOH), Eastern Region	daytime phone: (509) 329-2100 24-hour phone: 1-877-481-4901
Washington Department of Ecology (DOE)	daytime phone: 575-2490 24-hour phone: 575-2490
DOH Drinking Water After-Hours Emergency Hotline	1-877-481-4901

TABLE 6-10 SERVICE / REPAIR NOTIFICATION LIST	
Entity	Contact Numbers
Electrical: H2 Electric	daytime phone: 837-1453
Pumps: Lower Valley Machine Shop Picatti Brothers	daytime phone: 882-3881 daytime phone: 248-2540
Telemetry System: Conley Engineering, Inc.	daytime phone: 965-9872
Water System Materials: Consolidated Supply Co.	daytime phone: 622-7128

TABLE 6-11 SENSITIVE USERS NOTIFICATION LIST	
Entity	Contact Numbers
Schools: Grandview School District	daytime phone: 882-8500
Medical / Dental Facilities: Lift Options Birch St. Medical Center Grandview Medical Center Farm Workers Medical Center Mountain View Woman's Center Valley Family Dentistry Westside Family Dental	daytime phone: 882-1899 daytime phone: 882-3500 daytime phone: 203-1080 daytime phone: 882-3444 daytime phone: 882-4700 daytime phone: 882-3423 daytime phone: 882-3151
Nursing Homes: Grandview Health Care Orchard House	daytime phone: 882-1200 daytime phone: 882-4400
Red Cross:	daytime phone: 457-1690

Notification procedures describe who is responsible for conducting notifications, who assists in the notifications, how to make notifications to specific parties, and what methods are used to complete the

notifications. Notification procedures include how to issue a health advisory in the event the water supply is unsafe for drinking or use.

Other procedures include:

- Notifying water system personnel who are on-call and/or off-duty.
- Notifying customers, priority customers, and industrial users.
- Alerting local law enforcement, local emergency management, local health officials, drinking water officials, and water testing laboratories when appropriate.
- Contacting service and repair contractors.
- Contacting neighboring water systems for assistance, if necessary.
- Arranging for alternative water supplies.

Table 6-12, Table 6-13, Table 6-14, Table 6-15, and Table 6-16 provide notification procedures for the Grandview Water System.

TABLE 6-12 CUSTOMER NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director (PWD) should consult with the Mayor and the City Administrator as part of the decision-making process, whether to notify customers regarding a potential water shortage, water contamination, or other situation that results in water use restrictions. Once the decision is made to notify customers, procedures for notification should be initiated.
Procedures:	The Mayor, the City Administrator, and the PWD develop the message to be delivered to the customers and to the media. PWD consults with DOH regarding the problem and response alternatives. The PWD continues to investigate problem and make repairs/take action as necessary. Notice to customers will be distributed by: Water System staff placing water notices on customers' doors and on signs posted on travel routes throughout the City. City Administrator contacts media requesting issuance of notice and information on the problem. Administrative support person will provide a pre-scripted message to phone callers and log in each phone call. The PWD continuously updates the Mayor and the City Administrator on the current condition of the problem. Once the problem is resolved: Water System staff re-notify customers through signs on doors. City Administrator notifies media regarding problem resolution.

TABLE 6-13 LAW ENFORCEMENT, EMERGENCY MANAGEMENT, COUNTY HEALTH, DOH, AND WDOE NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director (PWD) is responsible for notifying law enforcement, emergency management, county health, DOH, and WDOE.
Procedures:	PWD consults with the Mayor and the City Administrator regarding if and when to notify law enforcement, emergency management, county health, DOH, and WDOE. PWD consults with DOH regarding the problem and response alternatives. PWD informs law enforcement, emergency management, county health, and WDOE, and requests assistance as appropriate.

TABLE 6-14 SERVICE AND REPAIR CONTRACTOR NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director (PWD) is responsible for contacting service and repair contractors.
Procedures:	The PWD determines what repairs and/or services are needed to return the water system to normal operation. PWD contacts service and repair contractors and monitors the progress of the work.

TABLE 6-15 NEIGHBORING WATER SYSTEM NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director (PWD) is responsible for contacting neighboring water systems.
Procedures:	PWD consults with the Mayor and with the City Administrator regarding if and when a neighboring water system will be contacted, and what assistance will be requested. PWD contacts neighboring water system and requests appropriate assistance.

TABLE 6-16 HEALTH ADVISORY ISSUANCE NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director (PWD) is responsible for issuing a health advisory.
Procedures:	PWD consults with DOH regarding problem and response procedures.

6.4.6 Water Quality Sampling

Many types of emergencies can jeopardize the quality of water and potentially sicken those using the water. Because the most important goal for any water system is to protect human health, the system must know how to act quickly and make decisions on whether to issue a health advisory.

Contamination of drinking water, whether intentional or unintentional, comes in many forms, and are classified in the following four general categories:

- Bacteriological organisms.
- Inorganic substances such as metals or cyanide.
- Organic substances such as pesticides or volatile compounds.
- Radionuclides.

The Grandview Water System monitors its system's water quality in accordance with DOH requirements. Grandview's regular water testing program was described earlier in this Chapter.

If there is reason to believe that the water has been contaminated, the Public Works Director should consult with DOH and consider issuing a health advisory as soon as possible - often before conducting water quality sampling.

If Grandview determines that water quality sampling and testing should be conducted, the City should immediately contact the laboratory that will be performing the analysis to obtain appropriate sampling bottles, and sampling and chain-of-custody procedures. Grandview typically uses Cascade Analytical for its water quality analysis.

Cascade Analytical, Inc.
1008 West Ahtanum Road
Union Gap, WA 98903
Phone: 452-7707

Bacteriological testing should be conducted in accordance with the City's current *Coliform Monitoring Plan*. A copy of that document is included in CHAPTER 10.

6.4.7 Response Actions for Specific Events

For any emergency, there are a series of general steps that a water system should take:

1. Confirm and analyze the type and severity of the emergency.
2. Take immediate action to save lives.
3. Take action to reduce injuries and system damage.
4. Prioritize and accomplish system repairs.
5. Return the system to normal operation.

Table 6-17, Table 6-18, Table 6-19, Table 6-20, Table 6-21, Table 6-22, Table 6-23, Table 6-24, and Table 6-25 identify the assessment, response actions, notifications, and follow-up actions required for various emergency situations.

TABLE 6-17 RESPONSE ACTIONS FOR POWER OUTAGES

Assessment	The Grandview Water System experiences an average of 2 outages per year that last 20 minutes to several hours. Three of the system's source wells (West Main, North Willoughby, and South Willoughby) are equipped with emergency electrical generators. Historically, power outages have been of short duration such that reservoir storage has been able to supply the City with water until power is restored.
Immediate Actions	1. Assess whether the outage is likely to last more than 2 hours. If no, be on alert for changing conditions and monitor reservoir levels. If yes, complete the following: a. Ensure the standby generators West Main, North Willoughby, and South Willoughby are in operation. b. Implement water shortage response actions to inform customers to cut back on water usage until power is restored.
Notifications	1. Pacific Power (power company) - Let them know that a public water system is experiencing an outage. 2. Implement water shortage response actions to inform customers to cut back on water usage until power is restored.
Follow-Up Actions	1. Turn off and disconnect standby generators at West Main, North Willoughby, and South Willoughby. 2. Return system to general power supply. 3. Inspect reservoirs and pumping facilities to ensure proper operation and to assess any damages.

TABLE 6-18 RESPONSE ACTIONS FOR WATER MAIN BREAK	
Assessment	Visually determine the physical nature of the problem.
Immediate Actions	Visually assess the problem. Return to the area if the water needs to be turned off to effect repairs.
Notifications	Notify customers prior to shutting off water.
Follow-Up Actions	Check with all customers to ensure water has been returned to normal service. Take water samples for bacteriological testing.

TABLE 6-19 RESPONSE ACTIONS FOR DISINFECTION EQUIPMENT FAILURE	
Assessment	Determine the cause of the failure.
Immediate Actions	Replace and/or repair broken equipment.
Notifications	Inform the Public Works Director.
Follow-Up Actions	Return the equipment to service, ensure that it is operating satisfactorily, and check for leaks or other operational problems. Take water samples for bacteriological testing.

TABLE 6-20 RESPONSE ACTIONS FOR MICROBIAL CONTAMINATION	
Assessment	Collect repeat samples to confirm contamination. If confirmed, determine the reason for the cause or source and the locations of the contamination.
Immediate Actions	Inform the Public Works Director, who will review the assessment with the appropriate personnel. Immediately take corrective actions.
Notifications	Contact DOH to discuss public notification, follow-up requirements, and additional steps to resolve the problem. Acute maximum containment levels (MCL) violations require public notification within 24 hours, and a boil water order will almost always be issued.
Follow-Up Actions	If contamination was accidental due to construction or a repair procedure, then those procedures need to be reviewed. If the cause was intentional, then new or existing safeguards need to be implemented or reviewed.

TABLE 6-21 RESPONSE ACTIONS FOR CHEMICAL CONTAMINATION	
Assessment	Collect repeat samples to confirm contamination. If confirmed, determine the cause or source and the location(s) of the contamination.
Immediate Actions	Inform the Public Works Director, who will review the assessment with the appropriate personnel. Immediately take corrective action.
Notifications	Contact DOH to discuss public notification, follow-up requirements, and steps to resolve the problem. Maximum containment levels (MCL) violations require public notification within 24 hours.
Follow-Up Actions	Follow-up actions for chemical contamination monitoring and sampling frequency will be conducted under the procedures listed in WAC 246-290-320 and the Code of Federal Regulation 141.24. If contamination was accidental due to construction or a repair procedure, then those procedures need to be reviewed. If the cause was intentional, then new or existing safeguards need to be implemented or reviewed.

TABLE 6-22 RESPONSE ACTIONS FOR EARTHQUAKE	
Assessment	Visually determine the nature and extent of damage to the water system.
Immediate Actions	Inform the Mayor, the City Administrator, and the Public Works Director, of the nature and extent of damage/disruption to the water system.
Notifications	Notify affected customers.
Follow-Up Actions	Provide customers with estimated length of service disruption.

TABLE 6-23 RESPONSE ACTIONS FOR HAZARDOUS MATERIAL SPILL	
Assessment	Assess the nature and extent of the spill.
Immediate Actions	Contact local agencies including DOH, WDOE, Grandview Police, Yakima County Sheriff, and Yakima County Office of Emergency Management.
Notifications	Notify all affected customers.
Follow-Up Actions	Provide customers with estimated length of service disruption.

TABLE 6-24 RESPONSE ACTIONS FOR ELECTRONIC EQUIPMENT FAILURE	
Assessment	Assess the nature and extent of the failure.
Immediate Actions	Contact certified electrician.
Notifications	Notify all affected customers.
Follow-Up Actions	Provide customers with estimated length of service disruption.

TABLE 6-25 RESPONSE ACTIONS FOR VANDALISM OR TERRORIST ATTACK	
Assessment	Assess the nature and extent of the situation/condition.
Immediate Actions	Contact Grandview Police Department.
Notifications	Notify all affected customers.
Follow-Up Actions	Repair all known problems.

6.4.8 Alternative Water Sources

Water contamination or disruption of supply may require that the water system obtain water from another source to meet basic community needs, and water systems should plan ahead to provide safe water during an emergency. It is important to evaluate potential alternative water supplies ahead of time to ensure the water is safe and the supply is available.

In 2012, the City of Grandview, City of Prosser, City of Sunnyside, and City of Mabton entered into an interlocal agreement (Resolution No. 2011-51) regarding the cooperative use of facilities, equipment, and personnel. The agreement encourages and promotes coordination and use of facilities in the event assistance is needed by any of the agencies involved. This Resolution is included in CHAPTER 10.

Table 6-26 provides information regarding alternative water sources.

TABLE 6-26 ALTERNATIVE WATER SOURCES

Alternative Source	Name	Phone	Availability	Safe for Drinking?
City of Prosser in conjunction with tanker trucks	City of Prosser Marty Groom	(509) 786-1112	yes	yes
City of Sunnyside in conjunction with tanker trucks	City of Sunnyside Shane Fisher	(509) 837-5206	yes	yes
City of Mabton in conjunction with tanker trucks	City of Mabton Public Works	(509) 894-4096	yes	yes
Bottled Water	Central Vending	(509) 248-1212	yes	yes
	Crystal Springs Water Co.	(509) 225-7822	yes	yes
	Culligan Water Conditioning	(509) 452-6601	yes	yes
	Independent Water Service	(509) 457-3631	yes	yes

6.4.9 Returning to Normal Operations

As the emergency passes, the system must prepare to return to normal operation. This may be a very simple or very complex process, depending on the type and severity of the emergency. Returning to normal operation may simply mean the system restores power and the portable generator is disconnected, or it could mean the system has to be repeatedly disinfected to obtain the proper number of satisfactory coliform tests necessary to lift a health advisory.

Many factors may need to be considered before a water system is returned to normal operation. Examples include:

- Has the system been repaired to the point that it can meet demand?
- Has the system manager made a safety and operational inspection of all system components?
- Has the system been properly flushed, disinfected, and pressure tested?
- Has the water been adequately tested in accordance with sampling regulations?
- Does the water meet drinking water standards?
- Is there adequate staff to operate and manage the system?
- Do federal, state, and local agencies support returning the system to normal operation?
- Have the proper public messages and notifications been developed?

Table 6-27 presents a guide of actions and activities for returning the system to normal operation.

