Water System Plan

Prepared for

City of McCleary
100 South Third Street
McCleary, WA 98557

Prepared by

Parametrix
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CITATION

Parametrix. 2008. Water System Plan. Prepared by Parametrix, Sumner, Washington. September 2008.

McCleary City Council

PROPOSED AGENDA

October 8, 2008

6:30 Worksession

6:45 Public Forum: Water System Plan Update

7:00 Council Meeting

Flag Salute	
Roll Call	
Minutes	
Public Comment	
Mayor's Report	
Staff Reports:	Busse Nutley, City Administrator Dan Glenn, City Attorney Department Heads
Public Hearing:	Arndt Alley Vacation
Old Business:	
New Business:	Bid Award – Patch Paving
Ordinances:	Vacate Alley Right-of-Way (Arndt)
Resolutions:	Water System Plan Adoption Employee Handbook – Military Leave (new benefit) Ratify Sole Source Purchase – Bunker Gear
Vouchers	
Mayor/Council Comments	
Public Comment	
Executive Session	
Adjournment	

Americans with Disabilities Act (ADA)
Accommodation is Provided Upon Request

Please Turn Off Cell Phones – Thank You

RESOLUTION NO. 575

A RESOLUTION ADOPTING A COMPREHENSIVE WATER PLAN.

R E C I T A L S:

1. The City maintains within its governmental operations a water distribution system.

2. Pursuant to the mandates of the Department of Health of the State of Washington, the City has undertaken the development and preparation of an update to its Comprehensive Water Plan relating to that system of collection and distribution. This update includes the required elements in relation to water use efficiency mandated under the provisions of law.

3. Pursuant to the applicable provisions of law, an Environmental Checklist was prepared and submitted by the responsible official. The same was reviewed by and a Declaration of Non-significance issued. That Declaration was issued on June 16, 2008, and notice thereof published on July 24, 2008. More than the allowed days have elapsed since that time without appeal or comment.

4. All mandatory requirements in relation to providing public notice of and the allowance of public input and comment prior to the adoption of the Plan have been fulfilled.

CITY OF McCLEARY
100 SOUTH 3RD STREET
McCLEARY, WASHINGTON 98557

5. The City has received an indication from the Department of Health that the Plan requires the approval of the Council prior to its submission to the Department for final approval.

NOW, THEREFORE, BE IT RESOLVED AS FOLLOWS BY THE CITY COUNCIL OF THE CITY OF McCLEARY, THE MAYOR SIGNING IN AUTHENTICATION THEREOF:

SECTION I: That certain Comprehensive Water Plan dated September 2008, prepared by the City, with the assistance of the engineering firm of Parametrix, Inc., a copy of which is on file with the Office of the Clerk-treasurer, shall be and is hereby adopted as the official Comprehensive Water Plan of the City of McCleary.

SECTION II: The City Administrator shall undertake such notification of affected agencies, including submission to the State Department of Health, of the adoption of this Plan as may be required by law.

PASSED THIS 8th DAY OF October, 2008, by the City Council of the City of McCleary, and signed in authentication thereof this 8th day of October, 2008.

CITY OF McCLEARY:

Wallace Bentley

WALLACE BENTLEY, Mayor

CITY OF McCLEARY
100 SOUTH 3RD STREET
McCLEARY, WASHINGTON 98557

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B Water Facilities Inventory Form

C McCleary Municipal Code

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E Water Use Summary and Well Production Summary

F Sequestering Reagent Calculations

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H Water Rights and Water Rights Assessment

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J Wellhead Protection Plan

K Asbestos Cement Removal and Disposal ORCAA Rule 6.3.4

L Cross Connection Control and Backflow Prevention Manual

M City of McCleary Coliform Monitoring Plan

N Emergency Response Contingency Plan

O Material/Chemical Safety (see Section 6.8.1)

P 2007 Development Standards (see Section 7.4.1)

Q Capital Improvement Plan Cost Estimates (see Section 8.1)

R Financial Viability Test Worksheets (see Section 9.3.6)

S SEPA Checklist and Determination of Non-Significance

T Job Descriptions

U Modeling Results

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

9/15/08

EXPIRES 2/18/2010

Prepared by Cole Elliott, P.E.

Checked by Nathan Mozer, P.E.

Approved by David B. Roberts, P.E.

KEY TERMS

AC	asbestos cement
ac-ft	acre-feet
AWWA	American Water Works Association
CCS	Cross Connection Control Specialist
CI	Cast Iron
CIP	Capital Improvement Plan
CT	contact time
DDBPR	Disinfectants and Disinfection Byproducts Rule
DI	Ductile Iron
DOH	Washington State Department of Health
DS	Dead Storage
DWSRF	Drinking Water State Revolving Fund
E. coli	Escherichia coli
EPA	United States Environmental Protection Agency
ERP	Emergency Response Program
ERU	Equivalent Residential Connection
ES	equalizing storage
fps	feet per second
FSS	fire suppression storage
GHRP	Grays Harbor Regional Planning Department
gpd	gallons per day
gpm	gallons per minute
HAA5	haloacetic acids
HGL	hydraulic grade line
IDSE	Initial Distribution System Evaluation
IOCs	Inorganic chemicals
MCL	maximum contaminant level
MCLG	Maximum Contaminant Level Goal
mg/L	milligrams per Liter
MMC	McCleary Municipal Code
MRDLs	Maximum Residual Disinfectant Levels
NFPA	National Fire Protection Association
O&M	Operation and Maintenance
ORCAA	Olympic Regional Clean Air Agency

KEY TERMS (CONTINUED)

OS	operational storage
pCi/L	picocuries per liter
PE	Polyethylene
PHD	peak hour demand
PRV	pressure-reducing valves
psi	pounds per square inch
PUD	Public Utility District
PVC	polyvinyl chloride
RUS	Rural Utilities Service
SB	standby
SEPA	State Environmental Policy Act
SOC	Synthetic Organic Compound
SWDA	Safe Water Drinking Act
TTHMs	total trihalomethanes
UCP	Utilities Comprehensive Plan
VOC	Volatile Organic Compound
WAC	Washington Athletic Code
WDM	Water Distribution Manager
WFI	Water Facilities Inventory
WRWA	Washington Rural Water Association
WUE	Water Use Efficiency
WWTP	wastewater treatment plant

1. EXISTING WATER SYSTEM

The objective of this chapter is to provide basic information that will serve as a foundation for developing the comprehensive program to meet the City of McCleary's current and future water system needs. This chapter contains the following information:

- Ownership and Management.
- System Background.
- Inventory of Existing Facilities.
- Water System Service Area.
- Future Service Area.
- Existing Facilities.
- Related Plans.
- Service Area Policies, Agreements, and Conditions of Service.

This chapter provides familiarity with the City of McCleary's water system, as well as a basic understanding of the information needed to develop a Comprehensive Water Plan that includes current and future water system needs. WAC 246-290-100 and WAC Chapter 246-295-230 requires the information presented in this chapter. Appendix A includes a copy of the related WAC requirements.

1.1 OWNERSHIP AND MANAGEMENT

The water system for the city of McCleary is owned and operated by the City of McCleary and operates under Washington State Department of Health (DOH) Water System ID Number 52250U. The existing system serves 735 connections. The City of McCleary Water/Wastewater Manager manages the water system with the support of three maintenance staff. A current copy of the Water Facilities Inventory (WFI) form is included in Appendix B.

1.2 SYSTEM BACKGROUND

1.2.1 History

The area, now called McCleary, was first under the ownership of the Northern Pacific Railroad Company through a land grant given by President Harrison in 1864. At that time, several homesteads occupied the area that is now the downtown portion of the city of McCleary.

In 1897, Mr. Henry McCleary from Guernsey County, Ohio, began a small cedar lumber mill. The City of McCleary was then considered a "company town" because the McCleary Mill owned most of the buildings, homes, and utilities. . The mill and the community continued to grow and prosper through 1910, and the mill expanded to include a door plant.

For the next 10 years, the community went through a period of rapid growth and construction that included digging "Sam's Canal" along Maple Avenue, which provides for much of the stormwater drainage within the city.

The community continued to grow and prosper until the onset of the Great Depression of 1929. The sawmill closed 2 years later due to lack of available local timber. Then in January of 1942, Simpson Logging Company purchased the McCleary door plant. Shortly after purchase of the plant, Simpson encouraged the community to incorporate into a city.

The City of McCleary incorporated on January 9, 1943, with a population of 1,200. Today, McCleary's economy is still influenced heavily by the timber industry. Simpson Timber Company continues to be the City's largest employer; however, the City encourages economic diversity to provide more stability and growth. The current population of the City of McCleary has grown to approximately 1,550. Current growth projections indicate the city will grow at a rate of approximately 2 percent per year over the next 20 years.

Through its initial incorporation, the City of McCleary purchased the water and power utility from Simpson Timber Company. Simpson completed some improvements to these utilities prior to the sale; however, the need for adequate fire protection and sanitary sewer service resulted in an expansion and upgrade of the City's utilities during the 1950s. In 1952, a two-stage wastewater treatment plant, sanitary sewer collection system, new water mains, and a storage tank were constructed. Over the years, upgrades and modifications to these facilities occurred to meet growth needs, as well as regulatory requirements. Today, McCleary's water system includes three wells located north of the downtown area, a 150,000-gallon and a 500,000-gallon storage tank located east of downtown, and approximately 65,000 linear feet of water mains throughout the city.

1.3 RELATIONSHIP TO OTHER PLANS

To ensure coordination with other plans, the following documents were reviewed:

- *Utilities Comprehensive Plan (UCP)*, Grays Harbor County, 1991.
- *City of McCleary Water System Plan*, 1999.

The purpose of the UCP was to implement regional utility planning. In relation to drinking water, the plan identifies the Chehalis River Valley as a limited source for additional water supply and describes a potential intertie of the McCleary to Elma water system to meet growing demands.

There is also a significant interest in developing a regional water system, primarily driven by the fact that the City of Aberdeen has an abundant supply of water and Ocean Shores and Westport are both dealing with saltwater intrusion problems.

Grays Harbor County was not required to adopt a Comprehensive Plan in accordance with the Growth Management Act.

1.4 SERVICE AREA CHARACTERISTICS

1.4.1 General Location

The City of McCleary is located approximately 20 miles west of Olympia in east Grays Harbor County, Washington. Figure 1-1 shows the location of McCleary. The city is approximately 2 square miles in area and is situated in portions of Sections 11, 12, 13, and 14, Township 18 North, Range 5 West, Willamette Meridian.

1.4.2 Geography

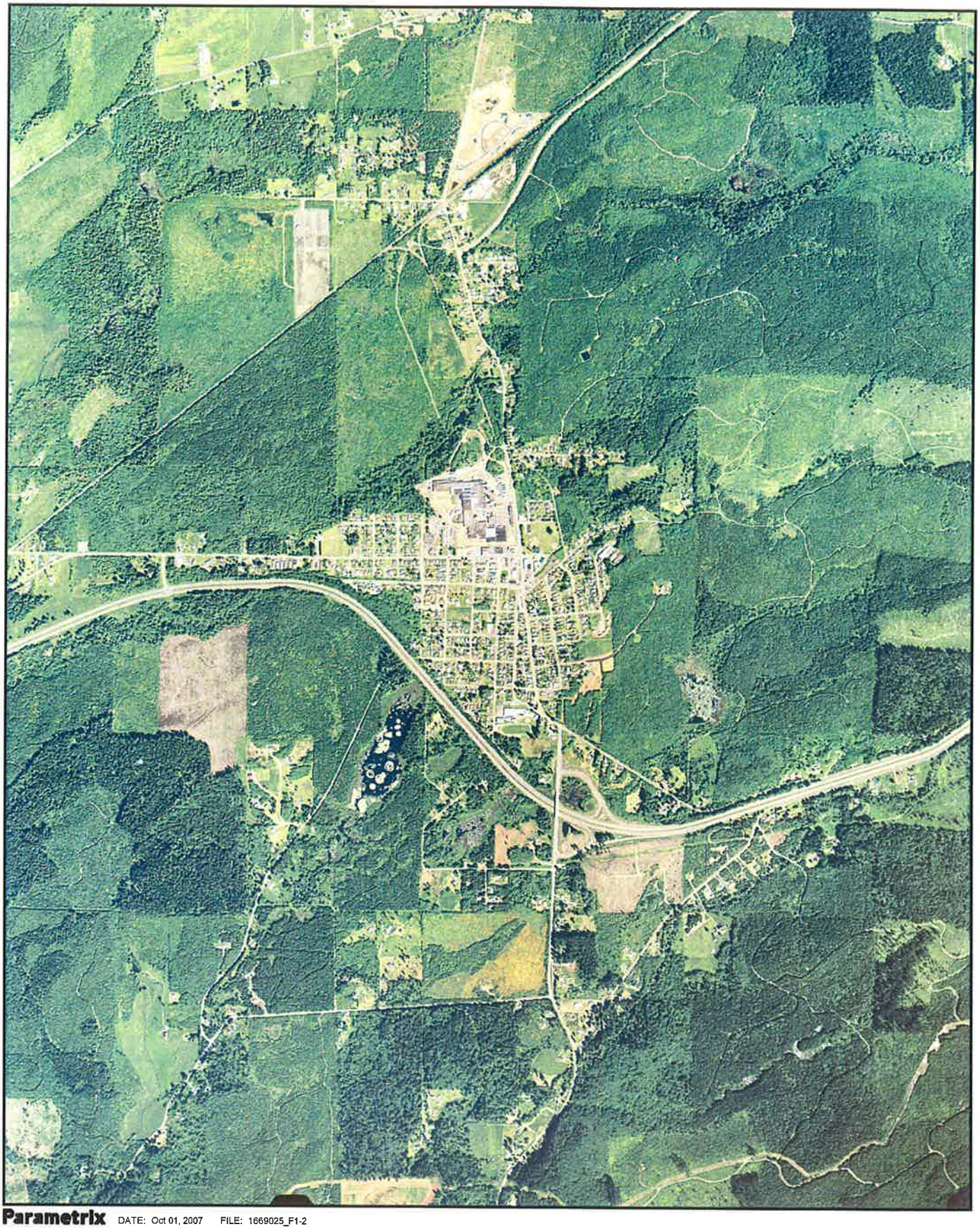
As shown in Figure 1-2, McCleary's elevations range from 426 feet at the water tanks to 262 feet at the west end of town. The city center generally lies at 280 feet. The highest house in the water service area is or will be located at the eastern end of Cedar Street at an approximate elevation of 377 feet.

Parametrix DATE: May 27, 2008 FILE: 1669025_F1-1

N

NO SCALE

Figure 1-1
City of McCleary
Vicinity Map



Parametrix DATE: Oct 01, 2007 FILE: 1669025_F1-2

N

Figure 1-2
City of McCleary
Geography

1.4.3 Adjacent Purveyors

There are no Class A water systems immediately adjacent to the McCleary system. The City of Elma's Class A water system is located approximately 10 miles west of McCleary. Thurston County PUD owns one Class A and two Class B water systems approximately one mile north of McCleary. Individual domestic wells primarily serve the neighboring properties. The Utilities Comprehensive Plan identifies five Class IV water systems and one Class II water system within a mile of the City of McCleary's service boundary.

The Simpson door plant is an industry that is centrally located in the city of McCleary. The Simpson Timber Company owns and maintains a fire protection system at the door plant. This is a non-potable system dedicated entirely for fire protection at the plant. The McCleary water system supplies the door plant with potable water for domestic use. Wildcat Creek provides fire protection. Simpson Timber has a dam and water rights for Wildcat Creek. The dam impounds approximately 6 acre-feet (ac-ft) of water, and a 22-inch-diameter supply main transports water from the dam to Simpson's pumping plant. This pumping plant has a capacity of 3,850 gallons per minute (gpm) at 110 pounds per square inch (psi). The following provides the pumping plant capacity:

- 1,500 gpm: Pump with 200-hp Direct Drive Diesel Motor.
- 850 gpm: Pump with Electric Motor.
- 500 gpm: Pump with Electric Motor.
- 500 gpm: Pump with Gasoline Powered Motor.

The pumping plant is piped directly to the fire protection system within the door plant, including a 750,000-gallon reservoir through a 12-inch-diameter pipe approximately 2,100 feet in length. The reservoir is located on a hill northeast of the Simpson plant at an elevation of 185 feet above the plant.

1.4.4 Existing Service Area

The City of McCleary currently provides water service to 735 customers located both inside and outside the city limits. Figure 1-3 shows the existing water service area boundary.

1.4.5 Existing Zoning and Land Use

The majority of the system is zoned residential; however, the City also has a significant portion of land zoned industrial. As mentioned previously, the major commercial property owner, Simpson, owns a separate fire flow system. The current city zoning map is shown in Figure 2-1.

McCleary's *Comprehensive Plan* was updated in 2003 and the McCleary Municipal Code Title 17 Zoning was updated in 2004 to comply with the recommended changes from the *Comprehensive Plan*. Chapter 17.20 provides a table of the permitted and conditional land uses allowed in a zoned area. Appendix C includes Title 17.

The Grays Harbor Comprehensive Plan governs land growth and uses outside of McCleary's city limits and is codified in Grays Harbor County Code Title 17. This 2008 City of McCleary Water System Plan is consistent with the most recent updates of the City of McCleary code and Grays Harbor County code.

1.5 FUTURE SERVICE AREA

For planning purposes, the future service area was based on the existing service area plus proposed annexation and logical extension of the water system. The City will continue to evaluate each annexation on a case-by-case basis. Figure 1-3 shows the future service area.

1.6 INVENTORY OF EXISTING FACILITIES

This section describes and explains the components of the existing McCleary water system. Information was gathered from City records, a site visit, and information provided by maintenance staff. Figure 1-4 shows the water system and indicates its various components. The system currently has 735 connections, and a copy of the WFI is included in Appendix B.

1.6.1 Pressure Zones and System Configuration

The McCleary Water System consists of three wells and two reservoirs. The wells pump through the water distribution system to two reservoirs located on a ridge east of the city. The system consists of a single pressure zone with an overflow elevation of 472 feet. The service area ranges in elevation from 262 feet to 377 feet.

1.6.2 Wells

A well field located north of the city, near the intersection of Summit and Larson Roads, supplies water to the McCleary water system. This location is in the east half of the northwest quarter of Section 11, Township 18 North, Range 5 West.

There are three wells in this well field, two of which provide regular service to the McCleary water system. The third well, Well No. 1, is inactive due to the sand intrusion from the aquifer and currently not connected to the system. Table 1-1 presents the data for each of the three wells.

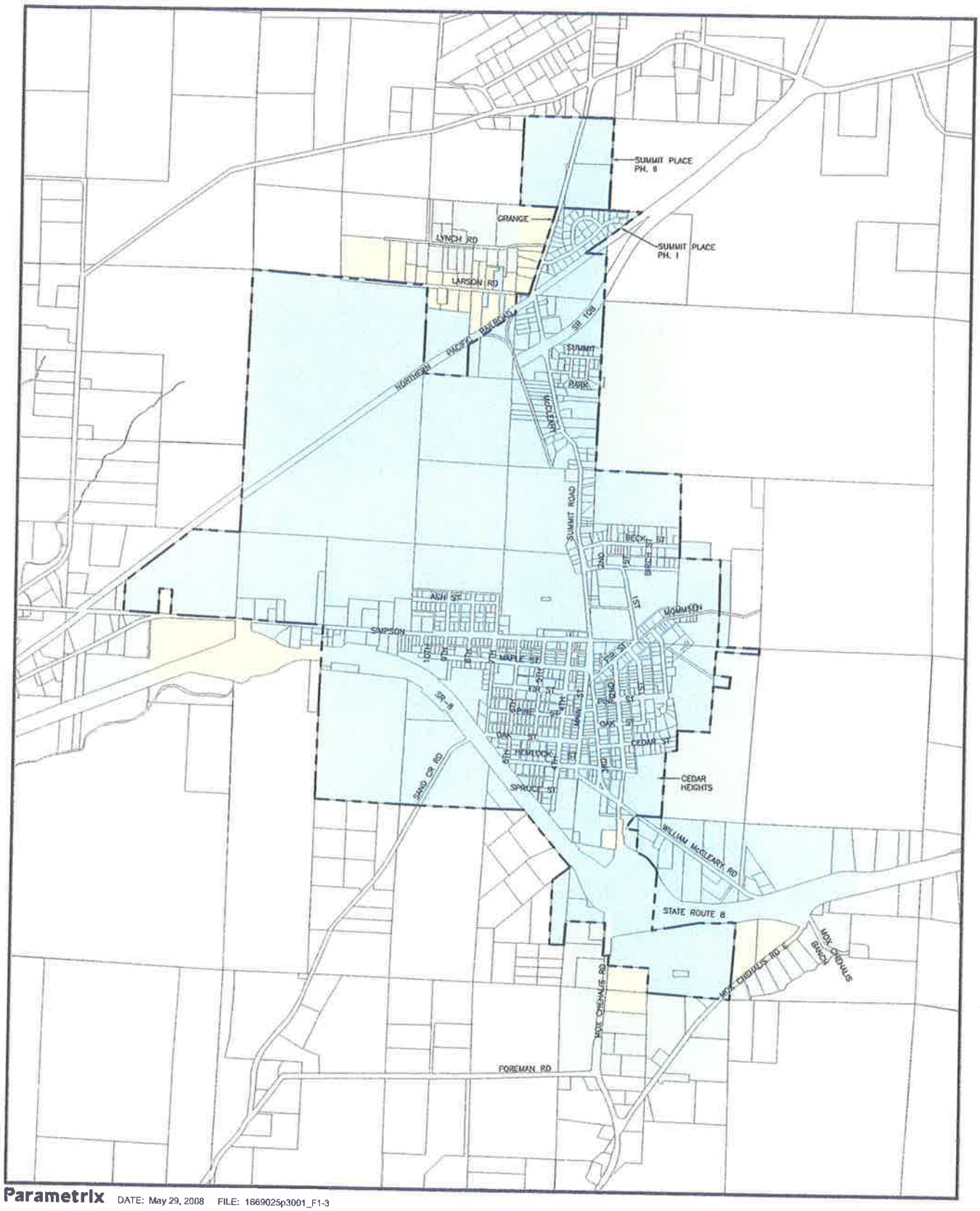
Table 1-1. Well and Pump Data

	Well No. 1[a]	Well No. 2	Well No. 3
Year Constructed:	1951	1952	1962
Casing Diameter:	8-inch	12-inch	16-inch
Ground Elevation:	300 feet	300 feet	300 feet
Casing Depth:	74 feet	82 feet	93 feet
Static Water (Depth below Top of Casing):	33 feet	38 feet	38 feet
Motor:	Layne-Bowler	Layne-Bowler	U.S. Motors
Pump Manufacturer:	Layne-Bowler	Layne-Bowler	General Electric
Horse Power:	20	40	40
RPM:	800	1,800	N/A
Volts:	220, 60 cycle	220, 60 cycle	220, 60 cycle
Model Number:	895966	929265	31E259
Frame:	364-4	404-1	164
Pump Type:	Turbine	Turbine	Turbine
Flow Rates:	N/A	400 gpm[b]	440 gpm
Pump Diameter:	N/A	N/A	7-1/2-inch
Meter:	Very worn	6-inch, 0–1,300 gpm	6-inch, 0–1,300 gpm

[a] Well No. 1 is not metered and is not used as a supply well. Wells No. 2 and No. 3 can supply 670 gpm when working simultaneously.

[b] Maximum allowed instantaneous withdrawal rate. Pump must be throttled back to meet this flow rate.

N/A = Information is not available.



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N

0 2000'

SCALE IN FEET

LEGEND

- Existing Water Service Area
- Proposed 6 Year Water Service Area
- Proposed 20 Year Water Service Boundary
- City Limits

Figure 1-3
City of McCleary
Existing and Proposed 6 & 20 Year Service Area Boundaries

Typically, the City of McCleary alternates use of Wells No. 2 and No. 3 for most of the water pumped and distributed within the distribution system.

1.6.3 Treatment/Disinfection Equipment

The City of McCleary currently uses polyphosphates to sequester high levels of iron and manganese and sodium hypochlorite for disinfection of the system.

1.6.3.1 Sequestering

The City currently utilizes sequestering as a method to treat high levels of iron for both Well No. 2 and Well No. 3. The sequestering agent fed into the system and controlled by a small metering pump is to achieve a concentration of approximately 1.8 mg/l. The usage rate is approximately 30 gallons every 6 weeks.

1.6.3.2 Chlorine

Well No. 2 and Well No. 3 are equipped with a hypochlorination disinfection system. The City currently uses sodium hypochlorite to disinfect drinking water at Well No. 2 and Well No. 3. Sodium hypochlorite fed into the system is at a high enough concentration to achieve a residual of approximately 0.2 to 0.6 mg/l in the distribution system. The sodium hypochlorite is added approximately 20 feet downstream of the well head.

1.6.4 Storage Facilities

There are two steel reservoirs in the system, a 500,000-gallon tank and a 150,000-gallon tank, which are located at the highest point in the system. A chain link fence, kept locked at all times, encloses the two storage facilities. The reservoirs are approximately 50 feet in diameter and 35 feet high and 30 feet in diameter and 30 feet high, respectively. Figure 1-5 shows a schematic of the existing system.

The wells pump into the distribution system, and the hydraulic grade line (HGL) is established by the level in the reservoirs.

1.6.5 Water Distribution System

The McCleary water system is comprised of mostly asbestos cement (AC) pipe with some polyvinyl chloride (PVC) and cast iron pipe. Table 1-2 shows approximate quantities of pipes by diameter. Figure 1-4 also shows the diameter of the pipes.

Table 1-2. Inventory of Water Distribution Main

Pipe Size	Asbestos Cement	Cast Iron	PVC	Total
2-inch	**N/A**	3,920[a]	770	**4,690**
4-inch	7,660	390	100	**8,150**
6-inch	18,240	3,960	3,470	**25,670**
8-inch	6,640	4,620	8,725	**19,985**
10-inch	N/A	N/A	6,590	**6,590**
Total:	**32,540**	**12,890**	**19,655**	**65,085**

[a] Material is steel.

1.7 SERVICE AREA POLICIES

The purpose of this section is to identify and define the policies that affect the development of the McCleary water system. Below are summaries of the policies, as well as the water service regulations defined in the McCleary Municipal Code (MMC) under Title 13. This section also provides a guideline for water service requests from both inside and outside of the service area boundaries, and a guide for the development of the water system. Chapters 13.04, 13.08, 13.20 and 13.24 of the McCleary Municipal Code and City of McCleary Development Standards adopted June 1997 (Appendix C) provides further information.

1.7.1 Ownership of Mains and Service Connections

The City should own all mains, service connections, and appurtenances in the public streets, alleys, or utility rights-of-way. Any person or contractor responsible for construction of such service mains must turn over all interest of the service main to the City per Section 13.04.060 after meeting all provisions, codes, and standards. Special exceptions to this rule only apply to private systems existing at the time. Under Section 13.04.060 these systems are to remain under private ownership unless dedicated to the City and approved by the Council.

1.7.2 Administration and Enforcement

The Public Works Department has the authority to administer and enforce any of the provisions outlined in this section, or in Chapter 13 of the MMC.

1.7.3 Wholesaling of Water

The City is currently not wholesaling any water. However, if authorized by the City Council, Section 13.04.140 allows the wholesaling of water where service through an individual meter is not practical. The MMC states that authorization may be granted to a community or a group of individual users served by a common master meter, if the plans are reviewed and approved by the City Engineer. The City shall install the master meter at the applicant's expense and the City shall thereafter maintain, own, and control the master meter. The water service beyond the master meter shall be the responsibility of the members served by the connection. Once approval is granted for a particular community or development, any additional connections require a separate application process and approval.

1.7.4 Wheeling Water

The City of McCleary does not currently have a policy for wheeling of water. Because the system is remote, consideration of this policy is a low priority at this time.

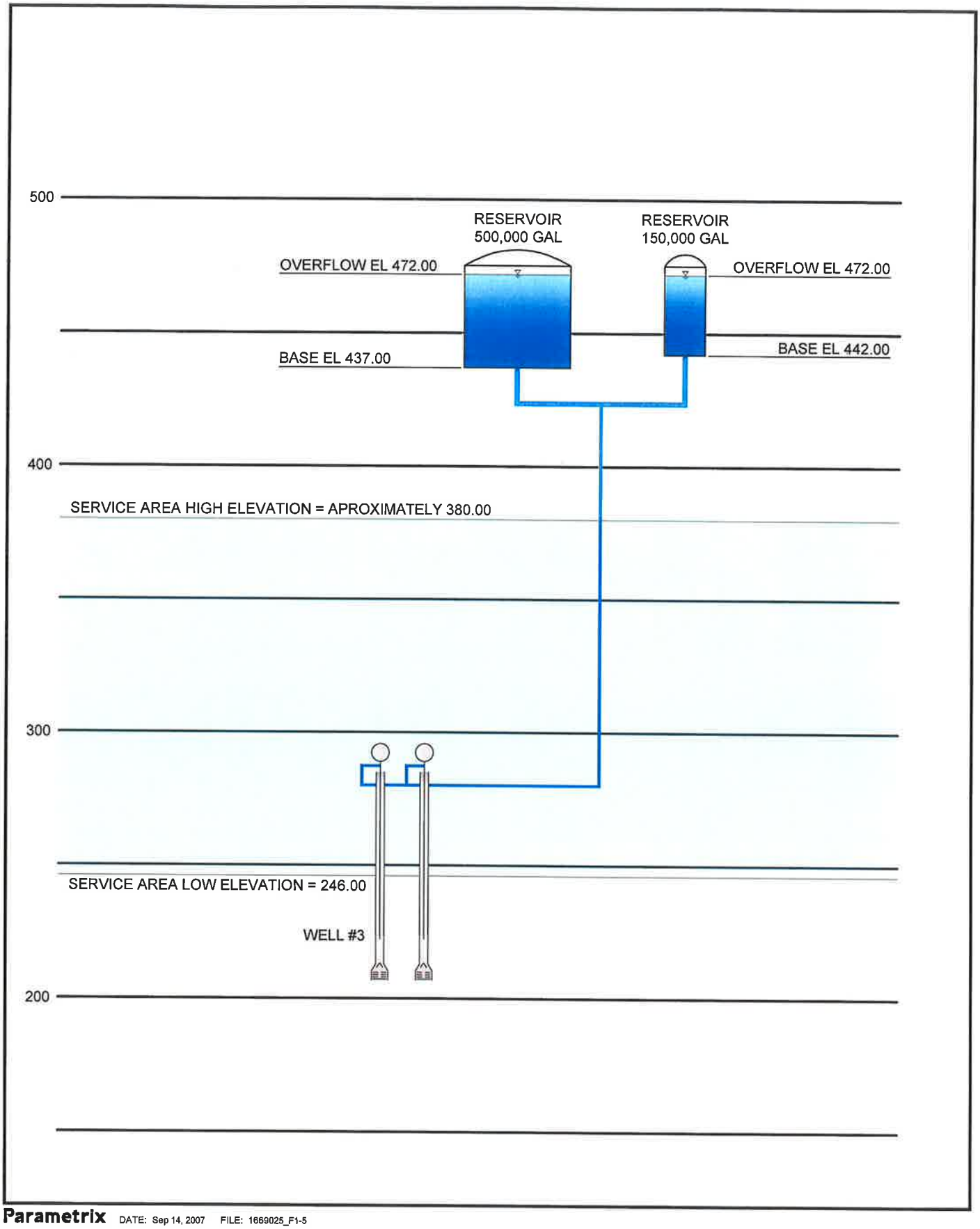
1.7.5 Annexation Policy

In accordance with City Council policy, any property not within the existing city limits must sign an agreement to annex into the City, prior to obtaining water service. If a water main is within 200 feet of the City's water system, the owner is required to connect to the City's system if the service area is within the existing city limits.