TABLE 6-27 ACTIONS FOR RETURNING THE SYSTEM TO NORMAL OPERATION

Action / Activity	Description
Inspect, flush, and disinfect the system	Public Works Director (PWD) and support staff inspect all system facilities and verify that the system has been flushed and disinfected and that all water quality tests have been done.
Verification of water quality	PWD verifies water quality sampling results.
Coordinate with DOH	PWD coordinates with DOH regarding system condition and water quality results.
Notify customers	PWD meets with City Administrator and communications lead to write and distribute notice to customers.

6.5 CROSS-CONNECTION CONTROL PROGRAM

In 2003, Grandview developed and implemented a cross-connection control program intended to protect the City's water distribution system from the possibility of contamination due to existing or potential cross-connections. Grandview's cross-connection program includes the following elements:

1. Adoption of a written ordinance authorizing the establishment and implementation of a cross-connection control program (City Ordinance No. 1649, enacted 2003, now exists as Chapter 13.18 – Cross-Connection Control, within the City of Grandview Municipal Code);
2. Written procedures for implementing the cross-connection control program;
3. Identification of a staff position delegated for organization and implementation of the cross-connection control program, and the qualifications required of personnel working in the cross-connection control program;
4. Detailed procedures for conducting surveys of new and existing facilities to identify all existing and potential cross-connections;
5. A list of approved backflow assemblies;
6. A procedure to ensure all required backflow assemblies are tested upon installation, after a repair or relocation, and on a routine basis as established by State regulation;
7. A record system which includes a list identifying the location of all required cross-connection control devices, the type of device, the testing schedule, the performance results, a description of repairs and/or repair recommendations, and the tester's name and certification number; and
8. A description of the process which will provide cross-connection control information to existing and future users.

Any cross-connection violations shall be enforced, and penalties imposed in accordance with Chapter 15.72 of the Grandview Municipal Code.

A copy of Grandview's *Cross-Connection Control* municipal code chapter and the *2013 Water Quality Report* are included within CHAPTER 10.

6.6 RECORDKEEPING, REPORTING, AND CUSTOMER COMPLAINT PROGRAM

The City of Grandview maintains a Water System Customer Complaint Response Program. The program is designed to formally receive, track, and record complaints received regarding the City's water system. Water system complaints typically include taste, cloudy and/or discolored, odor, low or excessive pressure, and leaky or broken service connections or water mains. 26 complaints have been received by the City for the reporting period between 2008 and 2013, as shown in Table 6-28.

TABLE 6-28 GRANDVIEW WATER SYSTEM COMPLAINTS 2008-2013

Year	Taste	Cloudy and/or Discolored	Odor	Low/High Pressure	Leaky/Broken Service Connections	Other
2008						
2009			1			
2010		4	4			
2011				1		
2012		3	4	2		
2013	1	3	2	1		
TOTALS	1	10	11	4		

Complaints received by the City are recorded onto a *Citizen Contact Record* form. The complaint information and form are routed to the Public Works staff for investigating and resolving the problem. Actions taken to resolve the problem are recorded on the form and kept on file at the Public Works Office. A copy of the *Citizen Contact Record* form is included in CHAPTER 10.

6.6.1 Record Keeping and Reporting

The City of Grandview keeps and maintains records on its water system as shown in Table 6-29.

TABLE 6-29 GRANDVIEW WATER SYSTEM RECORDS

Record Type	Location of Records	Retained For:
Water Consumption (by user category)	City Hall	10 Years
Water Production (by well)	Public Works Department	10 Years
Well Water Level Measurements	Public Works Department	6 Years
Water Quality Testing Results	Public Works Department	System Life
Equipment Maintenance	Public Works Department	6 Years
Water System Complaints	Public Works Department	6 Years
Backflow Assembly Testing	Public Works Department	6 Years

Water quality monitoring results are reported to the DOH as required.

6.7 SAFETY PROCEDURES

All City personnel are instructed to exercise the utmost care when working on any water system facility. Safety of City staff and the public is the number one priority. Provided below is an outline of safety procedures to be followed when working on water system facilities:

A. Pumping Equipment

1. Removing Pump

   a. Close valves.
   b. Shut off power to the pump, use lockout/tagout policy and procedures.
   c. Ensure power is disconnected and then remove electrical cables.
   d. Lift pump with proper equipment.

2. Installing Pump

   a. Lift pump with proper equipment.
   b. Ensure all pipe connections are properly installed and tightened.
   c. Employ an electrician to properly connect power cables.
   d. Check pump rotation.
   e. Open valves.
   f. Ensure pump control valve (if present) is operating properly.
   g. Turn on power to the pump and remove lockout/tagout tag.

B. Chlorination Equipment

1. Check all chlorine alarms and sensors for proper operation.
2. Verify leak alarm status before entering the room.
3. Immediately check for chlorine odors.
4. Routinely inspect for leaks.
5. Check ventilation system equipment for proper operation.
6. Properly maintain emergency breathing equipment.

C. Reservoir – Interior Inspection

1. Inspection to be conducted by a minimum of two workers, one work to stay outside the reservoir.
2. Ensure the reservoir interior is properly ventilated and illuminated.
3. Properly set and secure ladder before climbing into reservoir.

D. Distribution System – Pipeline Installation

1. All construction work requiring excavation, trenching, and shoring shall be conducted in accordance with the Department of Labor and Industries Safety Standards for Construction Work.
2. Close all valves connecting to pipe segment.
3. Properly set traffic control signing, barricades, and cones.
4. Install shoring or cribbing in all trenches over 48 inches in depth.
5. Install joint restraints or construct thrust blocking, if required, and partially backfill the trench at a minimum prior to charging the pipeline.
6. Flush, disinfect pipe, and conduct bacteriological testing prior to putting new line into service.

6.8 SERVICE AND SUPPLY REPRESENTATIVES

Provided below is a list of service and supply representatives for the various system components:

A. Pipe, Valves, and Fittings

1. H.D. Fowler Co.
   1100 River Road
   Yakima, WA 98902
   Phone: 509-248-8400
   Contact: Tim Heary – 509-952-7751

2. Consolidated Supply Co.
   1100 Walla Walla Ave
   Wenatchee, WA 98801
   Phone: (509) 662-7128
   Fax: (509) 663-2279

3. Ferguson Waterworks
   1130 W. Washington St.
   Pasco, WA 99301
   Phone: (509) 545-2111

B. Water Service Materials

1. H.D. Fowler Co.
   1100 River Road
   Yakima, WA 98902
   Phone: 509-248-8400
   Contact: Tim Heary – 509-952-7751

2. Consolidated Supply Co.
   1100 Walla Walla Ave
   Wenatchee, WA 98801
   Phone: (509) 662-7128
   Fax: (509) 663-2279

C. Service Meters – Mueller Meters

1. Consolidated Supply Co.
   1100 Walla Walla Ave
   Wenatchee, WA 98801
   Phone: (509) 662-7128
   Fax: (509) 663-2279

D. Chlorination Equipment – Wallace & Tiernan

1. TMG Services
   13202 Second Street East
   Sumner, WA 98390
   Phone: 800-562-2310

E. Chlorine Gas

1. Oxarc
   509 Scoon Road
   Sunnyside, WA
   Phone: (509) 837-6212
   Fax: (509) 839-2961

F. Water Main Tapping

1. Spear Taps, Inc.
   309 NE 159th Street
   Seattle, WA 98155
   Phone: 206-363-8053

G. Electrical

1. H2 Electric
   211 Lappin Ave.
   Sunnyside, WA 98944
   Phone: (509) 837-1453

H. Pumps

1. Lower Valley Machine Shop
   104 West Fifth Street
   Grandview, WA 98930
   Phone: 509-882-3881

2. Picatti Brothers
   111 South Third Avenue
   Yakima, WA 98902
   Phone: 509-248-2540

I. Pressure Reducing Valves

1. Consolidated Supply Co.
   1100 Walla Walla Ave
   Wenatchee, WA 98801
   Phone: (509) 662-7128
   Fax: (509) 663-2279

J. Telemetry System

1. Conley Engineering, Inc.
   1433 Lakeside Court, Suite 100
   Yakima, WA 98902
   Phone: 509-965-9872

K. Pump, Motor Oil, and Bearing Grease

1. R.E. Powell Distributing
   501 East Wine Country Road

Grandview, WA 98930
Phone: 509-882-2115

2. 940 E. Wine Country Rd
Grandview, WA 98930
Phone: (509) 882-1225

6.9 O&M IMPROVEMENTS

Improvements required for operation of the existing water system, including routine sanitary surveys by the DOH, planning document updates, and other miscellaneous operational improvements are discussed in CHAPTER 8. System operational costs associated with water quality testing and administrative tasks are included in the City's general water operational budget and have not been identified or estimated separately.

Recommended improvements necessary for maintenance of the existing system, such as well rehabilitation, reservoir cleaning and inspection, and other miscellaneous maintenance related improvements, are also discussed in detail in CHAPTER 8. Further, CHAPTER 8 includes a schedule for completion of both routine and individual O&M improvements, including their estimated costs.

CHAPTER 7 -

DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS

HLA
Engineering and Land Surveying, Inc.

7.1 PROJECT REVIEW PROCEDURES

The City of Grandview requires that all water system improvements proposed by others (e.g., developers, industries, etc.) be designed and appropriate construction documents prepared by a professional engineer licensed to practice in the State of Washington. The City may require a project report prior to design and document preparation if the proposed work includes pumps, reservoirs, and/or other unique characteristics.

Project reports and/or construction plans and specifications for water distribution main improvements shall be submitted to the City for review. Review of said documents is undertaken by the City's Public Works Department, Fire District, and engineering consultant under the provisions of WAC 246-290-125(2). Comments and/or required changes are then forwarded to the proponent. Resubmittal of the revised documents, review and City approval are required before construction may proceed. Following completion of construction and acceptance by the City, a completed DOH Construction Completion Report form shall be submitted to the City.

In addition to being reviewed and approved by the City Public Works Department, City Fire Department, and engineering consultant, project design reports and/or construction plans and documents for all projects except for distribution-related projects, as defined in WAC 246-290-010, must be submitted to and approved by the DOH as specified in WAC 246-290-120 before construction may proceed. Required documents shall be submitted by the proponent to the following address:

Washington State Department of Health
Office of Drinking Water
Eastern Drinking Water Operations
16201 East Indiana Avenue, Suite #1500
Spokane Valley, WA 99216

7.2 POLICIES AND REQUIREMENTS FOR OUTSIDE PARTIES

Grandview will provide water service to properties outside the City Limits, but within its service area in accordance with the service area policies of Chapter 13.28 of the City's Municipal Code. Customers outside the City Limits must execute an outside utility agreement and will be assessed water rates which are higher than those charged to customers within the City Limits. A copy of the City's Municipal Code is provided in CHAPTER 10.

As a prerequisite to obtaining domestic water service, Grandview requires property owners to hook onto sanitary sewers which are within 200 feet or less of the nearest property corner. If sanitary sewers are not available within 200 feet, the property owner is required to sign a waiver prohibiting the property owner from opposing a future Local Improvement District (LID) for sewer service.

All costs associated with extending water mains to unimproved properties are the responsibility of the developer, including any required inspection fees by the City. Requirements to be met by developers when extending the City's water system are identified in the *Extension by Developers Policy* and the *City of Grandview Design and Construction Standards and Specifications for Public Works Improvements*. Copies of these documents are provided in CHAPTER 10. In addition, Grandview has established, by City Code Chapter 13.28.160, a "Latecomer's Agreement" for extension of water mains. A copy of this chapter is provided in CHAPTER 10.

7.3 CONSTRUCTION AND DESIGN STANDARDS

All water system improvements must conform to Grandview's most current design and construction standards, *City of Grandview Design and Construction Standards and Specifications for Public Works Improvements*. A copy of the design and construction standards is provided in CHAPTER 10.

7.4 CONSTRUCTION CERTIFICATION

Grandview confirms that water system extensions are constructed in accordance with City requirements through construction inspection by City Public Works staff and observation of pressure testing of new water lines by the developer. Construction inspection procedures are addressed in the *City of Grandview Design and Construction Standards and Specifications for Public Works Improvements* and in the "Extension by Developers Policy" as provided in CHAPTER 10. The City may reject construction for which it has not had ample opportunity for inspection.

CHAPTER 8 -

CAPITAL IMPROVEMENT PROGRAM

HLA
Engineering and Land Surveying, Inc.

8.1 IMPROVEMENT PROGRAM OBJECTIVE

The development of a water system improvement program is a primary goal of this Water System Plan. Through the analysis of existing system demands, capabilities and deficiencies, and by projecting future system growth, improvements have been identified throughout the Plan.

In previous sections, deficiencies in the existing City of Grandview water system have been identified and specific improvements have been recommended. The costs of such improvements often prohibit their completion within a short time without seriously impacting budgets and user rates. It is prudent, therefore, to group improvements so they might be reasonably accomplished over several years.

Recommended system improvements have been categorized into three main categories: 1) Operational and Maintenance (O&M) Improvements, 2) Major Capital Improvements, and 3) Future Capital Improvements (Planning). The O&M improvements are necessary for system operation and maintenance of existing facilities, including well and reservoir rehabilitation, water use efficiency (WUE) measure implementation, and other miscellaneous improvements. Major capital improvements are those necessary to improve a system deficiency such as fire flow, source and/or storage capacity, water quality, or replacement of aging and/or undersized system components. The future planning improvements category is improvements that would be necessary to accommodate system expansion to serve the future service area because of new development.