1.7.6 Direct Connection

1.7.6.1 Service Application

All future connections to the water system require an application for service as outlined by Section 13.04.100. The owner of the property requesting service shall complete an application and fully state all uses for the water. Applications for service connections are available at the Office of the Clerk-Treasurer and a copy is included in Appendix D. One-half of the connection fee is due at the time of filing an application for utility service.



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KEY

ELEVATION RANGE OF SERVICE AREA (FEET)

Figure 1-5
City of McCleary
Existing Water System
Elevation Schematic

1.7.6.2 Connections

All new structures, as well as any existing structures, applying for or receiving water within the city limits will have a water meter installed per Section 13.08.010 and also comply with the provisions of Section 13.08.010.

Section 13.04.110 states the City will not provide any future connections without a standard main owned by the City in the public right-of-way or adjacent to the premises requiring the connection. Every new connection will have its own meter, unless otherwise approved by the City Council. The City shall install all service connections at the expense of the property owners. The connections shall be an extension of a line from the service main to the property line. The costs of connections are included in Appendix D and are subject to change by the City Council based on the prevailing cost of installations at the actual time of installation. All connections to the City's water system shall conform to the Standard Specifications and regulations of the City. Standard Specifications and Standard Details are included in the *City of McCleary Development Standards*, May 1997.

1.7.6.3 Reconnections

An application is required for a service reconnection either to increase the size of the connection or to relocate the connection in accordance with MMC Section 13.04.190. The owners of the premises desiring the reconnection are required to pay the cost of the increase in size or change of location.

1.7.6.4 Service Connection Meter and Hookup Charge

All persons connecting to the City's water system shall pay in advance a hookup and water meter charge in accordance with the schedule set forth by resolution of the Council under Section 13.04.120.

Appendix D shows the current costs for connections, as well as other parameters defining the costs.

1.7.6.5 Temporary Service Connections

According to Section 13.04.130, water service may be provided on a temporary basis. Temporary service will be granted only if all of the following conditions are met:

- The City approves the application for a temporary permit.
- The water service is used only for the purposes stated in the application.
- The applicant pays the total costs required for the connection prior to connection.
- The applicant immediately notifies the City when temporary service is no longer needed, or the temporary service needs to be converted to a permanent connection.
- The temporary service conforms to City Standard Specifications, regulations, and requirements of Section 13.04.130.

1.7.6.6 Abandonment of Connection

Any connection unused for a period of 5 years or more is considered abandoned. Upon request of renewal of service, per Section 13.04.070, the owner will need to fill out an application for a new connection.

1.7.7 Design and Performance Standards Policy

All new connections are required to meet the minimum design and performance standards as required by Section 13.04.050. New standards may be adopted from time to time upon the recommendation of the engineer, and a copy of the standards is maintained on file at the Office of the Clerk-Treasurer. The current design performance standards are any line installed over 150 feet must be at least 8 inches in diameter and maintain a static water pressure of 30 psi and fire flow pressure of 20 psi. Looped mains may be 6 inches in diameter as long as the fire flow standards and peak-hour needs are achieved. The material requirements are included in the development standards. A main that meets the operational requirements and the material requirements is considered a standard main. The City of McCleary Development Standards, June 2007, provides the Standard Specifications and Standard Details required for new development.

1.7.8 Formation of Local Improvement Districts Outside Legal Boundaries

New facilities, extensions, and/or improvements may be financed by the applicant or by the formation of a Local Improvement District. In either case, water system extensions, improvements, or new facilities will be constructed in accordance with the City's extension policies, technical standards, and specifications.

1.7.9 Urban Growth Areas

The City of McCleary is not officially designated as an urban growth boundary area, because Grays Harbor County has not had sufficient population and growth rates to warrant compliance with the Growth Management Act.

1.7.10 Late-Comer Agreements

The City of McCleary currently has one late-comer agreement in effect. If a property owner requests a late-comer agreement, then the conditions of the agreement will be reviewed by the City Council prior to the proposed improvements.

1.7.11 Oversizing Policy

The developer is responsible for the cost of installing water mains that meet the City's minimum design criteria, performance standards, and DOH requirements. The City of McCleary may require the installation of an oversized main and pay the additional cost associated with purchasing the larger main.

1.7.12 Cross Connection Control Program

The City Council, under the direction of the City Engineer, may require the installation of backflow prevention devices on any premises receiving water under the provisions outlined in Section 13.04.200. The owner of the property shall pay the total cost of the installation, and the type of protective device shall conform to the provisions of WAC 248 54 500 and the policies outlined in the Cross Connection Control Policy adopted by the City Council. A copy of the Cross Connection Control program is included in Appendix L.

1.7.13 Extension Policy

Upon receipt of an application for a new service where there is no main adjacent to the street or right-of-way, a standard main must be installed prior to connection. The owner of the premises that the connection is benefiting shall pay all costs associated with the extension. The costs are determined by the City Council on the advice of the City Engineer based upon the prevailing costs for the necessary material, labor, and equipment, as well as the other

provisions outlined by Section 13.04.170. In accordance with the *Development Standards,* the main must extend across the property frontage to the furthest property line.

No substandard or temporary mains shall be installed or connected to the water system unless approved by the City Council as outlined in Section 13.04.160.

1.8 CONDITIONS OF SERVICE

The City may provide facilities for the distribution of water within the service area boundaries in accordance with land use plans and policies approved and adopted by the City Council. The following sections define the specific requirements that facilitate the implementation of the City's service area policies. This section also outlines the City's expectations to provide services, as well as the customer's responsibilities.

1.8.1 Specific Purveyor Responsibilities as a Service Provider

1.8.1.1 Ownership

The City has the responsibility to own, operate, control, and maintain all approved and accepted components of the City's water system in the public streets or utility right-of-way up to and including the service meter. The City is responsible for the portion of the water service beyond the public right-of-way contained within easements dedicated to the City. The City is not responsible for utilities contained within private (parcel owner to parcel owner) easements.

1.8.1.2 Providing Service

The City may provide water within its service area as long as system capacity is available. Water service is provided upon acceptance of an application and receipt of required deposits from the property owner. Properties not abutting a standard main can receive service as outlined below and in Section 13.04.150:

- A standard main is constructed according to City policies to provide service.
- All new service mains shall conform to the City's Development Standards.

This rule also applies to the extension of existing water mains to serve a property located within the service area boundary. The owner(s) of the premises benefiting from the extension is shall pay the extension costs (MMC, Section 13.04.170).

No alterations shall be made to any connection, nor shall any connection be made to the City's water system without approval as outlined in Section 13.04.060.

1.8.1.3 Meter Reading and Billing

It is the City's policy to have all water customers metered. Meters shall be read and bills sent monthly. Meter readings shall be made as nearly as possible on the same cycle date. Variations in reading periods of five days or less caused in part by holidays, Saturdays, Sundays, and differences in lengths of calendar months shall not be construed as a change. The City may estimate meter readings for billing purposes when its meter reader is unable to gain access to the premises on his regularly scheduled meter-reading trip, when the meter has been tampered with or is not functioning properly, or when circumstances beyond the control of the City make reading of meters impracticable or impossible.

1.9 CUSTOMER RESPONSIBILITIES

1.9.1 Access

The customer shall grant reasonable access to enable the City to inspect the water serving facilities on the premises of the customer to ensure that the services conform to the requirements of Chapter 13.04.

1.9.2 Connection between Meter and Point of Access

It is the customer's responsibility to maintain the connection between the meter and any point of access on the customer's property as stated in Section 13.04.060.

1.9.3 Connection Fees

Extension of the water system to serve additional customers, properties, tracts, or subdivisions will be paid for by the individuals that are benefiting from the extension. The applicant (hereinafter "Applicant" or "Developer") for water service extensions are responsible for financing the entire cost of the extension(s). Costs paid by the applicant include but are not limited to the following:

- New system components and component installation.
- The replacement of existing system components when necessary for making the extension or improvement and upgrades to meet City standard requirements, such as fire flow, which are associated with the applicant's project.

In addition, each parcel owner is required to pay a connection fee outlined in Appendix D as required by the City.

All persons connecting to the City's water system shall pay, in advance of connection to the water system, a hookup and water meter service charge in accordance with the schedule set forth by resolution of the City Council.

A service connection initiated by application of an owner desiring to increase the size or change the location of an existing connection shall be deemed an original connection and the cost of installation shall be borne by the owner of the premises served by such a connection. However, no additional connection fee will be charged.

1.9.4 Meter and Materials Requirements

All service connections to the City water system shall be metered. Water meters shall be sized to provide adequate domestic water service to the customer. Minimum water meter sizes shall be determined by the number of units being served and are summarized in Table 1-3 below:

Table 1-3. Minimum Meter Requirements

Number of Equivalent Residential Units	Size of Meter
1–2	3/4 inch
3–5	1 inch
6–10	1-1/4 inch
11–20	1-1/2 inch

All requests for water service to six or more units through a single meter shall be subject to approval by the City Council and shall be reviewed by the City Engineer. The City Engineer shall size all water service connections larger than 20 units.

1.9.5 Consent for Inspection, Maintenance, and Repair Service

Properly identified authorized employees of the water department shall have free access, at reasonable hours of the day, to all premises served by the City's water system for the purpose of inspecting these services to verify conformity with the Water System Plan as outlined in Section 13.04.090. Access includes but is not limited to the following maintenance duties:

- Read meters.
- Connect or disconnect a water service connection.
- Inspect and repair a portion of the City's water system.
- Remove or install meters or other equipment, including customer-owned cross connection control devices.

1.9.6 Connection Responsibility

No premises shall hereafter be connected to the City's water system unless there is a standard main owned by the City in a public right-of-way adjacent to the actual connection or within a dedicated easement conveyed to the City. All connections to the City's water system shall conform to the Standard Specifications and the McCleary Municipal Code.

1.9.7 Design Standard Requirements

All new construction or additions to the City's water system will meet the design requirements adopted by the City Council, under recommendation of the City Engineer, in Section 13.04.050.

2. BASIC PLANNING DATA

The objective of this chapter is to summarize the existing planning data available to the City of McCleary and the City's plans for future development of the service area. This water use data establishes the design criteria for the system. The criteria and the forecast of projected water usage provide the basis for required infrastructure improvements. The chapter was prepared in accordance with WAC 246-293-100 and 246-290-100.

2.1 CURRENT POPULATION AND NUMBER OF CONNECTIONS

In 2000, the Grays Harbor Regional Planning Department (GHRP) performed the most recent population survey for the City of McCleary. From the survey, the McCleary population in 2005 was estimated to be 1,475 people and 592 households. This results in approximately 2.49 people per housing unit. The City of McCleary records indicate that the number of estimated residential water connections served in 2005 was 508. Growth within the city limits has historically been very slow. Table 2-1 presents the historical number of estimated service connections by customer class. These numbers reflect an estimated number of accounts for water service based on City records. The number of multifamily units is estimated because the City does not currently monitor multifamily units separate from residential units.

Table 2-1. Total Service Connections by Customer Classes

Type of Service Connection	Number of Connections		
	2005	2006	2007
Residential	508	547	587
Multifamily[a]	84	84	84
Commercial	63	63	63
Industrial	1	1	1
Total Number of Connections:	**656**	**695**	**735**

[a] Estimated value based on 2005 data.

2.2 HISTORICAL WATER USAGE

Water usage is measured and recorded daily at the source meter, and customer (consumption) meters are read on a monthly basis. Table 2-2 presents water consumption by customer category and the approximate average daily demand per ERU based upon the water consumed for years 2004 to 2006.

Table 2-2. Water Consumption

	2004	2005	2006
Industrial Consumption (1,000 gallons)	2,607	3,034	3,073
Commercial Consumption (1,000 gallons)	5,785	28,671	32,017
Number of Residential Connections	502	508	547
Multifamily ERUs	50	50	50
Total Residential Consumption (1,000 gallons)	53,809	50,131	50,817
Average Daily Demand per ERU (gal/ERU)	267	246	233

The data in Table 2-2 shows that the City has had relatively low variation in residential and industrial water consumption. The total annual volume has varied less than 10 percent during the 2-year period. The commercial water consumption shows a dramatic increase in 2005 due to the City's re-evaluation and verification of correct account categories. A more detailed summary by month is included in Appendix E. A comparison of source volume verses consumption is included in Chapter 4 – Water Conservation.

2.3 EQUIVALENT RESIDENTIAL UNIT

In order to determine system capacity, the number of existing equivalent residential units for the McCleary Water System must first be determined. Table 2-3 shows the total gallons consumed by the residential connections. In 2005, for example, 592 residential connections consumed 50,131,080 gallons of water. This number (592) of residential connections includes 84 multifamily units. Based on similar systems, the multifamily units were assumed to equal 0.6 ERU. As shown in Table 2-3, this equates to 50 ERUs. The average daily demand per ERU has been 267 to 233 gallons per day (gpd) for the three–year period of 2004, 2005, and 2006. For the purpose of the McCleary Water System Plan, one Equivalent Residential Connection (ERU) is assumed to be equal to 279 gpd. The corrected ERU is based upon the historical consumption plus an assumed average system loss of 11.7 percent.

Table 2-3. Annual Maximum Daily Flow

Years	Maximum Day Demand (gallons)	Average Day Demand (gallons)	Peaking Factor
2004	900,368	234,546	3.84
2005	937,468	246,067	3.81
2006	997,533	278,186	3.58

The maximum day demand per ERU can also be estimated from historical water use. Table 2-4 provides a summary of the average daily supply verses maximum daily supply from 2004 to 2006. Both flow measurements are based on source meter readings. The ratio of the two provides an estimate of the peaking factor for the system. Table 2-4 shows that the average ratio of maximum day demand to average day demand is 3.74. Based on this analysis, the maximum day demand is estimated to be approximately 1,021 gal/ERU, which equates to 279 gal/ERU times 3.74.

Table 2-4. Estimated Historical ERUs – Commercial and Industrial

	2004	2005	2006
Commercial Usage (gallons/year x 1,000)	5,785	28,671	32,017
Commercial ERUs	57	281[a]	314[a]
Industrial Usage (gallons/year x 1,000)	2,607	3,034	3,073
Industrial ERUs	26	30	30

[a] Beginning in 2005, all water accounts were reevaluated and reassigned into their proper category.

As previously stated above, the City adjusted the commercial ERUs for 2005 and 2006 based upon reassignment account categories.

Table 2-4 converts the flow from the commercial and industrial accounts into ERUs based on an average day demand per ERU of 279 gallons. Table 2-4 shows that the total number of commercial and industrial ERUs for 2005 was 281 and 30, respectively. The total number of ERUs for the system in 2005 can be determined by adding the 508 residential connections and 50 multifamily ERUs (see Table 2-2), plus 281 commercial ERUs and 30 industrial ERUs (see Table 2-4), for a total of 869 ERUs.

2.4 FUTURE PLANNING DATA

2.4.1 Projected Land Use

Figure 2-1 shows the current zoning map for the City of McCleary. As shown within the city limits, the land is primarily zoned industrial (50 percent), and residential (40 percent), with a smaller area designated forestry (10 percent). The industrial property is primarily undeveloped. The major property owner is the Simpson Timber Company. The majority of the residential area within the city limits is developed. It is not anticipated that the forestry area will develop within the current planning horizon.

The proposed expansion of the service area south of Highway 8 is based on logical extension and looping of the water system.

To provide more economic stability, the City of McCleary is planning to promote development of the industrial district. Currently, only one industrial connection receives domestic water service. The area zoned industrial is mostly undeveloped with the exception of the Simpson Door mill located in the area. The Simpson site has an isolated fire flow system; however, the City of McCleary is planning to provide fire flow to the industrial district in the future.

2.4.2 Projected Population and Number of Connections

The population forecast was based upon information provided by the Washington Office of Financial Management and information furnished by the City regarding the number of existing customers. Based on the Grays Harbor Utilities Comprehensive Plan, 1991, Table 2-5 presents population changes in 5-year increments. This is consistent with the historical growth rate within the city limits, which has been approximately one percent.

Table 2-5. Percent Change in Population

Period	Percent Change in Population
1995 to 2000	5.39
2001 to 2005	5.41
2006 to 2010	5.41

The 2007 population within the McCleary city limits, according the Washington Office of Financial Management, was 1,550 people. Assuming the percentage change for the period 2011 to 2020 is approximately the same as the previous 15-year forecast. The future population forecast is presented in Table 2-6.

Table 2-6. Forecasted Population

Year	Forecasted Population
2007	1,550
2013	1,685
2018	1,806
2023	1,936
2028	2,036

Table 2-7 presents the projected number of ERUs for the system based on the same growth rates as shown above.

Table 2-7. Projected Number of ERUs

Year	ERUs
2005	869
2007	964
2013	1,018
2018	1,066
2028	1,174

2.4.3 Projected Water Demand

Based on the projected number of ERUs and the average daily consumption, Table 2-8 presents the future water usage for the City of McCleary.

Table 2-8. Projected Water Usage

	2007	2013	2018	2028
Number of ERUs	964	1,018	1,066	1,174
Average Day Demand (gallons)[a]	268,956	284,022	297,414	327,546
Maximum Day Demand (gallons)[b]	984,244	1,039,378	1,088,386	1,198,654
Annual Consumption (gallons x 1,000)	98,169	103,668	108,556	119,554
Annual Unaccounted for Water (10%) (gallons x 1,000)	9,817	10,367	10,856	11,955
Total Annual Consumption (gallons x 1,000)	107,986	114,035	119,412	131,509
Total Annual Consumption including Conservation (gallons x 1,000) (2% in 5 years)	105,868	111,799	117,070	128,930

[a] ERUs x average day demand (279 gallons/ERU)

[b] ERUs x MDD (1,021 gallons/ERU)

2.4.4 Fire Flow Requirements

The City of McCleary currently does not have adopted fire flow standards. Additionally, Grays Harbor County is in the process of developing minimum fire flow standards. The City of McCleary has limited fire flow capabilities within small portions of the system; therefore, modest goals have been set as part of this plan in accordance with previous documents prepared by the City. It is anticipated that when Grays Harbor County adopts fire flow standards, the City of McCleary will then evaluate adopting the same standards. Commercial and industrial buildings need to be evaluated on a case-by-case basis.

The proposed minimum fire flow requirements in accordance with the Grays Harbor Fire Marshal and Draft No. 6 of the Ordinance are as follows:

- Residential: 500 gpm for 30 minutes.
- Commercial: 750 gpm for 60 minutes.
- Multifamily: 750 gpm for 60 minutes
- Industrial: 1,000 gpm for 60 minutes.

The minimum fire flow requirement utilized for the analysis was 1,000 gpm for 2 hours.

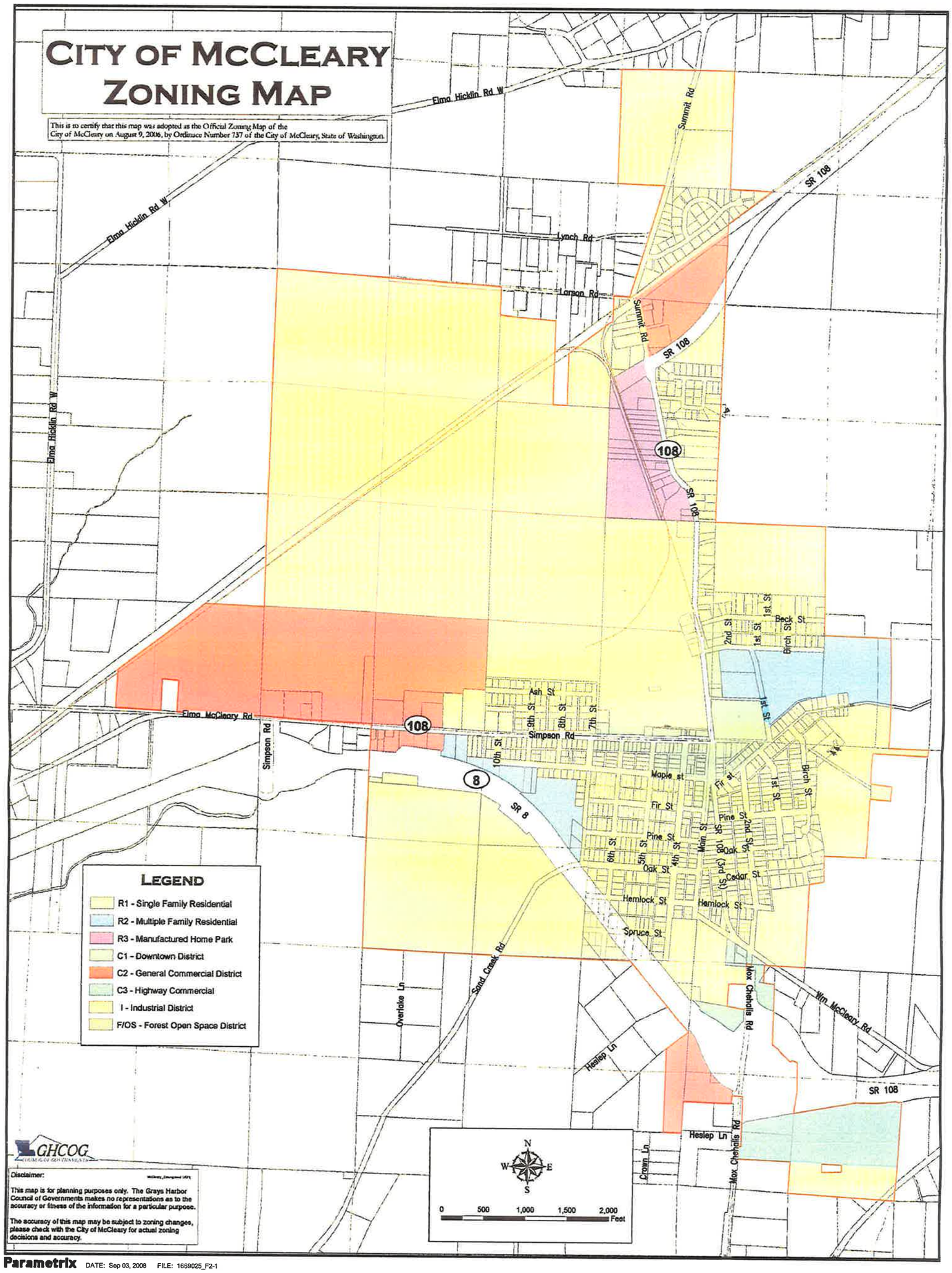

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Figure 2-1
City of McCleary
Zoning Map

3. SYSTEM ANALYSIS

3.1 INTRODUCTION

The objective of this chapter is to determine if the existing system facilities are capable of water supply sufficient in quality and quantity to meet existing and projected demands as determined in Chapter 2 in accordance with WAC 246-290.

The topics covered in this chapter include:

- System design standards.
- Water quality analysis.
- System description and analysis.
- Summary of system deficiencies.
- Selection and justification of proposed improvements.

3.2 WATER SYSTEM DESIGN STANDARDS

The standards for this evaluation, as well as future planning, were based on the applicable guidelines and regulations from the following sources:

- City of McCleary Municipal Code.
- City of McCleary Development Standards, Latest Version.
- Drinking Water Regulations, Washington State Department of Health (DOH).
- Chapter 246-290 WAC, latest edition.
- Standards of the American Water Works Association (AWWA).

All new construction on the water system will comply with the requirements of the documents listed above. Chapter 8 presents the system design standard specifications and construction details.

3.3 SOURCE REQUIREMENTS

The following sections present the source description, treatment, and maximum instantaneous demand of water supply.

3.3.1 Source Description

The city of McCleary has three sources of supply, Well No. 1, Well No. 2, and Well No. 3, which are all located north of the city within the same vicinity. The wells are located in the east half of the northwest quarter of Section 11, Township 18 North, Range West.

Well No. 1 was constructed in 1951 with an 8-inch casing to a depth of 74 feet. The well pump is currently not operational and has been physically disconnected from the system. The well is located within a masonry structure. When the well was operational, the well occasionally pumped sand into the system, which is the primary reason the well was taken off-line.

Well No. 2 was constructed in 1952 with a 12-inch casing to a depth of 82 feet. The well is contained within a locked masonry structure. The well currently pumps 410 gpm. In accordance with Water Right, this well must be throttled back to limit the pumping rate to 400 gpm. The well operates by telemetry from water level signals generated by the reservoirs. The well has high concentrations of iron and manganese and is currently using sequestering to treat the water.

Well No. 3 was constructed in 1962 with a 16-inch casing to a depth of 93 feet. The well is contained within a locked wooden structure. Well No. 3 has a pumping rate of 440 gpm and alternates water supply with Well No. 2.

Currently, the wells do not have standby power available. The City of McCleary has a generator that was salvaged from the wastewater treatment plant (WWTP) during its recent upgrade. City personnel are currently assessing the viability of either installing this generator at the well site or attaching the generator to a trailer and using it for both the water and sanitary sewer system during periods of prolonged outages.

3.3.2 Treatment

Both Well No. 2 and Well No. 3 have a hypochlorite disinfection system. Both wells also have sequestering systems for the treatment of iron and manganese. The disinfection systems for the wells are self-contained at each well. The sequestering system for Well No. 2 seems to be working adequately. Generally, complaints received related to the iron and manganese levels occur during periods of high demand when Well No. 3 is on line.

The City, in conjunction with the manufacturer of the sequestering reagent, has established the following dosing rates for each well:

- Well No. 2 = 2.2 gallons of Aqua Mag per million gallons of raw water produced.
- Well No. 3 = 3.1 gallons of Aqua Mag per million gallons of raw water produced.

The complete calculations for the sequestering reagent are included in Appendix F.

The City has initiated a flushing program in response to citizen complaints about the presence of black sediment and occasional odor. The design of the flushing program removes the iron and manganese sediment that precipitates in the system after treatment at the well field.

Ultimately, the City would prefer to replace the existing sequestering system with a treatment or filtration system. Currently, iron and manganese are considered secondary contaminates. Therefore, any treatment system would not be eligible for grant monies. Chapters 8 and 9 present further explanation of the treatment system.

3.3.3 Water Quality

This section summarizes the results of historical water-quality testing for the City of McCleary and recommendations necessary for compliance with DOH requirements. Chapter 6, Operation and Maintenance (O&M) Program, presents, in more detail, specific operational procedures and the basis for the water quality requirements. . Table 3-1 summarizes the current monitoring requirements established by WAC 246-290 that apply to the City of McCleary.

Table 3-1. Current Monitoring Requirements

Contaminant	Sampling Frequency
Bacteriological	Monthly.
Inorganic	Every 3 years.
Nitrate	Annually.
VOC	Every 3 years.
SOC	Every 3 years.
Stage 1 DDBPR	Every 3 years.
Arsenic	Every 3 years.
Radionuclides	2 samples every 3 years.
Lead and Copper	Following initial round, wait until directed by DOH.
Asbestos	Sampling in 2009 per DOH.

3.3.3.1 Coliform

Historical Coliform Results

The City of McCleary has routinely monitored for coliform at a minimum of two locations within the distribution system every month for 20 years and has had no confirmed failed coliform samples. On occasion, there have been failed samples caused by unclean sampling procedures, which when carefully re-tested, the samples have passed the coliform test.

Prior to 1991, water systems only tested for fecal coliform. In 1992, a new coliform rule required that all water systems test for total coliform. The City of McCleary has met the requirements set by the total coliform rule from April 1992 to present.

Coliform Monitoring Recommendations

The number of coliform samples required is determined by the total population served. The number of samples required for the McCleary population, 1,600 people, is two per month. The City of McCleary will continue monitoring in accordance with WAC 246-290-300.

3.3.3.2 Volatile Organic Compound (VOC) Monitoring

Historical VOC Monitoring Results

The City of McCleary has complied with the requirements for VOC monitoring. The City collected samples from Wells No. 2 and No. 3 in 2004 and 2006. There have been no contaminates recorded above the maximum contaminant level (MCL) limits. Appendix G includes a copy of the historical data for 2004 and 2007 for each source

VOC Monitoring Recommendations

There are no monitoring deficiencies or exceedances for Wells No. 2 and No. 3. The City of McCleary has made application for and granted that both wells are considered one well field. This determination allows one sample to be taken as a composite for both wells, which cuts the cost for VOC monitoring in half. If, however, an exceedance is detected, both wells would need to be resampled. Appendix G includes the VOC test results.

3.3.3.3 Physical/Inorganic Compound Monitoring

Inorganic Monitoring Results

The City of McCleary sampled for inorganics from all wells in 2004 through 2007 as determined by the City of McCleary records (Appendix G). The historical results indicate that both Well No. 2 and Well No. 3 have exceeded the MCL for manganese. The manganese levels are generally constant; therefore, there are no increasing trends.

During the 2004 through 2007 testing periods, Well No. 2 and Well No. 3 did not exceed iron levels.

The City of McCleary sampled for nitrates from Wells No. 2 and No. 3 in 2004; neither well exceeded nitrate MCL. Appendix G includes inorganic and nitrate sampling from 2004–2007.

3.3.3.4 Synthetic Organic Compound (SOC) Monitoring

Synthetic organic compound (SOC) is the general term for man-made compounds, pesticides, and various specialty chemicals. Many SOCs are regulated in drinking water because of the negative impacts on human health, particularly regarding cancer. The Department of Health adopted these SOC regulations. Due to the significant cost associated with monitoring SOCs, a program was developed to see how much of a risk SOCs were to Washington State residences. Initially, DOH sampled many wells in the area to determine an overall risk of contaminants and to develop a rating system that was used to determine purveyor waiver eligibility.

SOC Monitoring Results

The City of McCleary was selected to participate in the DOH study and their wells were sampled in 1994. Both Wells No. 2 and No. 3 did not have any SOCs detected. The test results for 2004 and 2006 continue to show zero detection. The tests are available in Appendix G.

SOC Monitoring Recommendations

Because the City of McCleary tested for SOCs during the 2000–2007 compliance period and no SOCs were detected, the City will consider its eligibility for a waiver during the next compliance period.

3.3.3.5 Disinfectants and Disinfection Byproducts

While effective in controlling many microorganisms, disinfecting chemicals commonly react with natural and organic matter in water to form disinfection byproducts. Disinfection byproducts are known to be carcinogenic in lab animals. Recent studies have also suggested a weak association between certain cancers and reproductive/development effects with exposure to chlorinated water.

Stage 1 of the Disinfectants and Disinfection Byproducts Rule (DDBPR) updates and supersedes the 1979 total trihalomethanes regulations. The purpose of the DDBPR is to reduce exposure to three disinfectants and many disinfection byproducts. The parameters to be monitored by each water system are specific to the disinfectant chemicals utilized. Table 3-2 shows the Maximum Residual Disinfectant Levels (MRDLs) for disinfectants and MCLs for disinfection byproducts (sodium hypochlorite disinfection) applicable to McCleary. Stage 2 of the DDBPR is still in draft form.

Table 3-2. Disinfection Residual and Byproduct Standards

Disinfectant Residual	MRDL (mg/L)
Chlorine	4.0 (as Cl_2)
Disinfection Byproduct	MCL (mg/L)
Total Trihalomethanes (TTHMs)	0.080
Haloacetic Acids (HAA5)	0.060

mg/L = milligrams per Liter

Compliance with the Stage 1 DDBPR requirements for disinfectant residuals is based upon a running annual average (computed quarterly) of monthly averages of all samples collected (including those collected in conjunction with coliform sampling). Disinfectant residual samples are collected at the same locations as bacteriological samples are collected. The system is in violation if the average of any four consecutive quarters exceeds the MRDL listed in Table 3-2 above. If found to be in violation of the MRDL, the system is required to notify the public (per 40 CFR 141.201 through 207 and WAC 246-290 Part 7, Subpart A), report the exceedance to DOH (per WAC 246-290-480), and complete follow-up action as outlined in WAC 246-290-320.