In each improvement category section, except for the future planning improvements section, a prioritized listing of the recommended system improvements, together with a brief description of the need, anticipated construction elements, and estimated project costs (based on 2021 construction costs). Actual costs will vary from those shown in the following estimates because of changes in the construction industry, the competitive bid process, the availability of materials and equipment, and the timing of the improvements. The estimated improvement costs should be increased by the rate of inflation for each subsequent year after 2021.

8.2 OPERATIONAL AND MAINTENANCE (O&M) IMPROVEMENTS

The following is a prioritized listing of the required and/or recommended O&M improvements, including a brief description of the need for each improvement and projected year the improvement will take place. A ten-year schedule for completion of the recommended O&M improvements, and improvement costs, are provided at the end of this Section, in Table 8-1. The estimated costs in Table 8-1 have been inflated for each year after 2021 to reflect the possible future costs, based upon the projected year the improvement will be completed. Improvements that are projected to take place after year 2032 have been inflated to reflect year 2033 costs, although some of these improvements may take place after the year 2033.

1. 3.0 MG RESERVOIR RECOATING

The existing 3.0 MG standpipe interior was last recoated in 1989 and the exterior was recoated in 1995. The anticipated life of a reservoir coating system is approximately 20 to 30 years. During the last tank inspection in 2019, the interior coating was showing signs of corrosion and the exterior was showing signs of weathering. It is recommended the tank be recoated to maintain water quality and structural integrity of the existing tank. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$50,000
Interior Access Ladder	LS	-	-	$10,000
Interior Pressure Wash/Sandblast	LS	-	-	$290,000
Tank Disinfection	LS	-	-	$15,000
Repair/Replace Roof Vent, Hatch, etc.	LS	-	-	$25,000
Exterior Pressure Wash	LS	-	-	$160,000
Repaint Exising Logo	LS	-	-	$25,000
			Construction Cost Subtotal	$575,000
			Sales Tax (8%)	$46,000
			Subtotal	$621,000
			Contingency (20%)	$93,150
			Subtotal	$714,150
			Engineering & Administration (15%)	$107,123
			Construction Engineering (15%)	$107,123
			TOTAL ESTIMATED COST	$928,395

2. SOURCE WELL S14 CLEANING AND REHABILITATION

Source well S14 (Butternut) is one of the City's primary source wells. Capacity has decreased from about 1,500 gpm to 1,275 gpm and the well has had signs of biofouling within the well and aerators because of bacterial growth within the well. The well and pumping equipment have not been rehabilitated since their original installation in 1990. The existing well is about 1,294 feet deep and has a 16-inch diameter production/pump chamber casing installed to a depth of about 739 feet. In 2020, water samples were taken, and a complete well profile analysis was performed. Recommendations from the well analysis include removing the existing pumping equipment following an initial pumping test using the existing pump and completion of a downhole video inspection to verify existing conditions, followed by chemical and mechanical cleaning of the well to address the bacterial issue. Since the new well pump will be out of the well it is recommended the existing pump and column shaft assembly be rebuilt prior to placing the pump back into service. A submersible level transducer should also be installed following well rehabilitation to monitor water levels and well performance. Well S14 does not have a telemetry control panel, so a local panel meter will be needed to record water levels. The City may want to consider installation of a telemetry control panel as part of future electrical and control system upgrades to monitor well production and water levels through the City's existing telemetry control system. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$30,000
Well Pump Testing, Complete	LS	-	-	$20,000
Well Video Inspection, Complete	LS	-	-	$2,000
Mechanical Well Cleaning, Complete	LS	-	-	$45,500
Chemical Well Cleaning, Complete	LS	-	-	$129,650
Pump Maintenance and Rehabilitation	LS	-	-	$30,000
Submersible Level Transducer	LS	-	-	$10,000
			Construction Cost Subtotal	$267,150
			Sales Tax (8.0%)	$21,372
			Subtotal	$288,522
			Contingency (20%)	$57,704
			Subtotal	$346,226
			Engineering & Administration (15%)	$51,934
			Construction Engineering (15%)	$51,934
			TOTAL ESTIMATED COST	$450,094

3. TELEMETRY CONTROL SYSTEM IMPROVEMENTS

Grandview's telemetry control system includes programmable logic controllers (PLCs) and radios at six of the City's source wells, including S03, S07/S16, S10, S13, S17, and S18, and the City's two reservoirs (via S03 and S10), and a master PLC and human machine interface (HMI) computer at the City's public works shop. The City's telemetry control system PLCs and radios were installed in 2005 and the HMI computer and software were last updated in 2015 using Wonderware Intouch 2014 software and a Windows 7 PC. Recommended telemetry system improvements include replacement of all PLCs, radios, and the HMI computer and software to maintain a reliable control system. The proposed telemetry control system improvements do not include installing additional control panels or monitoring features to the existing system. These updates will be included in future source well rehabilitation and/or replacement projects. The estimated total project cost is about $200,000.

4. 0.5 MG RESERVOIR CLEANING AND INSPECTION

The City's 0.5 MG reservoir was last cleaned and inspected in 2007. It is recommended that the City have its reservoirs cleaned and inspected approximately every five to ten years. The estimated cost of this improvement is $5,000.

5. SOURCE WELL PROTECTIVE COVENANTS

Only source wells S01, S03, S07, S08, S12, S16 and S17 currently have protective covenants. The remaining wells are S06, S10, S11, and S18. The City owns sufficient property around each of the remaining wells to establish protective covenants at each location. Provided in the Appendix of the Plan is a "Declaration of Covenant", which is used when the well site property is owned by the municipality. A "Declaration of Covenant" should be executed and filed with the Yakima County Auditor's Office for the remaining wells. The estimated cost for this project is $30,000.

6. SOURCE WELL S10 CLEANING AND REHABILITATION

Source well S10 (North Willoughby) capacity has decreased from 410 gpm to 315 gpm. The well is 613 feet deep with a 12-inch casing to 155 feet, a 10-inch liner casing from 155 feet to 613 feet, and perforations from 223 feet to 245 feet, 392 feet to 412 feet, and 576 feet to 613 feet. This improvement project will include an initial pump testing, water quality sampling and testing using the existing pump, and well video log of the existing conditions to determine the best cleaning and rehabilitation methods to use. Depending on video log results, mechanical and/or chemical cleaning treatments may be used. In tandem with cleaning and rehabilitation of the well, pump rehabilitation and maintenance will also be performed. Telemetry system improvements and software upgrades may be included as part of this project as well. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$15,000
Well Pump Testing, Complete	LS	-	-	$20,000
Well Video Inspection, Complete	LS	-	-	$2,000
Mechanical Well Cleaning, Complete	LS	-	-	$21,700
Chemical Well Cleaning, Complete	LS	-	-	$29,850
Pump Maintenance and Rehabilitation	LS	-	-	$27,000
Level Transducer, Complete	LS	-	-	$10,000
			Construction Cost Subtotal	$125,550
			Sales Tax (8.0%)	$10,044
			Subtotal	$135,594
			Contingency (20%)	$27,119
			Subtotal	$162,713
			Engineering & Administration (15%)	$24,407
			Construction Engineering (15%)	$24,407
			TOTAL ESTIMATED COST	$211,527

7. SOURCE WELL S01 CLEANING AND REHABILITATION

Grandview source wells have a history of capacity declines due to biofouling and encrustation on pumping equipment, well screens, and casings because of iron bacteria and similar organisms. To improve system reliability, well performance, and water quality, routine chemical cleaning, development, and pumping equipment rehabilitation is necessary. Source well S01 (West Main) capacity has decreased from 180 gpm to 70 gpm. The well construction includes a 212-foot long, 10-inch production casing and a 35-foot long, 8-inch perforated casing. This improvement project will include an initial pump testing with the existing pump, water quality sampling and testing, and well video log of the existing conditions to determine the best cleaning and rehabilitation methods to use. Depending on video log results, mechanical and/or chemical cleaning treatments may be used. In tandem with cleaning and rehabilitation of the well, pump rehabilitation and maintenance will also be performed. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$25,000
Well Pump Testing, Complete	LS	-	-	$20,000
Well Video Inspection, Complete	LS	-	-	$2,000
Mechanical Well Cleaning, Complete	LS	-	-	$8,400
Chemical Well Cleaning, Complete	LS	-	-	$10,250
Pump Maintenance and Rehabilitation	LS	-	-	$27,000
			Construction Cost Subtotal	$92,650
			Sales Tax (8.0%)	$7,412
			Subtotal	$100,062
			Contingency (20%)	$20,012
			Subtotal	$120,074
			Engineering & Administration (15%)	$18,011
			Construction Engineering (15%)	$18,011
			TOTAL ESTIMATED COST	$156,097

8. 3.0 MG RESERVOIR CLEANING AND INSPECTION

The City's 3.0 MG reservoir was last cleaned and inspected in 2019. It is recommended that the City have its reservoirs cleaned and inspected approximately every five to ten years. The estimated cost of this improvement is $10,000.

9. SOURCE WELL S18 CLEANING AND REHABILITATION

Grandview source wells have a history of capacity declines due to biofouling and encrustation on pumping equipment, well screens, and casings because of iron bacteria and similar organisms. To improve system reliability, well performance, and water quality, routine chemical cleaning, development, and pumping equipment rehabilitation is necessary. Source well S18 (Pecan) capacity has decreased from 180 gpm to 135 gpm. The well construction includes a 304-foot long, 12-inch production casing, a 35-foot long, 10-inch liner casing, and a 156-foot long, 10-inch perforated casing. This improvement project will include an initial pump testing with the existing pump, water quality sampling and testing using the existing pump, and well video log of the existing conditions to determine the best cleaning and rehabilitation methods to use. Depending on video log results, mechanical and/or chemical cleaning treatments may be used. In tandem with cleaning and rehabilitation of the well, pump rehabilitation and maintenance will also be performed. Telemetry system improvements and software upgrades may be included as part of this project as well. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$15,000
Well Pump Testing, Complete	LS	-	-	$20,000
Well Video Inspection, Complete	LS	-	-	$2,000
Mechanical Well Cleaning, Complete	LS	-	-	$17,500
Chemical Well Cleaning, Complete	LS	-	-	$27,800
Pump Maintenance and Rehabilitation	LS	-	-	$27,000
New Meter and Submersible Level Transducer, Complete	LS	-	-	$20,000
			Construction Cost Subtotal	$129,300
			Sales Tax (8.0%)	$10,344
			Subtotal	$139,644
			Contingency (20%)	$27,929
			Subtotal	$167,573
			Engineering & Administration (15%)	$25,136
			Construction Engineering (15%)	$25,136
			TOTAL ESTIMATED COST	$217,845

10. SOURCE WELL S08 CLEANING AND REHABILITATION

Grandview source wells have a history of capacity declines due to biofouling and encrustation on pumping equipment, well screens, and casings because of iron bacteria and similar organisms. To improve system reliability, well performance, and water quality, routine chemical cleaning, development, and pumping equipment rehabilitation is necessary. Source well S08 (Appleway Well) capacity was initially 93 gpm, but the pump has been removed since 2005 due to bacteria issues. The well construction includes a 134-foot long, 12-inch production casing, a 95-foot long, 8-inch liner casing, and a 113-foot long, 10-inch perforated casing. This improvement project will include an initial pump testing, water quality sampling and testing, and well video log of the existing conditions to determine the best cleaning and rehabilitation methods to use. Depending on video log results, mechanical and/or chemical cleaning treatments may be used. In tandem with cleaning and rehabilitation of the well, pump rehabilitation and maintenance will also be performed. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$28,000
Well Pump Testing, Complete	LS	-	-	$30,000
Well Video Inspection, Complete	LS	-	-	$2,000
Mechanical Well Cleaning, Complete	LS	-	-	$11,900
Chemical Well Cleaning, Complete	LS	-	-	$14,350
Pump Maintenance and Rehabilitation	LS	-	-	$27,000
			Construction Cost Subtotal	$113,250
			Sales Tax (8.0%)	$9,060
			Subtotal	$122,310
			Contingency (20%)	$24,462
			Subtotal	$146,772
			Engineering & Administration (15%)	$22,016
			Construction Engineering (15%)	$22,016
			TOTAL ESTIMATED COST	$190,804

11. WATER SYSTEM PLAN UPDATE

The DOH requires Water System Plans to be reviewed and updated every ten years. The total estimated cost to review and update the Water System Plan is $150,000.

12. SOURCE WELL S11 CLEANING AND REHABILITATION

Grandview source wells have a history of capacity declines due to biofouling and encrustation on pumping equipment, well screens, and casings because of iron bacteria and similar organisms. To improve system reliability, well performance, and water quality, routine chemical cleaning, development, and pumping equipment rehabilitation is necessary. Source well S11 (Highland) capacity has decreased from 60 gpm to 42 gpm. The well construction includes a 165-foot long, 12-inch production casing, a 19-foot long, 12-inch liner casing, and a 66-foot long, 10-inch perforated casing. This improvement project will include an initial pump testing using the existing pump, water quality sampling and testing, and well video log of the existing conditions to determine the best cleaning and rehabilitation methods to use. Depending on video log results, mechanical and/or chemical cleaning treatments may be used. In tandem with cleaning and rehabilitation of the well, pump rehabilitation and maintenance will also be performed. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$15,000
Well Pump Testing, Complete	LS	-	-	$20,000
Well Video Inspection, Complete	LS	-	-	$2,000
Mechanical Well Cleaning, Complete	LS	-	-	$9,100
Chemical Well Cleaning, Complete	LS	-	-	$14,350
Pump Maintenance and Rehabilitation	LS	-	-	$27,000
			Construction Cost Subtotal	$87,450
			Sales Tax (8.0%)	$6,996
			Subtotal	$94,446
			Contingency (20%)	$18,889
			Subtotal	$113,335
			Engineering & Administration (15%)	$17,000
			Construction Engineering (15%)	$17,000
			TOTAL ESTIMATED COST	$147,336

13. SOURCE WELL S13 CLEANING AND REHABILITATION

Grandview source wells have a history of capacity declines due to biofouling and encrustation on pumping equipment, well screens, and casings because of iron bacteria and similar organisms. To improve system reliability, well performance, and water quality, routine chemical cleaning, development, and pumping equipment rehabilitation is necessary. Source well S13 (South Willoughby) capacity has decreased from 1,980 gpm to 1,100 gpm. The well construction includes a 687-foot long, 16-inch production casing and a 267-foot long, 12-inch perforated casing. This improvement project will include an initial pump testing using the existing pump, water quality sampling and testing, and well video log of the existing conditions to determine the best cleaning and rehabilitation methods to use. Depending on video log results, mechanical and/or chemical cleaning treatments may be used. In tandem with cleaning and rehabilitation of the well, pump rehabilitation and maintenance will also be performed. Telemetry system improvements and software upgrades may be included as part of this project as well. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$30,000
Well Pump Testing, Complete	LS	-	-	$20,000
Well Video Inspection, Complete	LS	-	-	$2,000
Mechanical Well Cleaning, Complete	LS	-	-	$33,600
Chemical Well Cleaning, Complete	LS	-	-	$93,650
Pump Maintenance and Rehabilitation	LS	-	-	$45,000
Telemetry System, Software Updates, Level Transducer, Complete	LS	-	-	$20,000
			Construction Cost Subtotal	$244,250
			Sales Tax (8.0%)	$19,540
			Subtotal	$263,790
			Contingency (20%)	$52,758
			Subtotal	$316,548
			Engineering & Administration (15%)	$47,482
			Construction Engineering (15%)	$47,482
			TOTAL ESTIMATED COST	$411,512

14. SOURCE WELL S07/S16 CLEANING AND REHABILITATION

Source Wells S07 and S16 are located on the same site and will be rehabilitated under the same project. Source well S07 (Olmstead A) capacity has decreased from its design capacity of 245 gpm to about 180 gpm. The primary concern is that the capacity of S16 (Olmstead B) has declined from 90 gpm to 40 gpm and less than 20 gpm when run for an extended period. As a result, the blending capability of the two sources to reduce nitrate levels below the MCL is eliminated. Well S07 is 110 feet deep and includes a 12-inch production/pump chamber casing to a depth of 36 feet, a 10-inch liner casing to 53 feet, and a 1-inch perforated casing from 53 feet to 110 feet. Well S16 is 623 feet deep with a 16-inch production/pump chamber casing installed to a depth of 230 feet, a 12-inch liner casing from 230 feet to 349 feet, and a perforated casing from 349 feet to 623 feet. This improvement project will include an initial pump testing using the existing pump, water quality sampling and testing, and well video log of the existing conditions to determine the best cleaning and rehabilitation methods to use. Depending on video log results, mechanical and/or chemical cleaning treatments may be used. In tandem with cleaning and rehabilitation of the well, pump rehabilitation and maintenance will also be performed. This project will also include replacement of the source meters to improve accuracy. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$20,000
Well Pump Testing, Complete	LS	-	-	$20,000
Well Video Inspection, Complete	LS	-	-	$3,000
Mechanical Well Cleaning, Complete	LS	-	-	$25,900
Chemical Well Cleaning, Complete	LS	-	-	$55,600
Pump Maintenance and Rehabilitation	LS	-	-	$55,000
Meter Upgrades	LS	-	-	$20,000
			Construction Cost Subtotal	$199,500
			Sales Tax (8.0%)	$15,960
			Subtotal	$215,460
			Contingency (20%)	$43,092
			Subtotal	$258,552
			Engineering & Administration (15%)	$38,783
			Construction Engineering (15%)	$38,783
			TOTAL ESTIMATED COST	$336,118

15. SOURCE WELL S17 CLEANING AND REHABILITATION

Grandview source wells have a history of capacity declines due to biofouling and encrustation on pumping equipment, well screens, and casings because of iron bacteria and similar organisms. To improve system reliability, well performance, and water quality, routine chemical cleaning, development, and pumping equipment rehabilitation is necessary. Source well S17 (Ashael Curtis) capacity was initially 93 gpm, but the pump has been removed since 2005 due to bacteria and performance issues. The well construction includes a 340-foot long, 16-inch production casing, a 149-foot long, 12-inch liner casing, and a 231-foot long, 12-inch perforated casing. This improvement project will include an initial pump testing, water quality sampling and testing using the existing pump, and well video log of the existing conditions to determine the best cleaning and rehabilitation methods to use. Depending on video log results, mechanical and/or chemical cleaning treatments may be used. In tandem with cleaning and rehabilitation of the well, pump rehabilitation and maintenance will also be performed. Telemetry system improvements and software upgrades may be included as part of this project as well. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$30,000
Well Pump Testing, Complete	LS	-	-	$20,000
Well Video Inspection, Complete	LS	-	-	$2,000
Mechanical Well Cleaning, Complete	LS	-	-	$25,200
Chemical Well Cleaning, Complete	LS	-	-	$61,750
Pump Maintenance and Rehabilitation	LS	-	-	$45,000
Telemetry System, Software Updates, Level Transducer, Complete	LS	-	-	$20,000
			Construction Cost Subtotal	$203,950
			Sales Tax (8.0%)	$16,316
			Subtotal	$220,266
			Contingency (20%)	$44,053
			Subtotal	$264,319
			Engineering & Administration (15%)	$39,648
			Construction Engineering (15%)	$39,648
			TOTAL ESTIMATED COST	$343,615

16. RESERVOIR RECOATING

The existing 0.5 MG standpipe was last recoated in 2007. The anticipated life of a reservoir coating system is approximately 20 to 30 years. The estimated project cost is $600,000. This estimated cost does not include structural or mechanical repairs to the reservoirs.

TABLE 8-1 SCHEDULE OF RECOMMENDED O&M IMPROVEMENTS

Priority No.	Improvement Description	Estimated Cost in 2021 Dollars	Completion Year											Funding Source
			2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033 to 2042	
1	3.0 MG Reservoir Recoating	928,395	957,000												City
2	Source Well S14 Rehabilitation	450,094	464,000												City
3	Telemetry System Computer and Software Update	200,000		213,000											City
4	0.5 MG Reservoir Cleaning and Inspection	5,000			6,000						7,000				City
5	Source Wells Protective Covenants	30,000			33,000										City
6	Source Well S10 Rehabilitation	211,527				239,000									City
7	Source Well S01 Rehabilitation	156,097						187,000							City
8	3.0 MG Reservoir Cleaning and Inspection	10,000							13,000					15,000	City
9	Source Well S18 Rehabilitation	217,845								276,000					City
10	Source Well S08 Rehabilitation	190,804										257,000			City
11	2021 Water System Plan Update	150,000											208,000		City
12	Source Well S11 Rehabilitation	147,336												211,000	City
13	Source Well S13 Rehabilitation	411,512												587,000	City
14	Source Well S07/S16 Rehabilitation	336,118												480,000	City
15	Source Well S17 Rehabilitation	343,615												490,000	City
16	Source Well S18 Rehabilitation	217,845												311,000	City
17	Phase 3 Telemetry System Improvements	150,000												214,000	City
18	0.5 MG Reservoir Recoating	600,000												856,000	City
	TOTAL COSTS	4,756,186	1,421,000	213,000	39,000	239,000	0	187,000	13,000	276,000	7,000	257,000	208,000	3,164,000	
Note: Improvement costs for years following 2022 include 3% inflation per year.															

8.3 MAJOR CAPITAL IMPROVEMENTS

The following listing of recommended major capital improvements has been sub-divided into two categories: 1) year 2022 through year 2032 prioritized improvements and 2) year 2033 through year 2042 prioritized improvements, since not all the recommended improvements can be completed within the next ten years. The recommended improvements from both categories are identified in Figure 8-1 Recommended Water System Capital Improvements

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CITY OF GRANDVIEW

Water System Plan Update

WATER SYSTEM CAPITAL IMPROVEMENTS

LEGEND

RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)

SERVICE AREA BOUNDARY (URBAN GROWTH AREA)

IMPROVEMENTS

Year 2023 Improvements

1. FUTURE WELL C AND WELL REHABILITATION IMPROVEMENTS

Year 2024 Improvements

2. NEW 3.0 MG RESERVOIR AND TRANSMISSION MAIN

Year 2026 Improvements

3. 16" AC WATER MAIN REPLACEMENT - PHASE 1

Year 2028 Improvements

4. WELL S07/S16 TRANSMISSION MAIN

Year 2030 Improvements

5. FUTURE WELL A/B

Year 2033 - 2042 Improvements

6. BALCOM & MOE WELL S02 RECONSTRUCTION
7. 16" AC WATER MAIN REPLACEMENT - PHASE 2
8. 16" AC WATER MAIN REPLACEMENT - PHASE 3
9. CEDAR ST. WATER MAIN UPSIZING
10. N. ELM ST. WATER MAIN UPSIZING
11. W. 3RD ST. WATER MAIN UPSIZING
12. W. 4TH ST. WATER MAIN UPSIZING
13. GLEN ST. WATER MAIN UPSIZING
14. HILLCREST RD. AND VISTA DR. WATER MAIN LOOP AND UPSIZING
15. W. CONCORD AVE. WATER MAIN UPSIZING
16. PRINCEVILLE ST. WATER MAIN LOOP
17. GRANDRIDGE RD. AND APRICOT RD. WATER MAIN LOOP
18. W. 2ND ST. WATER MAIN UPSIZING
19. PECAN ST. WATER MAIN LOOP
20. WELL S07 AND S10 NITRATE TREATMENT SYSTEM
21. BUTTERNUT WELL S14 ELECTRICAL AND CONTROL SYSTEM UPGRADES

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FIGURE 8-1

8.3.1 Year 2022 through Year 2032 Prioritized Improvements

1. FUTURE WELL A/C AND WELL REHABILITATION IMPROVEMENTS

This project consists of constructing a new 1,500 gpm source well located within NE ¼, NW ¼, S24, T9N, R23E at the City's County Park. This source well will draw from the Wanapum Basalt Aquifer, at a depth of less than 1,200 feet. This project will improve the source capacity of Grandview's water system, allowing for future growth, and utilizing the City's water rights. This project also includes source well rehabilitation improvements determined by source capacity loss and scope of rehab. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Schedule A - New 1,500 GPM Wanapum Aquifer Well Drilling				
Mobilization	LS	1	$80,000	$80,000
Drill and Install 24-Inch Surface Casing	LF	50	$500	$25,000
Drill and Install 16-Inch Chamber Casing	LF	700	$650	$455,000
Drill and Install 12-Inch Well Screen (Incl. Filter Pack)	LF	200	$980	$195,900
Well Development and Testing	LS	1	$92,800	$92,800
Schedule B - New Well Control Building				
Mobilization	LS	1	$100,000	$100,000
Clearing and Grubbing	LS	1	$10,000	$10,000
Shoring or Extra Excavation	LS	1	$1,000	$1,000
Well Building, Complete	LS	1	$350,000	$350,000
Well Pump and Motor, Complete	LS	1	$100,000	$100,000
Electrical and Control System, Complete	LS	1	$200,000	$200,000
Engine Generator and Transfer Switch, Complete	LS	1	$80,000	$80,000
Site Piping, Fittings, and Valves, Complete	LS	1	$100,000	$100,000
Site Improvements, Grading, Drainage, and Fencing, Complete	LS	1	$95,000	$95,000
Schedule C - Existing Well Rehabilitation				
Mobilization	LS	1	$20,000	$20,000
Well Pumping Test, Complete	LS	1	$20,000	$20,000
Well Video Inspection, Comlete	EA	2	$2,000	$4,000
Mechanical Well Cleaning, Complete	LS	1	$26,000	$26,000
Chemical Well Cleaning, Complete	LS	1	$56,000	$56,000
Pump Maintenance and Rehab	LS	1	$55,000	$55,000
Meter and Control Upgrades	LS	1	$20,000	$20,000
			Construction Cost Subtotal	$2,085,700
			Sales Tax (8%)	$166,900
			Subtotal	$2,252,600
			Contingency (20%)	$450,500
			Construction Cost Subtotal	**$2,703,100**
			Engineering & Administration (15%)	$312,900
			Construction Engineering (15%)	$312,900
			Electrical Design and Programming	$100,000
			Hydrogeological Services	$50,000
			Environmental/Cultural Review	$15,000
			Project Administration	$30,000
			Plan Review and Building Permit Fees	$10,000
			Bid Advertisement Fees	$2,000
			DOH Review Fees	$2,000
			Audit Cost	$5,000
			Total Estimated Cost	$3,542,900
			TOTAL ESTIMATED COST INCL. 1% DWSRF LOAN FEE	**$3,578,329**