Disinfection byproduct compliance is based upon the running annual average of sampling results. Disinfection byproduct samples are collected at locations within the distribution system that represent the maximum residence time for each treated source during the month of warmest water temperature per 40 CFR 141.132(b)(1)(i). For McCleary, one sample per year is required, because it is a system (a) using only groundwater not under direct influence of surface water, (b) using chemical disinfectant, and (c) serving fewer than 10,000 people. A reduced monitoring frequency may be permitted if the conditions shown in Table 3-3 apply.

Table 3-3. Reduced Monitoring Requirements

Number of Years of Sampling	TTHM Annual Average	HAA5 Annual Average	Reduced Sampling Schedule
Two consecutive years of sampling indicate:	Less than or equal to 0.040 mg/L	Less than or equal to 0.030 mg/L	One sample per treatment plant per 3-year monitoring cycle.
One year of sampling indicates:	Less than or equal to 0.020 mg/L	Less than or equal to 0.015 mg/L	One sample per treatment plant per 3-year monitoring cycle.

The system is in violation if the annual average exceeds the MCLs in Table 6-9. Systems in violation must comply with the notification and follow-up actions listed above.

Water Management Laboratories were unable to detect either TTHM or HAA5 during McCleary's last test for TTHM and HAA5 in October 2007. McCleary tests every 3 years at the discretion of DOH. Results have been included in Appendix G of this report.

3.3.3.6 Arsenic National Primary Drinking Water Regulation

Arsenic is a naturally occurring element that comes from natural rock formations, especially those of volcanic origin. Ingestion of arsenic has been linked to the development of certain types of cancers, cardiovascular problems, and diabetes. Effective January 23, 2006, the MCL for arsenic was reduced from 0.05 mg/L to 0.010 mg/L, as shown in Table 6-9. The EPA is currently considering revising the rule to 0.030 mg/L, but no timeline or decision has been made as of the date of this document; therefore, it is assumed that the most stringent criteria of 0.01 mg/L will apply.

Sampling results from McCleary's Well No. 2 and Well No. 3 demonstrate arsenic concentrations below the detection limits. McCleary will continue to perform periodic testing in accordance with DOH regulations.

McCleary will be required to perform arsenic treatment if any of the following is true:

- A single sample >0.04 mg/L.
- An average of two quarters >0.020 mg/L.
- The running annual average (four consecutive quarters) >0.010 mg/L.

3.3.3.7 Lead and Copper Rule

Lead and Copper Results

As required by DOH in 2006, the City of McCleary has tested for lead and copper in the distribution system. The next scheduled testing period is between 2007 and 2009. Current test results are available in Appendix G.

Lead and Copper Monitoring Recommendations

The City of McCleary is scheduled to test for lead and copper by the end of 2009.

3.3.3.8 Radionuclide Testing

Radionuclides are known carcinogens. EPA has set a radionuclide maximum contamination level goal of zero. WAC 246-290 currently requires monitoring for radium-226, radium-228, and gross alpha particle activity. However, DOH may omit the analysis for radium-228 and radium-226 if the gross alpha particle activity is less than 5 picoCuries per liter (pCi/L). Once the initial test is on file, the City of McCleary will not be required to test wells again until directed by DOH.

Radionuclide Results

The City of McCleary tested for the radionuclide rule in 2005 and 2006. Test results have been included in Appendix G.

3.3.3.9 Asbestos Sampling

Asbestos tests are required for cities with more than 10 percent of their distribution system supplied by asbestos cement pipes. The City of McCleary has more than 10 percent asbestos pipe. Asbestos testing is scheduled for 2009.

3.3.3.10 Historical Monitoring Results

There are no asbestos monitoring results on file.

3.3.3.11 Asbestos Monitoring Recommendation

The City of McCleary is required to sample one location in their distribution system where there is a high percentage of asbestos cement pipe. Once test results are on file, the DOH will notify the City when to test for asbestos within the distribution system.

3.3.3.12 Summary of Water Quality Requirements

Detailed test requirements and procedures are located in the O&M chapter of this Water System Plan.

3.4 SOURCE EVALUATION

The City of McCleary water system is currently operating two source wells, Well No. 2 and Well No. 3, with a current pumping capacity of 400 gpm and 440 gpm, respectively. The existing sources are equipped to produce a maximum of 1,224,000 gpd assuming Well No. 2 is pumped without throttling in accordance with water right. Based on a maximum day demand of 936 gallons per ERU, the system is capable of meeting the maximum day demand for 1,307 ERUs. The redevelopment of Well No. 1 (200 gpm) would increase the source capacity to 1,615 ERUs. Well No. 1 is currently not in service and should be formally abandoned. A relocation of Well No. 1 would be necessary to provide the additional source capacity.

3.5 STORAGE REQUIREMENTS

Two storage reservoirs serve the City of McCleary water system. The Reservoirs No. 1 and No. 2 are approximately 500,000 and 150,000 gallons in total volume, respectively. The useable storage is based on the elevation that provides 30 psi to the highest service on the system. The highest potential service elevation is approximately 377 feet. In order to maintain a static pressure of 30 psi, the useable storage is approximately equal to the volume above elevation 446 feet. The smaller tank has a base elevation of approximately 445 feet; therefore, the storage from the base to the overflow of 472 feet is considered almost entirely useable. The bottom elevation of the larger tank is approximately 438 feet; therefore, the lower 8 feet is considered useable only during fire suppression. The volume of useable storage for Reservoirs No. 1 and No. 2 is 344,064 gallons and 123,856 gallons, respectively.

Required storage is calculated based upon five elements of storage that consist of operational storage (OS), equalizing storage (ES), standby (SB), fire suppression storage (FSS), and Dead Storage (DS). The following sections describe the methodology of calculating each element. The Sizing Guidelines for Public Water Systems, 1983, outlines the criteria for calculating the storage requirements.

3.5.1 Operational Storage

The operation storage volume is the volume of the reservoir used to supply the water system under normal operating conditions.

Currently, the well pumps receive a pump on signal when the reservoirs reach a water level of 27 feet (elevation 464.5) from the bottom of the 500,000-gallon reservoir. The pump off signal is conveyed at water level 34 feet (elevation 471.5); therefore, the operational storage for the reservoirs is 139,800 gallons.

3.5.2 Standby Storage

The baseline storage amount required is 1,021 gallons per ERU. The baseline amount may be reduced depending on how many source pumps are in the system, but in no case shall the amount be reduced less than 200 gallons per ERU. The analysis below is provided for the existing system at 964 ERUs:

(1,021 gallons/per ERU) x (964 ERUs) = 984,244 gallons

The City of McCleary water system has multiple source pumps (two); therefore, Standby Storage (SB) is determined using DOH's Equation 9-3:

SB = (2 days)(279)(964) – 1,440(840 – 440)

SB = 537,912 – 576,000 = -38,088

In accordance with Section 9.0.4 of the DOH *Water System Design Manual*, the standby storage should be no less than 200 gallons/ERU:

(200 gallons/ERU) x (964 ERUs) = 192,800 gallons

Therefore, total standby storage is 192,800 gallons.

3.5.3 Equalization Storage

Equalization storage (ES) is required whenever the ability of the sources cannot meet periodic demands placed on the water system. Equalization storage is calculated by the following formula:

ES = (PHD – Qs) x 150

where: PHD is the maximum instantaneous demand and Qs is pumping capability of the system. Equalization storage cannot be less than zero.

PHD = 1,271 gpm

Qs = 400 gpm + 440 gpm = 840 gpm

Equalization storage is, therefore, the following:

ES = (1,271 – 840) x 150

ES = 64,650 gallons

3.5.4 Fire Flow Storage

The City of McCleary currently does not have any adopted fire flow standards. Grays Harbor County is also in the process of developing minimum standards that are currently in the draft form. Based on discussion with the Assistant Fire Chief, Table 3-4 summarizes the recommended minimum requirements anticipated

Table 3-4. Recommended Minimum Fire Flow Standards

Classification	Minimum Flow Requirements (gpm)	Duration
Residential	500	30 min
Multifamily	750	1 hr
Commercial	750	1 hr
Industrial	1,000	1 hr

A fire flow of 1,000 gpm was used for the modeling and storage analysis. The total number of gallons required to provide the necessary fire flow is 120,000 gallons.

3.5.5 Total Storage Required

Standby Storage:	192,800 gallons
Equalizing Storage:	64,650 gallons
Fire Flow Storage:	120,000 gallons
	377,450 gallons

The required storage for 964 ERUs is therefore 377,450 gallons. Based on the existing available storage of 467,920 gallons, there is currently enough existing storage for the City of McCleary water system.

The projected number of ERUs in the year 2028 is 1,174 ERUs. Table 3-5 (Page 3-10) and Figure 3-1 (Page 3-11) summarize existing system capacity without redevelopment of Well No. 1 while Table 3-6 (Page 3-12) and Figure 3-2 (Page 3-13) summarize the system capacity with the redevelopment of Well No. 1. The maximum number of ERUs was determined from an iterative procedure following the same calculations as noted above.

The existing system is capable of accommodating 1,174 ERUs, the projected growth through the 2028 planning horizon. With the redevelopment of Well No. 1, the system should be adequate to provide sufficient capacity for more ERUs should the growth rate be higher than projected. In both cases, the number of ERUs is limited by the storage available. The increased multiple-well credit provides the additional capacity; however, the system could also provide for more ERUs with additional storage.

3.5.6 Operational Deficiencies

The City alternates Well No. 2 and Well No. 3. The capital improvement plan includes installation of telemetry to Wells No. 2 and No. 3. Redevelopment of Well No. 1 is necessary to meet the needs of the system in the future.

3.5.7 Capacity Analysis

The redevelopment of Well No. 1 is one method to provide for future capacity and maintain water rights. An alternative would be to install a new reservoir. Table 3-7 (page 3-14) is provided to show that an additional 300,000-gallon reservoir would provide capacity for the projected 2020 ERUs and increase fire flow storage to 240,000 gallons. Currently, the City is considering installation of a 150,000- to 200,000-gallon reservoir at the existing reservoir site and then as development continues and the growth patterns are more firmly established, the City will select another site for the remaining water storage. If development progresses on the south side of SR 8 it may be advisable to install the remaining storage at that location to balance the system and greatly improve the hydraulics of the system.

The Municipal Water Law has recently been contested as unconstitutional. If it is ever overturned, the City of McCleary may lose the insulation of its water rights currently provided under this law. Therefore, it is recommended that the City either redevelop Well No. 1 or change the water rights for Well No. 1 to a new point of withdrawal, so that the City can show beneficial use of their existing water rights.

Table 3-5. City of McCleary Storage Requirements – Existing System Without Well No. 1

Year	Projected Demands				Source Capacity (gpm)	Storage Capacity					
	Projected ERUs	ADD (273 gpd/ERU)	MDD (1,021 gpd/ERU)	PHD		Equalizing (gal)	Standby (gal)	Fire Suppression	Total Required	Available (gal)	Excess (gal)
2005	869	242,451	887,249	1,163	840	48,505	173,800	120,000	342,305	467,920	125,615
2006	886	247,300	904,994	1,183	840	51,462	177,276	120,000	348,738	467,920	119,182
2007	964	268,956	984,244	1,271	840	64,670	192,800	120,000	377,470	467,920	90,450
2008	973	271,378	993,106	1,281	840	66,147	194,536	120,000	380,683	467,920	87,237
2009	981	273,833	1,002,093	1,291	840	67,645	196,296	120,000	383,941	467,920	83,979
2010	990	276,323	1,011,205	1,301	840	69,164	198,081	120,000	387,245	467,920	80,675
2011	999	278,848	1,020,445	1,311	840	70,704	199,891	120,000	390,595	467,920	77,325
2012	1009	281,408	1,029,814	1,322	840	72,265	201,726	120,000	393,992	467,920	73,928
2013	1018	284,004	1,039,314	1,332	840	73,849	203,587	120,000	397,436	467,920	70,484
2014	1027	286,637	1,048,947	1,343	840	75,454	205,474	120,000	400,929	467,920	66,991
2015	1037	289,306	1,058,715	1,354	840	77,082	207,388	120,000	404,470	467,920	63,450
2016	1047	292,013	1,068,620	1,365	840	78,733	209,328	120,000	408,061	467,920	59,859
2017	1056	294,757	1,078,664	1,376	840	80,407	211,296	120,000	411,702	467,920	56,218
2018	1066	297,540	1,088,848	1,387	840	82,104	213,290	120,000	415,395	467,920	52,525
2019	1077	300,362	1,099,175	1,399	840	83,825	215,313	120,000	419,139	467,920	48,781
2020	1087	303,224	1,109,646	1,410	840	85,571	217,365	120,000	422,935	467,920	44,985
2021	1097	306,125	1,120,264	1,422	840	87,340	219,444	120,000	426,785	467,920	41,135
2022	1108	309,067	1,131,030	1,434	840	89,135	221,553	120,000	430,688	467,920	37,232
2023	1118	312,050	1,141,948	1,446	840	90,954	223,692	120,000	434,646	467,920	33,274
2024	1129	315,075	1,153,018	1,459	840	92,799	225,860	120,000	438,660	467,920	29,260
2025	1140	318,143	1,164,243	1,471	840	94,670	228,059	120,000	442,729	467,920	25,191
2026	1151	321,253	1,175,625	1,484	840	96,567	230,289	120,000	446,856	467,920	21,064
2027	1163	324,407	1,187,167	1,497	840	98,491	232,550	120,000	451,041	467,920	16,879
2028	1174	327,605	1,198,870	1,510	840	100,441	234,842	120,000	455,284	467,920	12,636

NOTES: Standby = 2 x ADD – 1,440 (Qs-Ql)

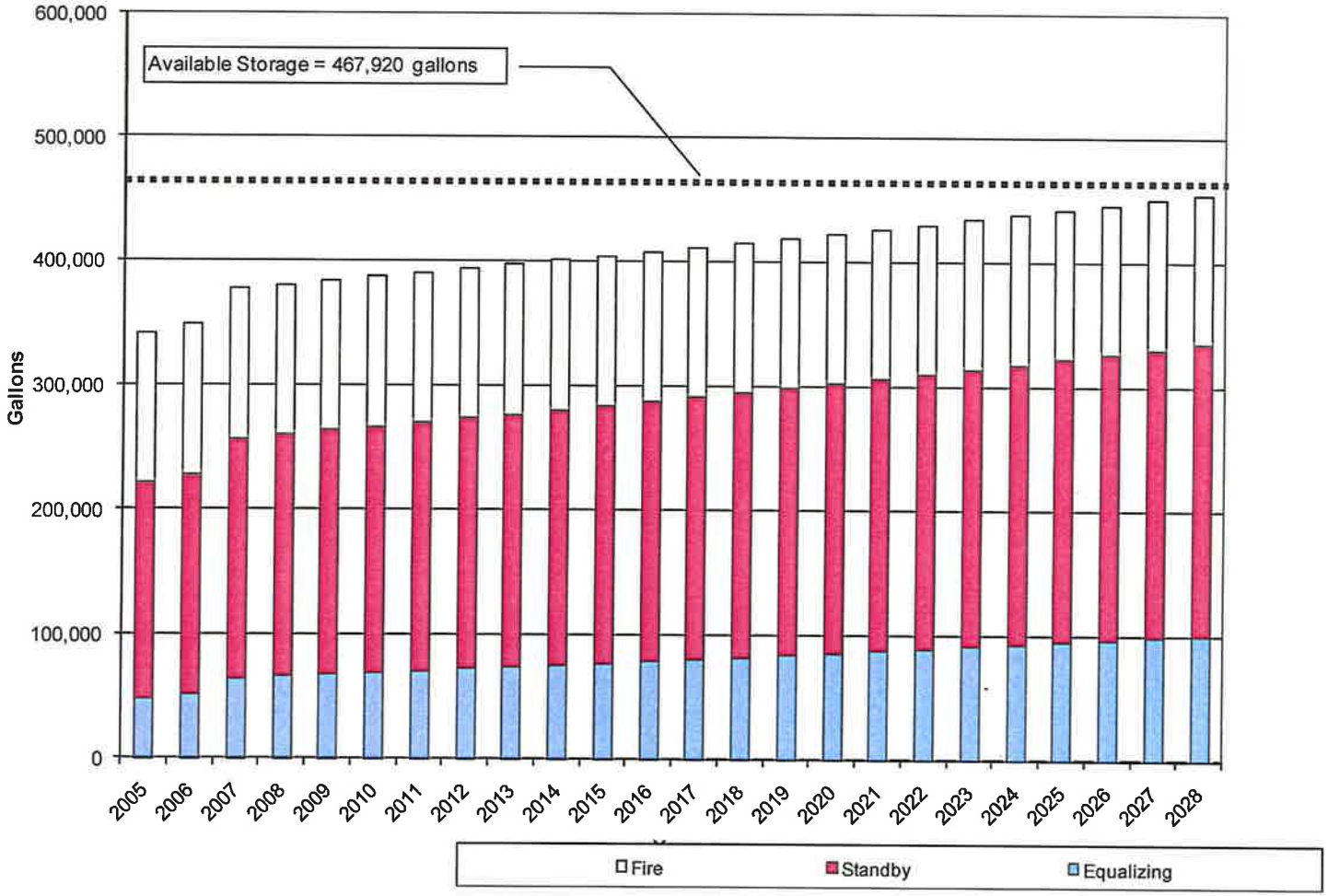


Figure 3-1. McCleary Water Storage (Without Well No. 1)