2. NEW 3.0 MG RESERVOIR AND TRANSMISSION MAIN

This major capital improvement project assumes the construction of a 3.0 MG standpipe reservoir located north of the SVID canal at Bethany Road. 1.5 MG is needed between elevations 897.5 feet and 941.6 feet to meet storage requirements. Other alternatives may be investigated at the City's request. This improvement will provide additional storage, and also improve fire flow for a large portion of the City. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$350,000
Temporary Traffic Control	LS	-	-	$2,000
Reservoir Excavation and Backfill	LS	-	-	$200,000
Site Grading and Drainage	LS	-	-	$100,000
16-Inch Transmission Main	LF	7,700	$100	$770,000
16-Inch Butterfly Valve	EA	5	$3,500	$17,500
3.0 MG Standpipe Reservoir	LS	-	-	$2,250,000
Inlet/Outlet Valve and Site Piping	LS	-	-	$200,000
Submersible Mixer	LS	-	-	$50,000
Electrical, Telemetry, and Control System	LS	-	-	$100,000
HMA Surfacing	SY	500	$60	$30,000
			Construction Cost Subtotal	$4,069,500
			Sales Tax (8%)	$325,560
			Subtotal	$4,395,060
			Contingency (20%)	$879,012
			Subtotal	$5,274,072
			Engineering & Administration (15%)	$791,111
			Construction Engineering (15%)	$791,111
			Property/Easement Acquisition	$100,000
			TOTAL ESTIMATED COST	$6,956,294

3. 16-INCH AC WATER MAIN REPLACEMENT – PHASE 1

The City's existing 16-inch transmission main that supplies water from the 3.0 MG reservoir the City's water distribution system is construction of aging asbestos cement pipe. Phase 1 of the 16-inch AC water main replacement project includes installation of approximately 1,560 feet of new C900 PVC piping. The new water main will be installed from the S10 wellhouse and 3.0 MG reservoir near Grandview Public Works and continue along E. Elm St. until crossing to the west side of the SVID canal. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$40,000
Temporary Traffic Control	LS	-	-	$6,000
16-Inch C900 PVC Water Main	LF	1,560	$100	$156,000
16-Inch Butterfly Valve	EA	2	$3,500	$7,000
HMA Surface Repair	SY	920	$60	$55,200
Gravel Surface Repair	SY	190	$40	$7,600
			Construction Cost Subtotal	$271,800
			Sales Tax (8%)	$21,744
			Subtotal	$293,544
			Contingency (20%)	$58,709
			Subtotal	$352,253
			Engineering & Administration (15%)	$52,838
			Construction Engineering (15%)	$52,838
			TOTAL ESTIMATED COST	$457,929

4. WELL S07/S16 TRANSMISSION MAIN

Blending is used to reduce the nitrate levels in Well S07 and S16 below the MCL. If Well S16 is out of service or the capacity is not sufficient to make blending feasible, blending with other source wells may be needed to improve system reliability. Well S10 and S13 are located approximately 3,960 feet south of the S07/S16 site, near the City's public works shop and 3.0 MG reservoir. Constructing a 6-inch transmission main from the S07/S16 well site to the blend with S13 prior to entering the 3.0 MG reservoir is a feasible option to maintain the City's blending strategy for nitrate treatment. This improvement project includes installation of approximately 3,960 LF of new 6-inch PVC transmission main piping within the existing SVID canal right-of-way, then down N. Willoughby Road to the 3.0 MG reservoir. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$40,000
Shoring	LF	3,960	$1	$3,960
Temporary Traffic Control	LS	-	-	$5,000
6-Inch C900 Water Main	LF	3,960	$55	$217,800
6-Inch Valve	EA	2	$1,500	$3,000
HMA Surface Repair	SY	840	$60	$50,400
Gravel Surface Repair	SY	270	$40	$10,800
			Construction Cost Subtotal	$330,960
			Sales Tax (8%)	$26,477
			Subtotal	$357,437
			Contingency (20%)	$71,487
			Subtotal	$428,924
			Engineering & Administration (15%)	$64,339
			Construction Engineering (15%)	$64,339
			Easement Acquisition	$50,000
			TOTAL ESTIMATED COST	$543,263

5. FUTURE WELL A/B

This project consists of constructing a new 250 gpm source well located within the fairgrounds at a location to be determined. This source well will draw from the Saddle Mountain Aquifer, a depth of less than 700 feet. Should the City desire to draw from the Wanapum Basalt Aquifer, the well will need to be drilled deeper and aeration treatment will likely be necessary. This project will improve the source capacity of Grandview's water system, allowing for future growth, and utilizing the City's water rights. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$85,000
Surface Casing	LS	50	500	$25,000
Drill and Install 12" Pump Chamber Casing	LF	450	$525	$236,250
Furnish and Install 8" Well Screen (Incl. Filter Pack)	LF	200	$400	$80,000
Well Development and Testing	LS	-	-	$70,000
Well Pump and Level Transducer	LS	-	-	$70,000
Electrical and Control System	LS	-	-	$80,000
Well Building Including Internal Piping, HVAC, and Chlorination	LS	-	-	$230,000
Site Piping	LS	-	-	$30,000
Site Grading and Drainage	LS	-	-	$35,000
Fencing	LS	-	-	$15,000
			Construction Cost Subtotal	$956,250
			Sales Tax (8%)	$76,500
			Subtotal	$1,032,750
			Contingency (20%)	$206,550
			Subtotal	$1,239,300
			Engineering & Administration (15%)	$185,895
			Construction Engineering (15%)	$185,895
			TOTAL ESTIMATED COST	$1,611,090

8.3.2 Year 2033 through Year 2042 Deferred Improvements

6. BALCOM & MOE WELL S02 RECONSTRUCTION

This project consists of demolishing the existing well building, installing a new booster pump and well enclosure, and constructing a new treatment building complete with aeration and chlorination equipment, electrical, and HVAC. Production from Well S02 has declined from its original capacity of about 690 gpm to 268 gpm in 2021. This improvement will increase water system supply capacity by about 400 gpm, improving system reliability and water quality. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$80,000
Demolition	LS	-	-	$40,000
Aeration Equipment	LS	-	-	$135,000
Chlorination Equipment	LS	-	-	$70,000
HVAC	LS	-	-	$40,000
Booster Pump (Aeration)	LS	-	-	$50,000
Site Piping	LS	-	-	$45,000
Building (900 SF)	LS	-	-	$225,000
Electrical and Control System	LS	-	-	$170,000
Well Enclosure	LS	-	-	$18,000
Site Grading and Drainage	LS	-	-	$27,000
Fencing	LF	200	$27	$5,400
30' Gate	EA	1	$800	$800
HMA Surface Repair	SY	140	$60	$8,400
Gravel Surface Repair	SY	340	$40	$13,600
Cement Conc. Sidewalk	SY	40	$90	$3,600
			Construction Cost Subtotal	$931,800
			Sales Tax (8%)	$74,544
			Subtotal	$1,006,344
			Contingency (20%)	$201,269
			Subtotal	$1,207,613
			Engineering & Administration (15%)	$181,142
			Construction Engineering (15%)	$181,142
			TOTAL ESTIMATED COST	$1,569,897

7. 16-INCH AC WATER MAIN REPLACEMENT – PHASE 2

Phase 2 of the 16-inch AC transmission main replacement project includes installation of approximately 3,890 feet of new C900 PVC piping. In Phase 2, the new water main will be installed along N. Elm Street, where the pipe will then turn west across an open field to Wilson Hwy, adjacent to Deangela Drive. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$50,000
Temporary Traffic Control	LS	-	-	$10,000
16-Inch C900 PVC Water Main	LF	3,890	$100	$389,000
16-Inch Butterfly Valve	EA	2	$3,500	$7,000
HMA Surface Repair	SY	860	$60	$51,600
Unsurfaced Area Repair	SY	1,580	$5	$7,900
			Construction Cost Subtotal	$515,500
			Sales Tax (8%)	$41,240
			Subtotal	$556,740
			Contingency (20%)	$111,348
			Subtotal	$668,088
			Engineering & Administration (15%)	$100,213
			Construction Engineering (15%)	$100,213
			TOTAL ESTIMATED COST	$868,514

8. 16-INCH AC WATER MAIN REPLACEMENT – PHASE 3

Phase 3 of the 16-inch AC transmission main replacement project includes installation of approximately 6,270 feet of new C900 PVC piping. In Phase 3, the new water main will be installed west along N. Wilson Hwy to the intersection of E. Bonnieview Rd. The installation will continue south along N Ave B to terminate at the well house adjacent Wine Country Road, and west along W. Bonnieview Rd./Forsell Rd., terminating at Wallace Way. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$50,000
Temporary Traffic Control	LS	-	-	$45,000
16-Inch C900 PVC Water Main	LF	6,270	$100	$627,000
16-Inch Butterfly Valve	EA	2	$3,500	$7,000
HMA Surface Repair	SY	4,130	$60	$247,800
Gravel Surface Repair	SY	290	$40	$11,600
			Construction Cost Subtotal	$988,400
			Sales Tax (8%)	$79,072
			Subtotal	$1,067,472
			Contingency (20%)	$213,494
			Subtotal	$1,280,966
			Engineering & Administration (15%)	$192,145
			Construction Engineering (15%)	$192,145
			TOTAL ESTIMATED COST	$1,665,256

9. CEDAR ST. WATER MAIN UPSIZING

This improvement project will replace the existing 6-inch water main pipes with 8-inch along Cedar Street between 4th Street and Wine Country Road. The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$20,000
Temporary Traffic Control	LS	-	-	$10,000
Shoring or Extra Excavation	LF	1,400	$1	$1,400
Select Backfill	CY	45	$50	$2,250
8-Inch C900 Water Main	LF	1,400	$65	$91,000
8-Inch Gate Valve	EA	6	$2,000	$12,000
Water Service Connection	EA	38	$1,500	$57,000
HMA Surface Repair	SY	950	$60	$57,000
Hydrant Assembly	EA	4	$5,000	$20,000
			Construction Cost Subtotal	$270,650
			Sales Tax (8%)	$21,652
			Subtotal	$292,302
			Contingency (20%)	$58,460
			Subtotal	$350,762
			Engineering & Administration (15%)	$52,614
			Construction Engineering (15%)	$52,614
			TOTAL ESTIMATED COST	$455,991

10. N. ELM STREET WATER MAIN UPSIZING

This improvement project will replace the existing 8-inch water main pipes with 10-inch along North Elm Street between Wine Country Road and Bonnieview Road. The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$15,000
Temporary Traffic Control	LS	-	-	$5,000
Shoring or Extra Excavation	LF	1,000	$1	$1,000
Select Backfill	CY	130	$50	$6,500
12-Inch C900 Water Main	LF	1,000	$75	$75,000
12-Inch Gate Valve	EA	8	$2,500	$20,000
Water Service Connection	EA	9	$1,500	$13,500
HMA Surface Repair	SY	700	$60	$42,000
Hydrant Assembly	EA	3	$5,000	$15,000
			Construction Cost Subtotal	$193,000
			Sales Tax (8%)	$15,440
			Subtotal	$208,440
			Contingency (20%)	$41,688
			Subtotal	$250,128
			Engineering & Administration (15%)	$37,519
			Construction Engineering (15%)	$37,519
			TOTAL ESTIMATED COST	$325,166

11. W. 3RD ST. WATER MAIN UPSIZING

This improvement project will replace the existing 6-inch water main pipes with 8-inch along West 3rd Street between Hillcrest Road and Euclid Road. The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$20,000
Temporary Traffic Control	LS	-	-	$10,000
Shoring or Extra Excavation	LF	1,350	$1	$1,350
Select Backfill	CY	170	$50	$8,500
8-Inch C900 PVC Water Main	LF	1,350	$65	$87,750
8-Inch Gate Valve	EA	6	$2,000	$12,000
Water Service Connection	EA	29	$1,500	$43,500
HMA Surface Repair	SY	900	$60	$54,000
Hydrant Assembly	EA	5	$5,000	$25,000
			Construction Cost Subtotal	$242,100
			Sales Tax (8%)	$19,368
			Subtotal	$261,468
			Contingency (20%)	$52,294
			Subtotal	$313,762
			Engineering & Administration (15%)	$47,064
			Construction Engineering (15%)	$47,064
			TOTAL ESTIMATED COST	$407,890

12. W. 4TH ST. WATER MAIN UPSIZING

This improvement project will replace the existing 6-inch water main pipes with 8-inch along West 4th Street between Hillcrest Road and Avenue “J”. The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$10,000
Temporary Traffic Control	LS	-	-	$10,000
Shoring or Extra Excavation	LF	700	$1	$700
Select Backfill	CY	70	$50	$3,500
8-Inch C900 PVC Water Main	LF	700	$65	$45,500
8-Inch Gate Valve	EA	6	$2,000	$12,000
Water Service Connection	EA	29	$1,500	$43,500
HMA Surface Repair	SY	470	$60	$28,200
Hydrant Assembly	EA	2	$5,000	$10,000
			Construction Cost Subtotal	$153,400
			Sales Tax (8%)	$12,272
			Subtotal	$165,672
			Contingency (20%)	$33,134
			Subtotal	$198,806
			Engineering & Administration (15%)	$29,821
			Construction Engineering (15%)	$29,821
			TOTAL ESTIMATED COST	$258,448

13. GLEN ST. WATER MAIN UPSIZING

This improvement project will replace the existing 6-inch water main pipes with 8-inch along Glen Street between Hillcrest Road and Avenue "J". The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$10,000
Temporary Traffic Control	LS	-	-	$10,000
Shoring or Extra Excavation	LF	650	$1	$650
Select Backfill	CY	90	$50	$4,500
8-Inch C900 PVC Water Main	LF	650	$65	$42,250
8-Inch Gate Valve	EA	5	$2,000	$10,000
Water Service Connection	EA	15	$1,500	$22,500
HMA Surface Repair	SY	450	$60	$27,000
Hydrant Assembly	EA	3	$5,000	$15,000
			Construction Cost Subtotal	$131,900
			Sales Tax (8%)	$10,552
			Subtotal	$142,452
			Contingency (20%)	$28,490
			Subtotal	$170,942
			Engineering & Administration (15%)	$25,641
			Construction Engineering (15%)	$25,641
			TOTAL ESTIMATED COST	$222,225

14. HILLCREST RD. AND VISTA DR. WATER MAIN LOOP AND UPSIZING

This improvement project will connect two branches of the water distribution system with 8-Inch water main. The improvement will improve both fire flow capacity, system reliability, and water quality in the southern residential area of the City. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$5,000
Temporary Traffic Control	LS	-	-	$5,000
Select Backfill	CY	70	$50	$3,500
8-Inch Water Main	LF	600	$65	$39,000
8-Inch Gate Valve	EA	2	$2,000	$4,000
HMA Surface Repair	SY	400	$60	$24,000
Service Connection	EA	19	$1,500	$28,500
Hydrant Assembly	EA	2	$5,000	$10,000
			Construction Cost Subtotal	$119,000
			Sales Tax (8%)	$9,520
			Subtotal	$128,520
			Contingency (20%)	$25,704
			Subtotal	$154,224
			Engineering & Administration (15%)	$23,134
			Construction Engineering (15%)	$23,134
			TOTAL ESTIMATED COST	$200,491

15. W. CONCORD AVE. WATER MAIN UPSIZING

This improvement project will replace the existing 4-inch and 6-inch water main pipes with 8-inch along West Concord Avenue. The improvement will improve both fire flow capacity and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$16,500
Temporary Traffic Control	LS	-	-	$20,000
Shoring or Extra Excavation	LF	1,700	$1	$1,700
Select Backfill	CY	80	$50	$4,000
8-Inch Water Main	LF	1,700	$65	$110,500
8-Inch Gate Valve	EA	7	$2,000	$14,000
Water Service Connection	EA	28	$1,500	$42,000
HMA Surface Repair	SY	1,150	$60	$69,000
Hydrant Assembly	EA	4	$5,000	$20,000
			Construction Cost Subtotal	$297,700
			Sales Tax (8%)	$23,816
			Subtotal	$321,516
			Contingency (20%)	$64,303
			Subtotal	$385,819
			Engineering & Administration (15%)	$57,873
			Construction Engineering (15%)	$57,873
			TOTAL ESTIMATED COST	$501,565

16. PRINCEVILLE ST. WATER MAIN LOOP

This project loops an existing 2-inch water main to an existing dead-end 6-inch water main with a new 8-inch water main. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$1,000
Temporary Traffic Control	LS	-	-	$500
8-Inch C900 Water Main	LF	100	$65	$6,500
8-Inch Valve	EA	1	$2,000	$2,000
Gravel Surface Repair	SY	40	$40	$1,600
Hydrant Assembly	EA	1	$5,000	$5,000
			Construction Cost Subtotal	$16,600
			Sales Tax (8%)	$1,328
			Subtotal	$17,928
			Contingency (20%)	$3,586
			Subtotal	$21,514
			Engineering & Administration (15%)	$3,227
			Construction Engineering (15%)	$3,227
			Easement Acquisition	$8,000
			TOTAL ESTIMATED COST	$32,741

17. GRANDRIDGE RD. AND APRICOT RD. WATER MAIN LOOP

This project consists of looping an existing 6-inch water main located at the corner of Euclid Road and Apricot Road with a 10-inch water main and connecting the line to an existing 10-inch water main located at the corner of Grandridge Road and Pleasant Avenue. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$40,000
Temporary Traffic Control	LS	-	-	$30,000
12-Inch C900 Water Main	LF	5,400	$75	$405,000
12-Inch Butterfly Valve	EA	6	$2,500	$15,000
Hydrant Assembly	EA	5	$5,000	$25,000
HMA Surface Repair	SY	3,600	$60	$216,000
			Construction Cost Subtotal	$731,000
			Sales Tax (8%)	$58,480
			Subtotal	$789,480
			Contingency (20%)	$157,896
			Subtotal	$947,376
			Engineering & Administration (15%)	$142,106
			Construction Engineering (15%)	$142,106
			TOTAL ESTIMATED COST	$1,231,589

18. W. 2ND ST. WATER MAIN UPSIZING

This project consists of replacing an existing 8-inch water main with a 12-inch water main located along West 2nd Street between Hillcrest Road and Westridge Drive. The improvement will improve both fire flow capacity and system reliability in this area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$30,000
Temporary Traffic Control	LS	-	-	$70,000
12-Inch C900 Water Main	LF	1,450	$75	$108,750
12-Inch Butterfly Valve	EA	2	$2,500	$5,000
Service Connection	EA	3	$1,500	$4,500
HMA Surface Repair	SY	1,000	$60	$60,000
			Construction Cost Subtotal	$278,250
			Sales Tax (8%)	$22,260
			Subtotal	$300,510
			Contingency (20%)	$60,102
			Subtotal	$360,612
			Engineering & Administration (15%)	$54,092
			Construction Engineering (15%)	$54,092
			TOTAL ESTIMATED COST	$468,796

19. PECAN ST. WATER MAIN LOOP

This project consists of looping an existing 6-inch water main located at the corner of Pecan Road and Appleway Road with an 8-inch water main and connecting the line to an existing 6-inch water main located at the corner of Pecan Road and Butternut Road, and replacing the 2-inch water main that dead-ends. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$1,500
Temporary Traffic Control	LS	-	-	$25,000
8-Inch Water Main	LF	1,000	$65	$65,000
8-Inch Gate Valve	EA	2	$2,000	$4,000
6-Inch Gate Valve	EA	2	$1,500	$3,000
Hydrant Assembly	EA	1	$5,000	$5,000
HMA Surface Repair	SY	15	$60	$900
Gravel Surface Repair	SY	250	$40	$10,000
			Construction Cost Subtotal	$114,400
			Sales Tax (8%)	$9,152
			Subtotal	$123,552
			Contingency (20%)	$24,710
			Subtotal	$148,262
			Engineering & Administration (15%)	$22,239
			Construction Engineering (15%)	$22,239
			TOTAL ESTIMATED COST	$192,741

20. WELL S07 AND S10 NITRATE TREATMENT SYSTEM

Well S07 and S10 have a history of nitrate levels exceeding the MCL. The City currently uses a blending strategy with adjacent wells to bring nitrate levels within an acceptable range, however, if one of the blending wells is out of service both sources must be temporarily taken offline. To improve system reliability in the future, and to address rising nitrate levels, a nitrate treatment and removal system will be needed. It is recommended that the treatment facility be constructed near Well S10 and the City's 3.0 MG reservoir. If S07/S16 blending is no longer effective, a transmission main can be construction from S07 to the S10 site as a separate improvement project to treat both wells at the same location. The proposed nitrate treatment and removal system will have a total capacity of about 800 gpm and include installation of a 200 gpm side stream reverse osmosis membrane filtration unit to remove nitrates and blend the filtered water with 600 gpm of untreated water to reduce nitrate levels below the MCL. The treatment equipment and controls will be housed in a new building near S10. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$100,000
Treatment Equipment Buiding and Piping	LS	-	-	$250,000
Treatment Equipment	LS	-	-	$500,000
Site Piping	LS	-	-	$50,000
Electrical and Control System	LS	-	-	$100,000
			Construction Cost Subtotal	$1,000,000
			Sales Tax (8%)	$80,000
			Subtotal	$1,080,000
			Contingency (20%)	$216,000
			Subtotal	$1,296,000
			Engineering & Administration (15%)	$194,400
			Construction Engineering (15%)	$194,400
			TOTAL ESTIMATED COST	$1,684,800

21. BUTTERNUT WELL S14 ELECTRICAL AND CONTROL SYSTEM UPGRADES

This project consists of upgrading the electrical and control system at Butternut Well. VFDs will be installed on the well pump and wet well booster pump motors, and programming will be completed to allow flow to be controlled depending on the water demand. This improvement project will also provide remote monitoring and control of the source and auxiliary power to improve water system reliability. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	-	-	$25,000
Electrical and Control System Upgrades	LS	-	-	$300,000
Engine Generator and Transfer Switch, Complete	LS	-	-	$60,000
Telemetry System Improvements	LS	-	-	$100,000
Flow Meters and Instrumentation	LS	-	-	$50,000
			Construction Cost Subtotal	$535,000
			Sales Tax (8%)	$42,800
			Subtotal	$577,800
			Contingency (20%)	$115,560
			Subtotal	$693,360
			Engineering & Administration (15%)	$104,004
			Construction Engineering (15%)	$104,004
			TOTAL ESTIMATED COST	$901,368

8.3.3 Major Capital Improvement Schedule

Table 8-2 provides a ten-year schedule for completion of some of the recommended major capital improvements. Scheduling of the remaining improvements beyond this ten-year period should be reviewed yearly as priorities and City growth patterns change and progress. The estimated improvement costs are provided in Table 8-2, as well as the total projected yearly cost. The estimated costs in Table 8-2 have been inflated for each year after 2022 to reflect the possible future costs based upon the projected year the improvement will be completed. Improvements that are projected to take place after year 2032 have been inflated to reflect year 2033 costs although many of these improvements will take place after the year 2033.

TABLE 8-2 SCHEDULE OF RECOMMENDED MAJOR CAPITAL IMPROVEMENTS

Priority No.	Improvement Description	Estimated Cost in 2021 Dollars	Completion Year											Funding Source
			2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033 to 2042	
1	Future Well A/C and Existing Well Rehabilitation	3,578,329		3,578,329											SRF Loan
2	New 3.0 MG Reservoir and Transmission Main	6,956,294			7,602,000										SRF Loan/City/ Grant/Private
3	16" AC Water Main Replacement - Phase 1	457,929					531,000								SRF Loan/City
4	Well S07/S16 Transmission Main	543,263							669,000						SRF Loan/City
5	Future Well B/D	1,611,090									2,103,000				SRF Loan/City/ Grant/Private
6	Balcom & Moe Well S02 Reconstruction	1,569,897												2,239,000	SRF Loan/City
7	16" AC Water Main Replacement - Phase 2	868,514												1,239,000	SRF Loan/City
8	16" AC Water Main Replacement - Phase 3	1,665,256												2,375,000	SRF Loan/City
9	Cedar St. Water Main Upsizing	455,991												651,000	SRF Loan/City
10	N. Elm St. Water Main Upsizing	325,166												464,000	SRF Loan/City
11	W. 3rd St. Water Main Upsizing	407,890												582,000	SRF Loan/City
12	W. 4th St. Water Main Upsizing	258,448												369,000	SRF Loan/City
13	Glen St. Water Main Upsizing	222,225												317,000	SRF Loan/City
14	Hillcrest Rd. and Vista Dr. Water Main Loop and Upsizing	200,491												286,000	SRF Loan/City
15	W. Concord Ave. Water Main Upsizing	501,565												716,000	SRF Loan/City
16	Princeville St. Water Main Loop	32,741												47,000	SRF Loan/City
17	Grandridge Rd. and Apricot Rd. Water Main Loop	1,231,589												1,756,000	SRF Loan/City
18	W. 2nd St. Water Main Upsizing	468,796												669,000	SRF Loan/City
19	Pecan St. Water Main Loop	192,741												275,000	SRF Loan/City
20	Well S07 and S10 Nitrate Treatment System	1,684,800												2,403,000	SRF Loan/City
21	Butternut Well S14 Electrical and Control System Upgrades	901,368												1,286,000	SRF Loan/City
	TOTAL COSTS	24,191,245	0	3,578,329	7,602,000	0	531,000	0	669,000	0	2,103,000	0	0	15,674,000	

Note: Improvement costs for years following 2022 include 3% inflation per year.

8.4 FUTURE MAJOR CAPITAL IMPROVEMENTS (PLANNING)

A general plan for future major capital improvements that would be a result of system expansion is shown in Figure 8-1. Recommended major capital improvements discussed in Section 8.3 are also shown in Figure 8-1 for reference. This plan represents the projected water mains/structures, including estimated sizes, required as development expands beyond what the existing system serves within the City's current and future service area boundaries. Although conditions and circumstances in the City's water system may change the exact location and/or configuration of needed improvements, the general plan shown in Figure 8-1 Recommended Water System Capital Improvements
allows the City to review proposed development with respect to system expansion. Also, as new development is proposed and/or occurs, the City will need to further evaluate the improvement required and review the effects that the system expansion plans will have on the existing distribution system.

CITY OF GRANDVIEW

CHAPTER 9 -

FINANCIAL PROGRAM

HLA
Engineering and Land Surveying, Inc.

9.1 PAST AND PRESENT FINANCIAL STATUS

Development of a comprehensive financial program requires an understanding of the water system's current financial status and past budgetary trends. The City's Water Operating Fund beginning and ending balance histories for the six-year period, 2015 through 2021 is presented in Table 9-1.