Table 3-6. City of McCleary Storage Requirements – Existing System With Redeveloped Well No. 1

Year	Projected Demands				Source Capacity (gpm)	Storage Capacity					
	Projected ERUs	ADD (279 gpd/ERU)	MDD (1,021 gpd/ERU)	PHD		Equalizing (gal)	Standby (gal)	Fire Suppression	Total Required	Available (gal)	Excess (gal)
2005	869	242,451	887,249	1,163	1,040	18,505	173,800	120,000	312,305	467,920	155,615
2006	886	247,300	904,994	1,183	1,040	21,462	177,276	120,000	318,738	467,920	149,182
2007	964	268,956	984,244	1,271	1,040	34,670	192,800	120,000	347,470	467,920	120,450
2008	973	271,378	993,106	1,281	1,040	36,147	194,536	120,000	350,683	467,920	117,237
2009	981	273,833	1,002,093	1,291	1,040	37,645	196,296	120,000	353,941	467,920	113,979
2010	990	276,323	1,011,205	1,301	1,040	39,164	198,081	120,000	357,245	467,920	110,675
2011	999	278,848	1,020,445	1,311	1,040	40,704	199,891	120,000	360,595	467,920	107,325
2012	1,009	281,408	1,029,814	1,322	1,040	42,265	201,726	120,000	363,992	467,920	103,928
2013	1,018	284,004	1,039,314	1,332	1,040	43,849	203,587	120,000	367,436	467,920	100,484
2014	1,027	286,637	1,048,947	1,343	1,040	45,454	205,474	120,000	370,929	467,920	96,991
2015	1,037	289,306	1,058,715	1,354	1,040	47,082	207,388	120,000	374,470	467,920	93,450
2016	1,047	292,013	1,068,620	1,365	1,040	48,733	209,328	120,000	378,061	467,920	89,859
2017	1,056	294,757	1,078,664	1,376	1,040	50,407	211,296	120,000	381,702	467,920	86,218
2018	1,066	297,540	1,088,848	1,387	1,040	52,104	213,290	120,000	385,395	467,920	82,525
2019	1,077	300,362	1,099,175	1,399	1,040	53,825	215,313	120,000	389,139	467,920	78,781
2020	1,087	303,224	1,109,646	1,410	1,040	55,571	217,365	120,000	392,935	467,920	74,985
2021	1,097	306,125	1,120,264	1,422	1,040	57,340	219,444	120,000	396,785	467,920	71,135
2022	1,108	309,067	1,131,030	1,434	1,040	59,135	221,553	120,000	400,688	467,920	67,232
2023	1,118	312,050	1,141,948	1,446	1,040	60,954	223,692	120,000	404,646	467,920	63,274
2024	1,129	315,075	1,153,018	1,459	1,040	62,799	225,860	120,000	408,660	467,920	59,260
2025	1,140	318,143	1,164,243	1,471	1,040	64,670	228,059	120,000	412,729	467,920	55,191
2026	1,151	321,253	1,175,625	1,484	1,040	66,567	230,289	120,000	416,856	467,920	51,064
2027	1,163	324,407	1,187,167	1,497	1,040	68,491	232,550	120,000	421,041	467,920	46,879
2028	1,174	327,605	1,198,870	1,510	1,040	70,441	234,842	120,000	425,284	467,920	42,636

NOTES: Standby = 2 x ADD – 1,440 (Qs-Ql)

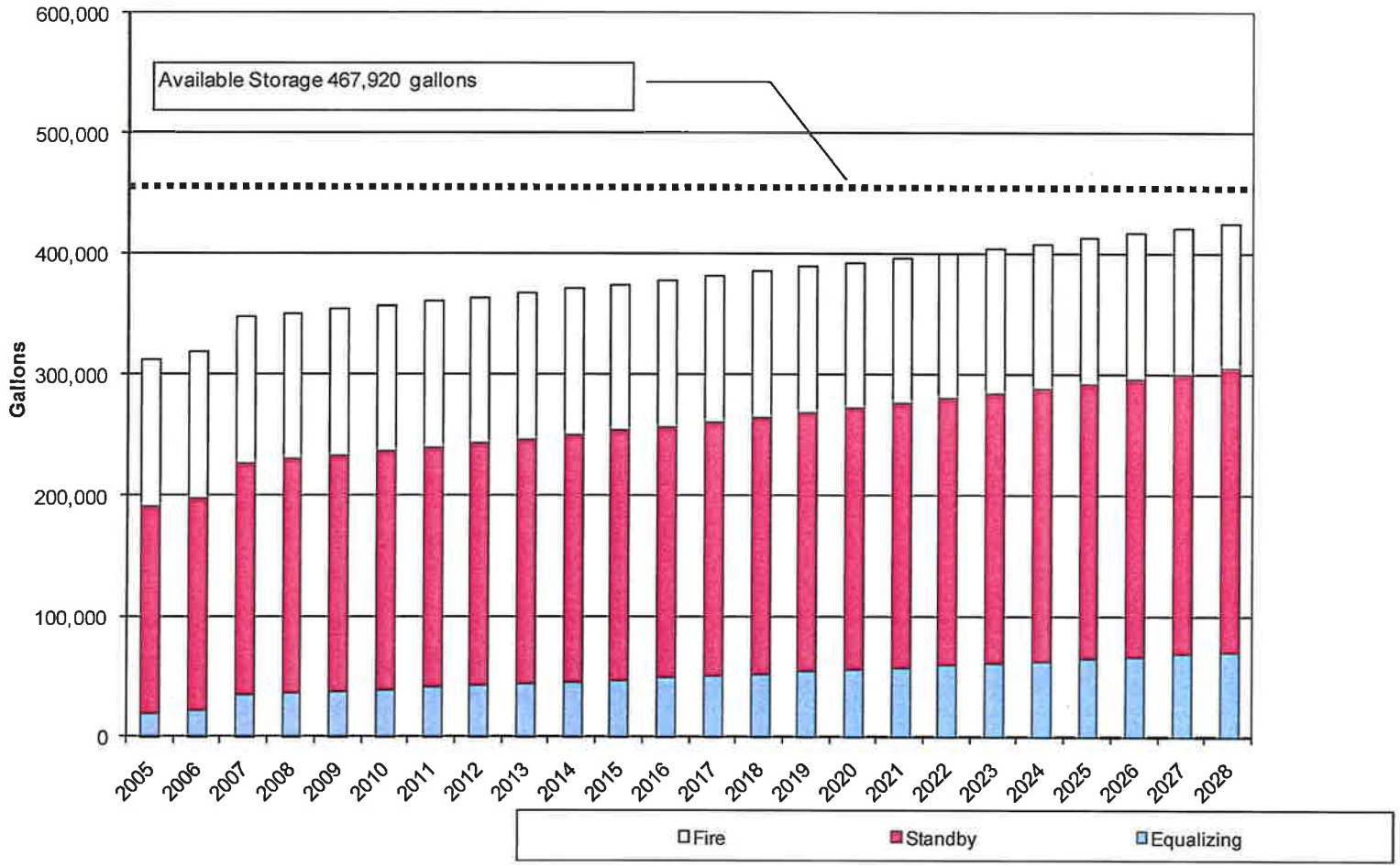


Figure 3-2. McCleary Water Storage (With Well No. 1)

Table 3-7. Existing Capacity with Only Well No. 2 Online

Inputs	
Number of System ERUs	964
Required Fire Flow (gpm)	1,000
Fire Flow Duration (minutes)	120
Source Available	
Well No. 1 (200 gpm), (gpd)	off-line
Well No. 2 (440 gpm), (gpd)	633,600
Well No. 3 (400 gpm), (gpd)	off-line
Total Available Source (gpd)	633,600
Storage Available	
Reservoir No. 1 (gal)	344,064
Reservoir No. 2 (gal)	123,856
Total Available Storage (gal)	467,920
Storage Required	
Equalizing Storage (gal) ([PHD – Qs] x 150)	36,147
Standby Storage (gal)	192,800
Fire Storage (gal)	120,000
Multiple Well Credit[a]	0
Total Storage Required (gal)	347,470
Source Surplus/(Deficit)	120,450

[a] Multiple Well Credit is the daily well capacity with the largest well out of service.

The following Table 3-8 provides a determination of whether the source, storage, or distribution system is the limiting factor for the City to provide water service to its customers based upon ERUs.

Table 3-8. Capacity Limitations

Parameter	Capacity ERU
Source (Well No. 2 and Well No. 3)	1,199[a]
Distribution System (8-inch main)	1,744[b]
Without Well No. 1 Redevelopment	
Equalization Storage	1,396
Standby Storage	1,396
With Well No. 1 Redevelopment	
Equalization Storage	1,482
Standby Storage	1,482

[a] $= \frac{(850\,gpm)(source\ capacity)(1{,}440)}{1{,}021(PHD)}$

[b] A review of the City's distribution system revealed one 8-inch-diameter segment at the intersection of Simpson and Summit which conveys all flows between the well field and the reservoirs. The distribution system appears to be the limiting parameter based upon a peak hour demand scenario.

Connection Capacity Determination

Currently the city has 735 connections. It is assumed that future growth will be residential.

The current number of system ERUs is 964.

The capacity limitation is 1,199 ERUs.

1,199 ERUs (capacity limitation) – 964 ERUs (current number)

= 235 ERUs

1 ERU = 1 residential connection.

235 ERUs = 235 residential connections.

735 (current connections) + 235 (future residential connections)

= 970 connections

The City's connection capacity limitation without any additional storage improvements is 970 connections.

3.6 SYSTEM HYDRAULIC ANALYSIS

A hydraulic analysis of the City's water transmission and distribution system was performed to evaluate the performance of the distribution system. Simulations were run to determine system pressures, as well as fire flow capacity during maximum daily flow events. The current flow and projected future maximum daily flows were evaluated.

3.6.1 Model Set-Up

The existing system was hydraulically analyzed utilizing WaterCAD® version 7.0, (Haestad Methods, 1996) software. The model was developed by using an AutoCAD base map of the existing service area, and then adding pipes and nodes at their respective sizes and locations until the existing system was built. The nodes provide the information about elevations for the system. The elevations were determined from both USGS Quad Maps and existing record drawings.

The storage volume used in the model was the total usable volume (467,920 gallons) operating within the elevation limits created by the telemetry system. The wells are signaled to turn on when the elevation of the tanks reach 27 feet (465 feet in elevation) and turns off the wells when the water level reaches 34 feet (472 feet in elevation). For the purpose of modeling the system, the water level in the tank was considered to be at a minimum level, 27 feet (465 feet in elevation).

The pumps were modeled using the available pump information to create a pump curve and simulated controls to model existing conditions. Well No. 2 was used as the primary source operated by the levels from the reservoirs. Well No. 3 was programmed to turn on by a minimum pressure requirement located by the reservoirs to simulate manually being turned on by the City during periods of high demand.

Demands were distributed in the system based on the concentrations of population within the distribution system. The demands used were determined by the ERU calculations, as well as the estimated maximum daily demand.

3.6.2 Performance and Design Criteria

Following are the criteria used to identify deficiencies within the distribution system:

1. System pressures shall not be less than 30 psi at all nodes in the distribution system during peak hour demand (PHD) with the water elevations in the storage tank at the bottom of the operational level (i.e., 27 feet or 465 feet in elevation).
2. Residual pressures, as well as minimum system pressures, shall not be less than 20 psi occurring at maximum daily demand with fire flow.
3. Fire flow criteria used for the future analysis was 1,000 gpm in residential areas and 1,000 gpm in commercial and industrial areas, respectively.

3.6.3 Analysis of Results

The following sections explain the results of the hydraulic analysis. The capital improvements chapter further explains the deficiencies identified. Appendix U includes a copy of the modeling results.

3.6.3.1 Pressure

Overall, the pressure within the existing system meets DOH guidelines during periods of peak hour demand.

The 1999 Water System Plan indicated the houses located at the end of Cedar Street were deficient in pressure during periods of high demand and especially during fire flow events. In 2004, a 10-inch-diameter main was installed from the reservoir to Evergreen Place then south to William McCleary Road. Between Evergreen Place and the existing water system located along Cedar Street, an 8-inch-diameter main was installed. The installation of this main solved the problem.

The 2008 modeling did not indicate any regions that failed to maintain the minimum pressures.

3.6.3.2 Current Fire Flow

The current system has a fire flow capability of at least 1,000 gpm, with five exceptions. The areas that cannot meet 1,000 gpm include:

- 4th Street south of Pine Street.
- Beck Street east of 1st Street.
- Ash Street west of 10th Street.
- Pine Street and 7th Street.
- The fire hydrant located at the WWTP.

Replacement of the existing 4-inch-diameter main along 4th Street and Beck Street is the recommended correction. In the short term, the McCleary Elementary School is currently preparing utility plans for a proposed expansion. As a condition of the expansion, the City will require extension of an 8-inch-diameter main from Main Street west to 4th Street, which will improve fire flow capabilities along 4th Street.

To correct the fire flow capabilities along Ash Street, it is recommended to replace the existing 2-inch and 4-inch diameter main with a 6-inch main to be looped to the existing main along Simpson through the western edge of the cemetery.

To correct fire flow capacities at Pine Street and 7th Street is recommended to extend a 6-inch main either north from Oak or south from Fir Street. The extension would also complete another system loop further improving water quality.

Correction of fire flow capacity at the WWTP will require replacement of the 4-inch main providing service to the treatment plant. The existing main crosses Sam's Canal from the north and will require coordination with Fish and Wildlife. The other option is to extend a main west along Maple Street.

3.6.3.3 Future Fire Flow

As mentioned in the storage analysis, the City of McCleary currently does not have any adopted fire flow standards. Grays Harbor County is considering adoption of the minimum standards summarized in Table 3-4.

Based on the modeling fire flow requirements (1,000 gpm for 2 hours), once the improvements described above are installed, the City of McCleary will meet the fire flow requirements at all locations. The capital improvements needed are further summarized in the capital improvement chapter.

4. CONSERVATION PROGRAM AND SOURCE SUPPLY

This Water Conservation Plan for the City of McCleary promotes efficient water use, ensures adequate water rights for existing and future needs, promotes system reliability, and describes existing and proposed interties. The plan complies with the Water Use Efficiency Act of 1989 and the regulations set by the Systems Regarding Water Use Reporting, Demand Forecasting, Methodology, and Conservation Programs (*Getting Started Water Use Efficiency Guidebook,* Washington Department of Health [DOH], July 2007).