TABLE 9-1 WATER OPERATING FUND BALANCES

Year	2015	2016	2017	2018	2019	2020	2021 (Est.)
Beginning Fund Balance	$3,545,052	$4,096,424	$4,745,502	$5,277,453	$6,076,192	$6,766,244	$6,474,189
Ending Fund Balance	$4,096,424	$4,745,502	$5,277,453	$6,076,192	$6,766,244	$6,474,189	$6,657,313
Net Increase (Decrease)	$551,372	$649,078	$531,951	$798,739	$690,052	($292,055)	$183,124

Presented below in Table 9-2 is a summary of the City's Water Operating Fund actual revenues and expenditures history for the 7-year period, 2015 through 2021. Over this 7-year period, Water Department operating revenues (not including loan/bond proceeds) have increased by approximately 93% in total. Over the same period, operating expenses have increased by approximately 27% in total. Although the fund balances have remained positive and recent trends generally present net increases, implementation of the recommended system improvements presented in CHAPTER 8 requires a close examination of the City's future financial plan and rate structure. A funding request has been submitted for the Well A/C project and is pending approval until February 2022. Other recommended system improvements will require financing by the City Operating Fund or alternative funding sources. The proposed financial plan to fund recommended improvements is presented later in Table 9-4.

TABLE 9-2 WATER OPERATING FUND REVENUES AND EXPENDITURES							
Year Ending	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021 Est. Year End**
	$3,545,052	**$4,096,424**	**$4,745,502**	**$5,277,453**	**$6,076,192**	**$6,767,645**	**$6,475,590**
Water Service Fees	$1,844,348	$1,837,745	$1,847,263	$1,962,688	$1,921,227	$1,850,442	$1,874,488
Connection Fees	$11,426	$6,064	$11,510	$10,338	$15,937	$39,810	$48,456
Interest Earnings	$19,485	$29,848	$35,661	$80,511	$100,148	$26,258	$15,380
Rents and Leases	$7,529	$5,877	$5,877	$6,202	$9,423	$10,745	$11,365
Other Water Revenue	$12	$15,490	$661	$6,950	$12,804	$33,645	$1,265
Loan/Bond Proceeds	$47,402	$811,428					
Utility Tax	$516,798	$514,746	$520,864	$552,444	$543,539	$541,127	$453,628
TOTAL - REVENUE	$2,447,000	$3,221,198	$2,421,836	$2,619,133	$2,603,078	$2,502,027	$2,404,592
Salaries and Wages	$271,076	$290,959	$301,742	$309,675	$362,940	$423,301	$345,490
Benefits	$124,772	$129,018	$132,134	$144,689	$175,052	$199,172	$168,500
Supplies	$71,986	$83,340	$79,896	$93,000	$100,388	$135,084	$80,000
Other Services & Charges	$441,121	$419,605	$439,937	$480,327	$501,864	$540,683	$926,490
Utility Tax	$516,798	$467,690	$470,593	$498,375	$489,336	$466,896	$453,628
Operating Transfers Out	$0	$0	$0	$0	$0	-	-
Subtotal - Water Operations	$1,425,753	$1,390,612	$1,424,302	$1,526,066	$1,629,580	$1,765,136	$1,974,108
Major Capital Improvements	$199,461	$906,198	$131,707	$0	$0	-	-
Misc. Capital Improvements	$39,315	$44,776	$41,605	$9,669	$1,142	$32,588	$190,000
O&M Improvements	$0	$994	$0	$0	$0	$772,044	-
Subtotal - Capital Outlays	$238,776	$951,968	$173,312	$9,669	$1,142	$804,632	$190,000
99 Well Rehab	$28,494	$28,223	$27,951	$27,680	$27,680		
03 SRF Loan	$152,619	$151,218	$149,818	$148,418	$148,418	$145,618	$144,220
New Yakima County SIED Loan	$28,500	$28,500	$28,500	$28,500	$28,500		
New USDA Loan	$21,192	$21,192	$21,192	$21,192	$21,192	$21,600	$21,605
OIE DWSRF Loan			$58,470	$58,462	$57,779	$57,096	$56,414
Future Debt Service					$0	-	-
Subtotal - Loans	$230,805	$229,133	$285,931	$284,252	$283,569	$224,314	$222,239
Transfers to Bond Redemption	$294	$407	$6,340	$407	($1,265)	-	-
Subtotal - Debt Service	$231,099	$229,540	$292,271	$284,659	$282,304	$224,314	$222,239
TOTAL - EXPENDITURES	$1,895,628	$2,572,120	$1,889,885	$1,820,394	$1,913,026	$2,794,082	$2,386,348
Ending Fund Balance	**$4,096,424**	**$4,745,502**	**$5,277,453**	**$6,076,192**	**$6,766,244**	**$6,475,590**	**$6,493,834**
Net Increase (Decrease)	$551,372	$649,078	$531,951	$798,739	$690,052	$(292,055)	$18,244

Notes:
1. 2015 through 2020 data based on actual revenue and expenditures.
2. 2021 data projected to year end based on data collected through November 2021.

9.2 AVAILABLE REVENUE SOURCE

Recommended system improvements are scheduled for completion in annual increments for the next six years. In addition, as areas outside the current service area develop, extension of the City's water system will be necessary. Future transmission mains, sources of supply, and reservoirs will undoubtedly require major local bond funding and/or outside funding participation to offset the high costs of the improvements.

There are five basic categories of potential financing for domestic water-related improvements:

1. Local Public Enterprise Funds
2. Use of Local Public Powers
3. State Assisted or Guaranteed Resources
4. Federally Assisted or Guaranteed Resources
5. Private Development

Current availability of funding is limited with a number of the sources within these categories. Many also restrict the use of funds to certain projects and others limit their participation to a percentage of the total cost. Each of these categories is described briefly below.

1. Local Public Enterprise Funds

   Reserves in the Enterprise Fund are accumulated from available revenues from water user fees. The amount of the reserves will depend on the balance of operation and maintenance costs of the system versus total revenue generated by the fees. These reserves may be used to finance any water system related project allocated by the City Council.

   Funds for future projects may be generated by increases in user fees, thus building the reserves in the Enterprise Fund. With this method of financing, often called the "pay-as-you-go" approach, the City is collecting interest on the reserves as opposed to paying interest on a loan balance. One method used by some communities to accumulate reserves is through the development of a capital recovery charge system. This approach is similar to assessing connection fees, except the amount is based on the capital costs of constructing collection system trunk lines and treatment facilities, and the collected funds are usually set aside as capital reserves for future projects.

2. Use of Local Public Powers

   In this section, three primary bonding techniques will be presented: general obligation bonds, revenue bonds, and special assessment bonds. There are advantages and disadvantages to each. The type of bond issued to finance a community improvement depends in part on custom and in part on the circumstances of a particular offering. General information about the three principal types of municipal bonds follows.

   General Obligation Bonds: These bonds pledge the unlimited taxing power and the full faith and credit of the issuing government to meet the required principal and interest payments.

Special Assessment Bonds (LID Bonds): LID bonds are used to finance improvements where the property specially benefited can be identified. Special assessment bonds are frequently used to make capital improvements in a particular neighborhood. Principal and interest payments for these bonds are made by special assessment on the property benefiting from the improvement. Before special assessment bonds are issued, estimated costs are mailed to property owners, a public hearing is held to allow the affected property owners to say whether they want the improvement, and a 30-day protest period elapses during which property owners may protest the improvements prior to City Council action formally establishing the project. Debt financed by special assessment bonds is not subject to debt limitations.

Revenue Bonds: Revenue bonds are frequently used to finance City-owned utilities, industrial parks, and other municipal public facilities. The bonds pledge the revenue from a particular revenue source to meet the principal and interest payments. Revenue bonds are appropriate debt instruments when the enterprise fund can be expected to generate sufficient revenue to meet both operating and debt service cost. Revenue bonds generally do not become a general obligation of the government issuing them. Communities may have to pay higher rates of interest on these bonds than on general obligation bonds, because revenue bonds are considered less secure. But, revenue bonds also have an important advantage over general obligation bonds in that the amount of the revenue bonds is not included in the amount of indebtedness subject to state debt limitations. The legal requirements for issuing revenue bonds are more complex than those for issuing general obligation bonds. When revenue bonds are issued, a special authority (Water Fund) operates the facility and a special revenue fund receives and disburses all funds. A trust agreement to provide for the monthly reimbursement of revenues and containing provisions to protect the bond holders must be formulated.

3. State Assisted or Guaranteed Resources

Public Works Trust Fund (PWTF): This fund was created in 1985 to provide loans for replacement of public works facilities. Applications for construction funds may be submitted once each year (in May), and applications for pre-construction funds (for such items as engineering design, bid document preparation, right of way acquisition and environmental studies) may be submitted once each month. Projects are evaluated based on:

a. Merits of the project as to need;
b. Degree of capital improvement planning;
c. Adequacy of existing rate structure;
d. Degree of local participation in financing project; and
e. Whether the area is economically distressed.

Current allocations of funds have been allowed for a wide variety of projects, including domestic water system replacement projects. The interest rates on PWTF loans generally range from 0.5% to 2% depending on the amount of matching money provided by the City.

PWTF loans have recently become less reliable due to legislative transfers from the PWTF into the general fund as a result of budget deficits.

Drinking Water State Revolving Fund (DWSRF): This fund provides low-interest loans to publicly and privately owned water systems for projects which improve water systems and ensure public health. Up to 100% of eligible project costs are fundable through this program. Applications are accepted once a year between October 1st and November 30th.

Community Economic Revitalization Board (CERB): CERB is a state board focused on economic development through job creation in partnership with local governments. The Board has the authority to finance public infrastructure improvements that encourage new private business development and expansion. However, by law CERB may only fund construction projects which can demonstrate that either significant private job creation or significant private investment will occur as a result of the public project. CERB is primarily a loan program with grants awarded on a case-by-case basis. The interest rates on CERB loans are 2.5% for distressed areas and 3.0% for non-distressed areas. Applications are accepted year around, while the Board considers applications every two months.

4. Federally Assisted or Guaranteed Resources

Three federally financed funding sources are available for domestic water system construction: 1) the USDA's Rural Development, Rural Utilities Service (RUS) Program; 2) the Economic Development Administration's (EDA) Public Works Grants and Loans Program; and 3) the Department of Housing and Urban Development's (HUD) Community Development Block Grants administered by the State Department of Community Planning and Development.

Rural Utilities Service Water & Waste Disposal Direct Loans and Grants Program: This program is one of several programs established by the USDA to provide public works assistance to small communities in rural areas. Public entities such as municipalities, counties, special purpose districts or authorities, Indian tribes, and nonprofit corporations or cooperatives are eligible in areas with a population under 10,000. Priority will be given to public entities in areas smaller than 5,500 people to restore a deteriorating water supply, or to improve, enlarge, or modify a water facility. Preference will also be given to requests which involve the merging of small facilities and those serving low-income communities. Loans and grant funds may be used to construct, repair, improve, expand, or otherwise modify rural water supply and distribution, including reservoirs, pipelines, wells, and pumping stations. Targeted at the neediest communities, grants are designed to keep costs economical. Grants are limited to reducing the facility per user costs for debt service to a minimum of 1% of the area's family income. Loans in the past have also been available at a 5% interest rate for the useful life of the facility, or the statutory limit on the applicant's borrowing authority, or for a maximum of 40 years.

Currently, Grandview does not qualify for this program due to population.

Public Works Grants and Loans Program: This program is funded by the Economic Development Administration (EDA) and is used to encourage long-range development gains in jurisdictions where economic growth is lagging, or where the economic base is shifting. The program provides public works and development facilities needed to attract new industry and provide business expansion. Financial aid may be used to acquire and develop land and improvements for public works, and to acquire, construct, rehabilitate, alter, expand or improve such facilities, including related machinery and equipment. When completed, such projects are expected to bring additional private investment to the area.

U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant Program: This program is administered by the State Department of Community Development. Communities with a population under 50,000 can apply for grants to undertake activities in providing adequate housing, expanded economic opportunities, and correcting deficiencies in public facilities which affect public safety and health of an area or community of residents. The program is designed to aid low and moderate income people and is also directed to have a maximum impact on stated community problems. Its primary focus is to assist blighted communities, or communities suffering a particular community or economic development problem.

5. Private Development

   Expansion of domestic water facilities to newly developing areas outside the existing service area is a common requirement of the private developer. Installation of public utilities within housing subdivisions is normally financed entirely by the developer. The City may participate by paying the cost of over-sizing the water main for possible extension at a later time.

Although funding has been curtailed in a number of programs within the last few years, projects are still receiving financing statewide. Competition for available funds, however, has increased significantly. Projects which show the greatest need and have the largest local funding participation or benefit to low-income families are receiving the majority of financing from these programs. Careful planning and packaging of the project is necessary so that the most effective dollar use, including local participation, may obtain the maximum benefit for the greatest number of people.

Table 9-3 provides a summary of funding sources and projects which are eligible under each program.