The Water Conservation Plan is intended to provide the tools and schedule for a combined effort between the City and its customers to efficiently deliver water, as well as encourage reductions to the demand on the system. The plan includes the following:

- Water use data collection requirements.
- Water use data.
- Conservation objectives.
- Conservation measures.
- Conservation approaches.
- Conservation plan action time line.

4.1 WATER USE DATA COLLECTION REQUIREMENTS

4.1.1 Data Collection Requirements

The DOH Guidelines and Requirements stipulate the minimum data required to be collected by public water systems. Table 4-1 outlines the data collection requirements for the City of McCleary:

Table 4-1. Minimum Collection Requirements

Data to be Collected	Units of Measure	Frequency of Collection
Source of supply meter readings	Gallons	Collect: Read daily but report monthly and annual totals
Peak day/peak month	Gallons	Each year's peak day and month totals
Unaccounted-for water[a]	Gallons	Annual totals
Non-revenue unaccounted-for water[b]	Gallons	Annual totals
Single-family service meter readings	Total gallons used by customers in this class	Monthly totals
Multifamily service meter readings	Total gallons used by customers in this class	Monthly totals
Commercial service meter readings	Total gallons used by customers in this class	Monthly totals
Government service meter reading	Total gallons used by customers in this class	Monthly totals
Industrial	Total gallons used by customers in this class	Monthly totals
Agriculture/Irrigation	Total gallons used by customers in this class	Monthly totals

(Table Continues)

Table 4-1. Minimum Collection Requirements (Continued)

Data to be Collected	Units of Measure	Frequency of Collection
Population served	Estimate the number of customers and service connections served in each residential class and the number of connections served in commercial, government, industrial, and agricultural classes	Annual totals
Conservation data[c]	Report the type of measure, the level of implementation, the duration of the measure, and the date when the measure was begun	Once per year
Economic data	Existing water rates for each customer class	Existing water rates

[a] Distribution system leakage is water that is lost through leaks, evaporation, or use that is not accounted for and/or recorded .

[b] Non-revenue water that is accounted for, such as fire protection, system flushing, and other designated uses, can be estimated and should not be included in the unaccounted-for estimate.

[c] Conservation data is not required to be reported annually but will be used in calculating a demand forecast. This data will be required in Water System Plans or as part of an application for water right.

All reported quantities outlined in the table above shall be monthly or annual totals as indicated. Averages shall not be reported.

Single-family is defined as a unit designed to house one family that has one service meter.

Multifamily is defined as a group of separate dwellings served by one meter. Multifamily is typically five dwellings or more per unit.

A duplex is defined as two single-family units when served by separate meters.

A commercial account is a provider of services that uses water in the provision of service or for domestic use. Commercial accounts include hotels, motels, and water used for golf course irrigation.

An industrial account is any manufacturer of products where water is used in the creation of the product.

Agricultural use is defined as water used for the irrigation of crops.

4.2 WATER USE DATA

Table 4-2 presents the historical water usage for the City of McCleary water system for the years 2005 and 2006. Data shown on this table includes total water usage based on individual user readings and total water production based on source meter readings. The difference between these data is indicated as distribution system leakage, which ranged from 8 to 14 percent of total water production. The distribution system leakage can be explained by the following unmetered sources and events:

- The City Cemetery and Park.
- Construction use.
- Food and vendor booths during the Bear Festival.
- Water utilized for flushing.
- Fire protection.
- Failing check valve at wells.

Table 4-2. City of McCleary's Historical Water Use

	Yearly Summary	
	2005	2006
Total Water Consumed (service meter, million gallons)	81.84	86.24
Total Production (source meter, million gallons)	89.57	101.26
Distribution System Leakage	8.6%	14.8%

4.3 CONSERVATION OBJECTIVES

The City of McCleary's conservation objective is to reduce the annual production by 2 percent. The following sections explain the conservation methods the City plans to use

4.4 CONSERVATION MEASURES

As defined in the Water Use Efficiency Guidebook (DOH, 2007), the City of McCleary serves less than 1,000 connections; therefore, the required measures for a small water system Water Conservation Program are as follows:

- Install source meters.
- Install service meters.
- Perform meter calibration.
- Implement a water loss control action plan to control leakage.
- Educate customers about water use efficiency practices

In addition to the mandatory measures, the City should also evaluate rates that encourage water demand efficiency.

4.5 CONSERVATION APPROACHES

There are two approaches to water conservation: demand-side and supply-side conservation. Demand-side conservation measures are those measures that decrease the quantity of water used by customers, either through more efficient water use or a voluntary decrease in water use. Supply-side conservation measures are those measures that increase the efficient delivery and tracking of the water available. Both types of water conservation are important and are included in this Water Conservation Plan.

4.5.1 Demand-Side Conservation

The demand-side conservation program includes the following elements:

- Program promotion.
- Metering of construction uses and system flushing.

4.5.1.1 Program Promotion

Currently, the City uses postcard utility bills. The City is considering purchasing a new accounting software and may switch to a full-page billing, which would then accommodate inserts. A reduction of 2 percent in the average water use per ERU will be the demand side measure.

The City of McCleary will consider using billing inserts as a way to promote water conservation. The bills would then include new tips on how to conserve water. The bills in autumn and winter months may focus on internal measures on how to reduce water. Examples of these tips may include average water usages for laundry, dishwater, and shower uses and how to reduce the quantity of water use in these and other water-use devices. The spring and summer tips may focus on reducing outside water uses like planting low-water-use plants, saving water from the shower to water plants, and installing a drip system.

4.5.2 Supply-Side Conservation

Most of the customers served by the City have service meters. Additionally, the City's sources are currently metered. The supply-side conservation program will be using the data generated by the source and service meters to determine the quantity of distribution system leakage. Currently, the City has identified four customers that are unmetered. The City will be installing water meters at these connections.

Beginning in early 2007, the City began metering all construction use by assembling a construction meter for connection to existing City fire hydrants. Currently, the City is considering assembling a second meter set-up for the upcoming 2008 construction season.

In addition, the City is beginning the process of updating all water and power meters to radio-transmitting, automatic read meters.

The elimination of zero or negative group billings will be the measure of supply side conservation.

4.5.3 Leak Detection Program

The historical data from recent years shows the distribution system leakage for the City is less than 20 percent but above the 10 percent currently allowed; therefore, a leak-detection program is required at this time. The City will begin to monitor the water system for distribution system leakage to reduce system leakage below 10 percent.

The leak-detection program will consist of systematically checking each main line of the system for leaks starting with the oldest main first. The City will contact the Washington Rural Water Association (WRWA) (509) 924-5568, to obtain the leak-detection equipment. A reduction of the unaccounted for water use below 7 percent will be a measure of the leak-detection program.

4.6 CONSERVATION ACTION TIME LINE

Table 4-3 shows the conservation schedule, budget, and monitoring requirements.

Table 4-3. Conservation Schedule, Budget, and Monitoring Requirements

Description	Schedule	Budget	Monitoring Requirements
Begin collecting production and consumption data	January 1, 2008	To be determined	See Table 4-1.
Include Water Use Efficiency (WUE) program in planning documents	January 22, 2008		
Set City WUE goals	January 22, 2008		

(Table Continues)

Table 4-3. Conservation Schedule, Budget, and Monitoring Requirements (Continued)

Description	Schedule	Budget	Monitoring Requirements
Submit service meter installation schedule	July 1, 2009		
Submit first annual performance report	July 1, 2009		
Meet distribution leakage standard (based upon 3-year rolling average)	July 1, 2011 or 3 years after installing all service meters.		
Complete installation of all service meters	January 22, 2017	To be determined	

4.7 WATER RIGHT CHANGES

Currently, the City is beginning to explore the opportunity of moving some of the water rights from the existing well field to another location. The City is considering moving a portion of the certified water rights to a location farther removed from the existing well field to reduce potential of contamination of the City's distribution system due to a plume of groundwater contamination.

4.8 INTERTIES

An intertie is the physical connection of two or more water systems to allow exchange or delivery of water between the systems. Currently, the City does not have any interties.

As previously stated, there are no Class A water systems immediately adjacent to the McCleary system. The two nearest Class A systems are the City of Elma's water system, which is located approximately 7 miles west of the City of McCleary, and Thurston County Public Utility District's (PUD) system located approximately one mile north of the City of McCleary.

To date the City has not received any requests for intertie of service. In the future, if such a request is made, the City will consider the request based upon the potential impact to its ability to continue to provide service to the City's existing customers.

4.9 ARTIFICIAL RECHARGE

Artificial recharge is the injection or infiltration of available surface water or other available water into an aquifer and its subsequent withdrawal.

In accordance with the City's stormwater manual, the preferred stormwater treatment method is to treat the surface runoff and then infiltrate into the existing groundwater.

4.10 RECLAIMED WATER

The City's 2001 Wastewater Facility Plan examined the feasibility of water reclamation within the city based upon the following criteria:

- Any potential reclaimed water uses should have demands proportionate to the cost of supplying the reclaimed water, both for treatment and conveyance.

- Reclaimed water uses should be located within one mile of the WWTP due to the high costs of distribution piping and associated pumping costs.
- Classes B, C, and D are preferable over Class A uses due to the higher costs for treatment to create Class A reclaimed water.

The 2001 report examined the potential uses of the reclaimed water for landscape irrigation, food or non-food crop irrigation, impoundment, industrial process water, groundwater recharge, wetlands, streamflow augmentation, and other minor uses. The report concluded that none of the potential uses appeared to meet the evaluation criteria.

The City will reevaluate the feasibility of reclaimed water uses when the opportunity for a development that meets the criteria listed above is proposed.

4.11 WATER RIGHT EVALUATION

The city of McCleary has three sources of supply, Well No. 1, Well No. 2, and Well No. 3, which are all located north of the city within the same vicinity. The wells are located in the east half of the northwest quarter of Section 11, Township 18 North, Range West.

Well No. 1 was constructed in 1951 with an 8-inch casing to a depth of 74 feet. The well pump is currently not operational and has been physically disconnected from the system. The well is located within a masonry structure. When the well was operational, the well occasionally pumped sand into the system, which is the primary reason the well was taken off-line.

Well No. 2 was constructed in 1952 with a 12-inch casing to a depth of 82 feet. The well is contained within a locked masonry structure. The well currently pumps 410 gpm. The well operates by telemetry from water level signals generated by the reservoirs. The well has high concentrations of iron and manganese and is currently using sequestering to treat the water.

Well No. 3 was constructed in 1962 with a 16-inch casing to a depth of 93 feet. The well is contained within a locked wooden structure. Well No. 3 has a pumping rate of 440 gpm and alternates water supply with Well No. 2.

In accordance with the 1945 state code for groundwater, water can only be put to use once an entity has obtained a water right permit from Ecology. The City of McCleary has existing water rights for all three wells. Table 4-4 provides a summary of the permits. The complete water right assessment table is located in Appendix H.

Table 4-4. Existing Water Right Permits

Permit or Certificate No.	Groundwater Permit No. 956-A	Groundwater Permit No. 1326-A	Groundwater Permit No. 4371-A
Name of Right Holder:	Town of McCleary	Water Department, Town of McCleary	Town of McCleary
Priority Date:	September 13, 1951	June 12, 1952	October 18, 1961
Source Number:	Well No. 1	Well No. 2	Well No. 3
Maximum Instantaneous Flow Rate Allowed (Q_i):	200 gpm	400 gpm	500 gpm
Annual Withdrawal Quantity Allowed (Q_a):	320 ac-ft/yr	640 ac-ft/yr	673 ac-ft/yr[a]
Primary or Supplemental:	Primary	Primary	Supplemental

[a] The total withdrawal under all existing water rights shall not exceed 673 ac-ft/yr.

A comparison of the water right applications for annual withdrawal quantity (673 ac-ft/yr) for projected water use for 2020 (232 gal/day/ERU or 321 ac-ft/yr) indicates that the water system will operate well within the annual withdrawal limits throughout the 20-year planning period. The annual yield available (673 acre-feet/year) is adequate for 2,267 ERUs. A water right self-assessment is included in Appendix H.

4.12 WATER SYSTEM RELIABILITY

The purpose of this section is to summarize water system reliability efforts being undertaken to ensure that an adequate quantity of water can be provided at all times. When water shortages or interruptions in service occur, public health can be threatened because customers may use non-potable sources of water inappropriately, or reduction in system pressure may impact the ability of the system to provide for the basic health needs and prevent backflow related problems.

4.12.1 Source Reliability

The City of McCleary has always had an interest in determining the adequacy and reliability of the Wildcat Creek Aquifer. In 1994, the City commissioned Hart-Crower to prepare recommendations for a wellhead protection plan and to provide an assessment of potential contamination sources within the well recharge area. Once prepared, the report was incorporated into the City's Water System Plan. The plan recommendations have been incorporated into all developmental and environmental assessments made since 1999.

In 2007-2008, the City of McCleary, Grays Harbor County, and the Washington Department of Health teamed together to have a supplemental report prepared in response to increasing growth within the City's identified aquifer recharge area. The report prepared by Horsley Witten Group further defined the City's well recharge area, prepared an assessment of the aquifer water quality and quantity, and provided wellhead protection strategies. A copy of this report is included in Appendix I.

4.12.2 System Reliability

Chapter 3 of this report describes the existing water system. The existing system deficiencies can be separated into two categories. The first is hydraulic and the second is non-hydraulic recommendations.

The hydraulic recommendations proposed include improvements to the distribution to provide fire flow in accordance with the proposed Grays Harbor standards. Additional storage or redevelopment of Well No. 1 has been recommended to provide sufficient storage or system capacity to allow for the continued growth in the system.

The non-hydraulic recommendations include examination or replacement of the wells pumps, well casings, and telemetry systems. In addition, a main replacement program has been recommended to provide for replacement of pipe segments reaching the end of normal useful life. These improvements will increase system reliability.

4.12.3 Critical Deficiencies to be Addressed

To ensure system reliability, the City has identified the following as the system's most critical deficiencies to be addressed:

- Redevelopment of Well No. 1.
- Well No. 2 and No. 3 improvements.
- Water Main Replacement.

5. SOURCE PROTECTION

5.1 INTRODUCTION

This chapter is intended to develop a program to protect, and if possible improve, source waters used by the City of McCleary. This protection program is accomplished by identifying, monitoring, limiting, and controlling all facilities and activities within the watershed to the extent feasible, which may adversely impact the source quality.

5.2 WELLHEAD PROTECTION PLAN

A wellhead protection plan for the well field was prepared in 1998 by Evergreen Rural Water and is currently in the process of being updated based upon the 2008 Horsley Witten Group study. The plan is included in Appendix J of this report. The plan indicates that the City of McCleary's well field is moderately vulnerable.

5.3 WATERSHED CONTROL PROGRAM

The City of McCleary uses groundwater wells that are more than 70 feet deep and more than 500 feet from any surface water source. The wells have not been characterized as groundwater under the influence of surface water; therefore, the City is not required to implement a watershed control program.

Due to recent proposals for large developments located in the county in the area traditionally recognized as the City of McCleary's aquifer recharge area, the City and the County have begun working in partnership to develop a useful Critical Areas Ordinance or Plan. This ordinance or plan will be integrated into the updated Wellhead Protection Plan and serve as a basis for a modification of the City's Critical Areas Ordinance (MMC 18.08).

5.4 WELL NO. 1 REDEVELOPMENT

The Hart Crowser and Horsley Witten Group aquifer studies both identify the Wildcat Aquifer as moderately susceptible to contamination. While the aquifer recharge area is currently under a construction moratorium, eventually the County will lift the moratorium. Therefore, a transfer of Well No. 1 water rights is recommended and development of a second source location to reduce the potential for loss of source due to contamination.

6. OPERATION AND MAINTENANCE PROGRAM

6.1 INTRODUCTION

This chapter is intended to demonstrate the City's operation and maintenance program to assure satisfactory management of the water system operations in accordance with WAC 246-290-100, -300, -310, -320, -440, -480, and -490; and WAC 246-292-020, -050, and -090.