TABLE 9-3 FUNDING SOURCE SUMMARY

FUNDING SOURCE	ELIGIBLE PROJECTS
Domestic Water Enterprise Fund	All water system projects
General Obligation Bond	All water system projects
Revenue Bond	All water system projects
Special Assessment Bond	Local Improvement District projects
Public Works Trust Fund	Replacement of existing water system facilities
Drinking Water State Revolving Fund (DWSRF)	All water system projects, except for the sole purpose of fire flow or growth
Community Economic Revitalization Board (CERB)	All water system projects demonstrating job creation or private investment
USDA RUS Rural Water Grant	All water system projects
USDA RUS Rural Water Loan	All water system projects
EDA Public Works Grant	Water system projects to attract new industries and provide for business expansion
EDA Public Works Loan	Water system projects to attract new industries and provide for business expansion
HUD Community Development Block Grant	Water system projects which directly benefit low and moderate-income families
Private Development	All water system projects necessary for new housing and / or commercial developments

9.3 RECOMMENDED FINANCING STRATEGY

Provided in Table 9-4 is a financial program for the City's Water Operating Fund, which incorporates projected water service fees, operating costs, improvements, and loan costs for the next ten-year period. The values for year 2021 are the budgeted figures used by the City.

The projected Water Department revenue from water service fees after 2022 includes additional revenue from a combination of projected increases in the number of services and rate increases at the beginning of the year. These projected revenue increases are necessary to complete the recommended system improvements, while maintaining a positive balance in the water fund. If conditions change that reduce the projected future revenue or increase future water department expenses, the financial program shown in Table 9-4 should be revised to account for the reduced revenue, or modifications to successive year rate increases will have to be made. Project financing methods presented are subject to change based on availability of funding programs, criteria of those programs, and funding limits. Financing strategies for each project will be sought at least one year prior to the project implementation year listed in the capital improvement program. Should financing options become unavailable, the City will consider raising rates or postponing projects to future years.

Future Water Department expenses were estimated based upon an average inflation rate of 2% per year, as shown in Table 9-4.

The City of Grandview will continue annual reviews of the water system's financial program during their budget preparation process. The financial program will also be reviewed and revised as needed during the *Water System Plan* update in 2021. This continued review will allow for modifications to the proposed rate and revenue increases, should financial conditions change.

TABLE 9-4 WATER SYSTEM CASH FLOW ANALYSIS

Year Ending	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Beginning Fund Balance	**$ 6,493,834**	**$ 8,888,928**	**$ 12,713,143**	**$ 4,782,576**	**$ 4,745,455**	**$ 3,890,560**	**$ 4,083,791**	**$ 3,115,329**	**$ 4,694,245**	**$ 2,260,103**	**$ 1,707,338**
Revenue											
Water Service Fees	$ 1,911,988	$ 1,950,227	$ 1,989,232	$ 2,068,801	$ 2,151,553	$ 2,237,615	$ 2,327,120	$ 2,420,205	$ 2,517,013	$ 2,617,694	$ 2,722,401
Connection Fees	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000
Interest Earnings	$ 47,826	$ 47,455	$ 38,906	$ 40,838	$ 31,153	$ 46,942	$ 22,601	$ 17,073	$ 47,826	$ 47,455	$ 38,906
Rents and Leases	$ 10,800	$ 10,800	$ 10,800	$ 10,800	$ 10,800	$ 10,800	$ 10,800	$ 10,800	$ 10,800	$ 10,800	$ 10,800
Other Water Revenue	$ 1,290	$ 1,316	$ 1,342	$ 1,369	$ 1,397	$ 1,425	$ 1,453	$ 1,482	$ 1,512	$ 1,542	$ 1,573
Loan / Bond Proceeds	$ 3,578,329	$ 7,602,000		$ 531,000		$ 669,000		$ 2,103,000			
Utility Tax	$ 462,701	$ 471,955	$ 481,394	$ 500,650	$ 520,676	$ 541,503	$ 563,163	$ 585,690	$ 609,117	$ 633,482	$ 658,821
TOTAL - REVENUE	$ 6,065,046	$ 10,160,188	$ 2,644,900	$ 3,195,446	$ 2,766,880	$ 3,534,249	$ 2,978,374	$ 5,187,330	$ 3,220,384	$ 3,321,119	$ 3,445,669
Expenditures											
Salaries and Wages	$ 355,855	$ 366,530	$ 377,526	$ 388,852	$ 400,518	$ 412,533	$ 424,909	$ 437,656	$ 450,786	$ 464,310	$ 478,239
Benefits	$ 173,555	$ 178,762	$ 184,124	$ 189,648	$ 195,338	$ 201,198	$ 207,234	$ 213,451	$ 219,854	$ 226,450	$ 233,243
Supplies	$ 82,400	$ 84,872	$ 87,418	$ 90,041	$ 92,742	$ 95,524	$ 98,390	$ 101,342	$ 104,382	$ 107,513	$ 110,739
Other Services and Charges	$ 954,285	$ 982,913	$ 1,012,401	$ 1,042,773	$ 1,074,056	$ 1,106,278	$ 1,139,466	$ 1,173,650	$ 1,208,859	$ 1,245,125	$ 1,282,479
Utility Tax	$ 462,701	$ 471,955	$ 481,394	$ 500,650	$ 520,676	$ 541,503	$ 563,163	$ 585,690	$ 609,117	$ 633,482	$ 658,821
Operating Transfers Out	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal – Water Operations	$ 2,028,795	$ 2,085,032	$ 2,142,864	$ 2,211,964	$ 2,283,329	$ 2,357,036	$ 2,433,162	$ 2,511,788	$ 2,592,999	$ 2,676,880	$ 2,763,521
Capital Outlays											
Major Capital Improvements	$ -	$ 3,578,329	$ 7,602,000	$ -	$ 531,000	$ -	$ 669,000	$ -	$ 2,103,000	$ -	$ -
Misc. Capital Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
O & M Improvements	$ 1,421,000	$ 213,000	$ 39,000	$ 239,000	$ -	$ 187,000	$ 13,000	$ 276,000	$ 7,000	$ 257,000	$ 208,000
Subtotal – Capital Outlays	$ 1,421,000	$ 3,791,329	$ 7,641,000	$ 239,000	$ 531,000	$ 187,000	$ 682,000	$ 276,000	$ 2,110,000	$ 257,000	$ 208,000
Debt Service											
99 Well Rehabilitation											
03 SRF Loan	$ 142,820	$ 141,420									
New Yakima County SIED Loan											
New USDA Loan	$ 21,605	$ 21,605	$ 21,605	$ 21,605	$ 21,605	$ 21,605	$ 21,605	$ 21,605	$ 21,605	$ 21,605	$ 21,605
OIE DWSRF Loan	$ 55,732	$ 55,050	$ 54,367	$ 53,685	$ 53,002	$ 52,320	$ 51,637	$ 50,955	$ 50,273	$ 50,955	$ 50,273
Future Debt Services		$ 241,537	$ 715,631	$ 706,314	$ 732,839	$ 723,057	$ 758,433	$ 748,065	$ 879,651	$ 867,443	$ 855,236
Subtotal – Loans	$ 220,157	$ 459,612	$ 791,603	$ 781,604	$ 807,446	$ 796,982	$ 831,675	$ 820,625	$ 951,528	$ 940,003	$ 927,113
Transfers to Bond Redemption	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal – Debt Service	$ 220,157	$ 459,612	$ 791,603	$ 781,604	$ 807,446	$ 796,982	$ 831,675	$ 820,625	$ 951,528	$ 940,003	$ 927,113
TOTAL – EXPENDITURES	$ 3,669,952	$ 6,335,973	$ 10,575,467	$ 3,232,567	$ 3,621,775	$ 3,341,018	$ 3,946,837	$ 3,608,414	$ 5,654,527	$ 3,873,883	$ 3,898,634
Ending Fund Balance	**$ 8,888,928**	**$ 12,713,143**	**$ 4,782,576**	**$ 4,745,455**	**$ 3,890,560**	**$ 4,083,791**	**$ 3,115,329**	**$ 4,694,245**	**$ 2,260,103**	**$ 1,707,338**	**$ 1,254,372**
Net Increase (Decrease)	$ 2,395,094	$ 3,824,215	$ (7,930,567)	$ (37,121)	$ (854,895)	$ 193,231	$ (968,463)	$ 1,578,916	$ (2,434,142)	$ (552,765)	$ (452,966)
Population Revenue Increase	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
Rate Increase	**0.0**	**0.0**	**0.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**

Notes:
1. O&M costs are assumed to increase at 3 percent per year.

9.4 WATER RATES

Grandview's current water rates and rate structure were adopted in 2017, Ordinance No. 2017-12, with a domestic water rate increase of 1% over the previous year. A summary of the current water service rates for the City is provided below. All consumption beyond the consumption threshold is charged at the overage rate shown. The complete list of the City's current water rates is provided in Ordinance No. 2017-12, a copy of which is provided in CHAPTER 10.

a) Within City Limits:

Meter Size	Rate
5/8 to 3/4 inch	$23.77
1 inch	$27.73
1 1/4 inch	$32.55
1 1/2 inch	$36.53
2 inch	$54.14
3 inch	$71.50
4 inch	$91.92
6 inch	$176.18
8 inch	$354.90

b) Consumption charges:

Consumption in Gallons	Rate
1,000 to 3,000	$0.36
3,001 to 15,000	$2.19
15,001 to 30,000	$1.76
30,000 and above	$1.52

c) Outside City Limits:

Rates shall be 150 percent of the applicable rate within the city limits, including standby or fire protection service charges.

Based on the above rates, the typical monthly charge for a Single-Family residential customer (1" meter) within the corporate limits, consuming 8,000 gallons of water in a month would be equal to $29.92. This monthly service charge is very reasonable, compared with neighboring cities of a similar size and amount of water use.

The City's current rates and/or total revenue will need to be increased in future years to maintain a positive operating fund balance, pay for rising O & M costs, fund necessary improvement projects, and make the necessary debt service payments for prior and future improvement projects. The annual rate increases will have a minor impact on customers, but will be necessary for operations, maintenance, and system improvements.

A more detailed rate analysis will be necessary in the future to determine the rate structure required to achieve the recommended revenue increases as shown in the financial program. Following the proposed rate analysis, annual review of the proposed rates and revenue increases will be necessary to determine required adjustments to either base rates, usage charges, or both.

With the City's current rate structure, customers pay more with increased water usage. Further conservation may be possible by changing to an inclining block rate or similar structure. This type of conservation rate structure would penalize customers that use excessive amounts of water, encouraging more efficient use of water. Further evaluation of the City's water rate structure will be considered in the future.

CITY OF GRANDVIEW

CHAPTER 10 -

MISCELLANEOUS DOCUMENTS

HLA Engineering and Land Surveying, Inc.

10.1 MISCELLANEOUS DOCUMENTS INDEX

1. State Environmental Policy Act (SEPA) Documentation
2. 2021 Water Facility Inventory
3. Water System Plan Comments and Responses
4. Consumer Meeting & Water System Plan Adoption
5. Water Use Efficiency Program and Goal Adoption Process Documentation
6. Local Government Consistency Review Checklist(s)
7. City of Grandview Fire Department Letter
8. City of Grandview Municipal Code, Ordinances, and Resolutions
   a. Chapter 13.04 General Provisions
   b. Chapter 13.18 Cross Connection Control
   c. Chapter 13.24 Water Service Regulations
   d. Chapter 13.28 Rates and Charges
   e. Chapter 13.30 Low-Income Senior Citizens and Low-Income Disabled Persons Utility Rates
   f. Chapter 13.36 Water Use
   g. Chapter 13.40 Capital Facilities Plan for Public Works Facilities
   h. Chapter 13.44 Recommended Standards for Water Works
9. Extension by Developers Policy
10. Property Deeds
11. Declaration of Covenants
    a. S01 – West Main
    b. S03 – Velma
    c. S07 & S16 – Olmstead A & B
    d. S08 – Appleway
    e. S12 – Pecan A
    f. S17 – Ashael Curtis
12. Well Logs
    a. S01 – West Main
    b. S02 – Balcom & Moe
    c. S03 – Velma
    d. S06 – Euclid
    e. S07 – Olmstead A
    f. S08 – Appleway
    g. S10 – North Willoughby
    h. S11 – Highland
    i. S12 – Pecan A
    j. S13 – South Willoughby
    k. S14 – Butternut
    l. S16 – Olmstead B
    m. S17 – Ashael Curtis
    n. S18 – Pecan B
13. Water Right Status Summary Memorandum – 10/24/2011
14. Water Right Documents
15. Same Body of Public Groundwater and Impairment Analyses Memorandum – 08/25/2009

16. Susceptibility Assessment Forms
    a. S01 – West Main
    b. S02 – Balcom & Moe
    c. S03 – Velma
    d. S07 – Olmstead A
    e. S08 – Appleway
    f. S10 – North Willoughby
    g. S11 – Highland
    h. S12 – Pecan A
    i. S13 – South Willoughby
    j. S14 – Butternut
    k. S16 – Olmstead B
    l. S17 – Ashael Curtis
    m. S18 – Pecan B
17. Wellhead Protection Plan and Notification Letters
18. 2015 Coliform Monitoring Plan
19. Water Quality (Consumer Confidence) Report
20. Disinfection Byproducts Monitoring Plan
21. Water Quality Monitoring Schedule
22. Source Sample Chemical Analysis Results (IOC, Nitrate, VOC, SOC, and Radionuclide)
23. Distribution System Chemical Analysis Results (Bacteriological, Lead, Copper, and Disinfection Byproducts)
24. Computer Printout of Hydraulic Analysis Results
25. Telemetry Control System Screen Printouts
26. City of Grandview Design and Construction Standards and Specifications for Public Works Improvements
27. Citizen Contact Record Form
28. Grandview Fire Department Hydrant Flow Test

Map A - Existing Water System
Map B - Hydraulic Analysis Nodes and Pipes