6.2 WATER SYSTEM MANAGEMENT AND PERSONNEL

Figure 6-1 is the City of McCleary organizational chart, and Table 6-1 shows the key responsibilities of the water system staff. Appendix T includes job descriptions.

Table 6-1. Key Responsibilities of Water System Staff

Responsibility	Staff Member
Normal Day-to-Day Operations	Water/Wastewater Manager
Preventative Maintenance	Water/Wastewater Manager Maintenance Crew Foreman
Field Engineering	Water/Wastewater Manager
Water Quality Monitoring	Water/Wastewater Manager
Troubleshooting	Water/Wastewater Manager
Emergency Response	Water/Wastewater Manager, Wastewater Treatment Plant Operator, Maintenance Crew Foreman, Maintenance Crew, and Weekend Crew
Cross Connection Control	Water/Wastewater Manager
Implementation of Improvement Programs	Water/Wastewater Manager, City Administrator
New Construction	City Administrator City Engineer Observation – Public Facilities Manager Pump Station – Water/Wastewater Manager
System Upgrade and Expansion	City Administrator City Engineer Water/Wastewater Manager
Budget Formulation	City Engineer, Water/Wastewater Manager
Response to Complaints	Water/Wastewater Manager, Maintenance Crew Foreman
Public/Press Contact	City Administrator Water/Wastewater Manager
Billing	Utility Accountant

6.3 OPERATOR CERTIFICATION

In accordance with WAC 246-292-050 and RCW 70.119, all public water systems with more than 100 connections must have a certified operator. In addition, specialty certification is required for treatment plant operation, backflow device testing, and asbestos-cement pipe handling. Table 6-2 shows the minimum education and experience requirements as outlined by WAC 246-292-060.

Table 6-2. Minimum Education and Experience Requirements

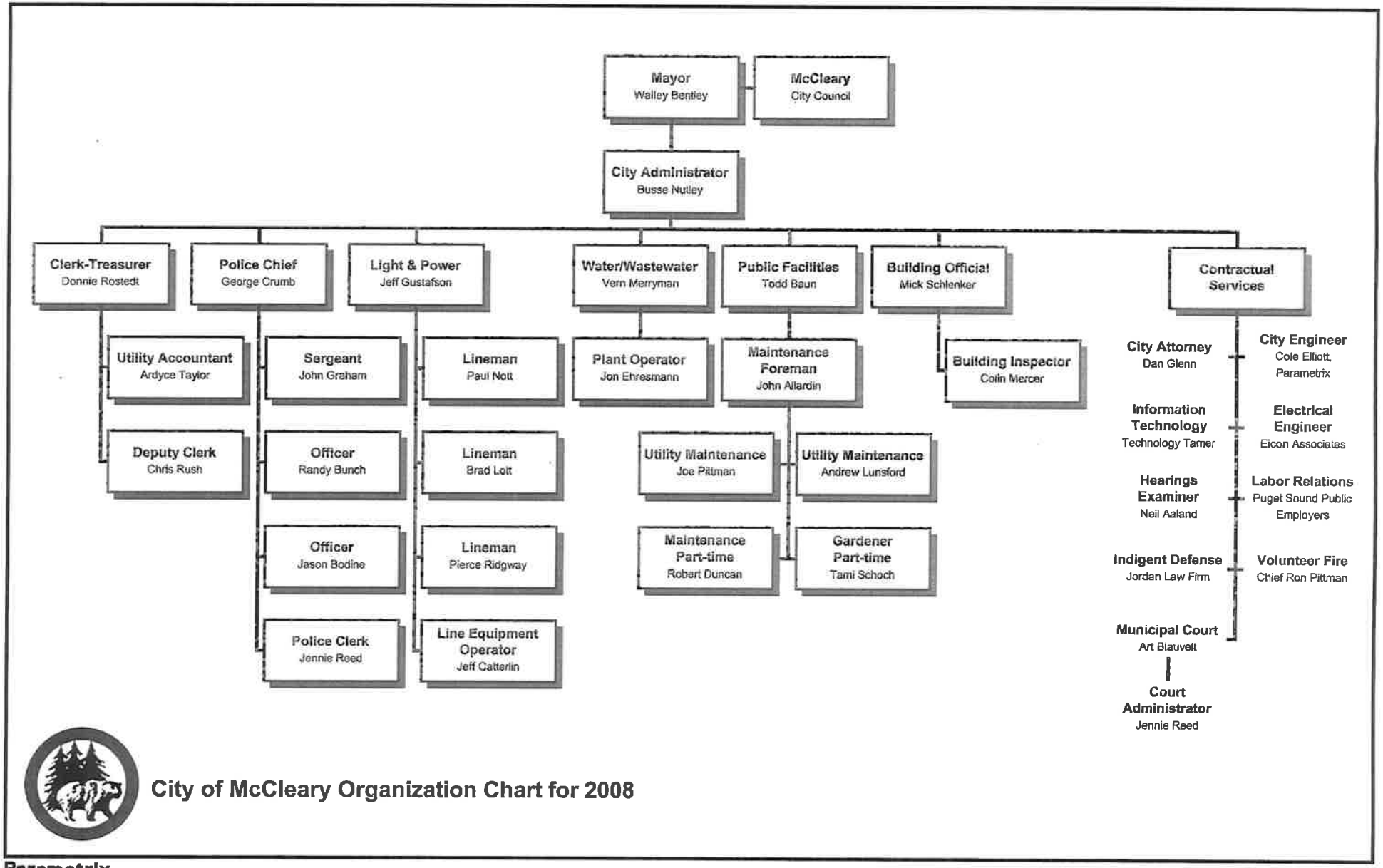
Water Works Operator Classifications	Level									
	0 [a]		1		2		3		4	
	Ed	Exp	Ed	Exp	Ed	Exp	Ed	Exp	Ed	Exp
Water Distribution Manager	12 yr	3 mo	12 yr	1 yr	12 yr	3 yr	14 yr	4 yr	16 yr	4 yr
Water Treatment Plant Operator	12 yr	3 mo	12 yr	1 yr	12 yr	3 yr	14 yr	4 yr	16 yr	4 yr
Basic Treatment Operator	12 years Education, 6 months Operating Experience									
Water Distribution Specialist	12 years Education, 6 months Operating Experience									
Cross-connection Control Specialist	12 years Education, 6 months Operating Experience									
Backflow Assembly Tester	12 years Education, 6 months Operating Experience									

[a] Operator in Training

The City of McCleary currently serves a population of 1,550, which requires a Water Distribution Manager certification and Class 2 purification or higher system in accordance with WAC 246-292-050. Table 6-3 shows the staff certification water list.

Table 6-3. Water Staff Certification List

Employee/Position	Operator Certification	Other Certifications
Busse Nutley City Administrator	None	None
Vern Merryman Water/Wastewater Manager	Water Distribution Manager (WDM) II	Cross Connection Control Specialist (CCS)
Jon Ehresmann	WDM II	CCS
John Allardin Maintenance Crew Foreman	WDM II	
Joe Pittman	None	
Andrew Lunsford	None	



City of McCleary Organization Chart for 2008

Figure 6-1
Organizational Chart

6.4 SYSTEM OPERATION AND CONTROL

To assist in the full understanding of how the McCleary water system operates the following section will describe the non-emergency system operation and maintenance.

6.4.1 Major System Components and Overview

Chapter 1 of the Water System Plan describes all existing water system components. The major components of the City of McCleary water system are summarized below:

- Three wells.
- Two reservoirs.
- Treatment system.
- Distribution system.

A copy of the Water Facilities Inventory (WFI) is included in Appendix B. Figures 1-4 and 1-5 show the system components and layout, as well as an elevation schematic.

6.4.2 Routine and Preventative System Operations

6.4.2.1 Wells, Pumps, and Pump Houses

Table 6-4 summarizes the routine and preventative operations of the wells, pumps, and pump houses.

Table 6-4. Routine and Preventative Operations of Wells, Pumps, and Pump Houses

Operation	Frequency
Read and log meter	Daily
Inspect well pipe and valves for leaks	Daily
Check telemetry system – Autodialer	Daily
Check for unusual vibration, noise temperature	Daily (when in use)
Check pump equipment operation	Daily (when in use)
Read and log pressure	Weekly
Inspect locks and doors	Weekly
Sweep or hose floor	Weekly
Exercise pump for 3 minutes (if not in use)	Weekly
Inspect pipes for rust and condition of paint	Weekly
Record well water level (static and depressed)	Monthly
Grease motor bearings	Monthly
Check oil level in motors	Monthly
Calibrate flow meter	Annually
Check amperage draw and brake horsepower	Annually
Conduct drawdown test (pump until drawdown stabilizes, then record time to static water level recovery while recording water levels at intervals during test)	Annually
Repair leaks	As required
Sand, prime, and repaint piping	As required
Post "No Trespassing" signs	As required
Maintain unobstructed access road	As required

All manufacturer recommended performance criteria should be met, including discharge head, amperage draw, temperature, and motor rpm. Well static and residual levels should be tracked to determine any changes in the aquifer. All vandalism or equipment malfunction should be corrected as soon as possible. Should a pump and/or motor need to be removed, both storage tanks should be filled as much as possible, prior to taking the pump/motor out of service. The Fire Department should be notified that there may be a possibility of temporary reduction in fire flow due to the pump/motor removal.

6.4.2.2 Reservoir Maintenance

Table 6-5 summarizes the routine and preventative maintenance schedule for the reservoirs.

Table 6-5. Routine and Preventative Maintenance of the Reservoirs

Operation	Frequency
Visually check water level indicator	Daily
Check for vandalism	Daily
Check telemetry system – Autodialer	Daily
Check for water leaks	Weekly
Check overflow pipe for obstructions	Weekly
Check for surface films	Weekly
Check locks and fence	Weekly
Read and record reservoir levels	Weekly
Check condition of valve covers	Weekly
Check lock on hatch	Weekly
Check condition of inside of tank	Annually
Check foundation and structural condition	Annually
Exercise all valves	Annually
Clean inside of reservoir	Annually
Post "No Trespassing" sign	As required
Clean exterior of tank	As required
Paint and maintain valve covers	As required
Maintain unobstructed access road	As required

Any problems in water quality at the reservoirs should be addressed immediately such as an odor or film detected in the reservoir.

Tank cleaning should be scheduled annually. Prior to discharging, the water must be dechlorinated to avoid surface water contamination. The Fire Department must also be notified prior to cleaning so they are aware of the potential for a reduced fire flow.

6.4.2.3 Distribution System

The distribution system pipe sizes vary from 2 inches to 10 inches. The system is comprised of pipes made from Poylvinyl Chloride (PVC), Asbestos Cement (AC), Cast Iron (CI), Ductile Iron (DI), Polyethylene (PE), and galvanized iron. The City maintains a supply of material to fix leaks as leaks occur, as well as remove and replace short lengths of pipe. Table 6-6 summarizes the routine and preventative maintenance of the distribution system.

Table 6-6. Routine and Preventative Maintenance of the Distribution System

Operation	Frequency
Flush Mains	Rotating schedule with one quarter of the City flushed every 3 months.
Check corrosion of representative pipes in system (based upon age and type of pipe material)	Rotating annual schedule
Exercise valves	Annually
Conduct leak detection testing	As required
Replace mains	As required

Results of any leak detection tests should be used to assess the integrity of the pipe segments and to assist in prioritizing pipe replacement.

Asbestos Cement Pipe Operations

A large portion of the existing distribution system is asbestos cement; therefore, all operators should be AC certified. Olympic Regional Clean Air Agency (ORCAA) has the authority to regulate asbestos. A copy of ORCAA, Rule 6.3.4, regulating the proper procedures for asbestos cement removal and disposal has been included in Appendix K of this report.

Cross Connection Control

A copy of the Cross Connection Control and Backflow Prevention Manual is included in Appendix L of this report.

6.4.2.4 Valves

All valves should be exercised on an annual basis. In addition any missing, buried, inoperable, or leaking valves should be located, exposed, or repaired by City staff. Table 6-7 summarizes the routine and preventable maintenance of valves.

Table 6-7. Routine and Preventative Maintenance of Valves

Operation	Frequency
Visually inspect each valve box	Annually
Clean valve box	Rotating annual schedule
Operate valve to fully closed and fully open	Annually
Record number of turns to fully operate valve	Annually
Record depth to valve operating nuts	Annually
Raise valve box to grade	As required
Replace valve box lid	As required

The purpose of the inspection is to assure all valves can be operated in case of an emergency. This includes knowing the location of each valve, depth to the operating nut, and number of turns required to fully engage the valve.

6.4.2.5 Equipment, Supplies, and Chemical Listing

Table 6-8 summarizes the available equipment for the power, water, sewer, and street departments.

Table 6-8. City of McCleary Vehicles and Equipment

Year	Equipment
	VEHICLE
2008	Ford Pick-up
1997	Ford Pick-up with Utility Boxes
2000	Chevrolet Pick-up with Utility Boxes
1988	Chevrolet S-10 Pick-up with Utility Boxes
1998	Chevrolet Lumina Car
1972	Ford Dump Truck
1987	Ford 1-Ton Dump Truck
1987	International Dump Truck
2007	John Deere Backhoe with Hoe-Pac Compactor
	Bobcat Skid Steer
	Forklift
	EQUIPMENT
	Mole for Utility Service Line Installation without Roadway Excavation
	Meueller Hot Tap Machine
	Shoring/Trench Box
	Water Meter Test Kit
	Two 3-hp Homelite Gasoline Pumps
	Two 3-hp Honda Gasoline Pumps
	Trailer Mounted Water Meter with Backflow Preventer
	Honda Gasoline Trench Compactor
	Hydraulic Jack Hammer
	Hydraulic Chop Saw
	Asbestos Pipe Cutter
	Stihl Gasoline Chop Saw
	Magnetic Locator
	CHEMICAL
	Sodium Hypochlorite
	Aqua Mag

6.5 COMPREHENSIVE MONITORING PLAN

The City of McCleary is required to sample the groundwater source at representative locations within the distribution system to determine the public health adequacy of the protection provided to its customers. Sampling requirements are primarily established by federal rule and adopted by the State under WAC 246-290-300 through -320. The State also has the enforcement responsibility for federal regulations included within primacy agreements with the United States Environmental Protection Agency (EPA). Water quality regulations continue to evolve due to implementation of the 1996 amendments to the Safe Water Drinking Act (SWDA) and other state and federal regulations.

Sampling and analysis of water quality is performed regularly pursuant to DOH and EPA requirements. Sampling protocol is described within the Coliform Monitoring Plan. Typically, the City of McCleary uses Water Management Laboratories for independent laboratory analysis.

6.5.1 Current Water Quality Regulations

Table 6-9 shows the current state-regulated chemical contaminants and physical properties tested by the City of McCleary and the MCL standards established for each parameter. The table includes both primary and secondary standards. Primary standards refer to those contaminants or physical properties associated with chronic, nonacute, or acute human health effects. Secondary standards refer to those contaminants or physical properties associated with problems other than health effects, such as the general aesthetic quality of the water.

Table 6-9. Primary and Secondary Maximum Contaminant Limits

Parameter	Units	MCL	Detection Limit	Comments
Inorganics/Primary				
Antimony (Sb)	mg/L	0.006	0.002	
Arsenic (As)	mg/L	0.01	0.005	Note[a]
Asbestos	Million fibers/L	7 (> 10 µm)	0.01	
Barium (Ba)	mg/L	2.0	0.1	
Beryllium (Be)	mg/L	0.004	0.002	
Cadmium (Cd)	mg/L	0.005	0.002	
Chromium (Cr)	mg/L	0.1	0.01	
Copper (Cu)	mg/L	Note[b]	0.2	Note[b]
Cyanide (HCN)	mg/L	0.2	0.05	
Fluoride (F)	mg/L	4.0	0.2	
Lead (Pb)	mg/L	Note[b]	0.002	Note[b].
Mercury (Hg)	mg/L	0.002	0.0005	
Nickel (Ni)	mg/L	0.1	0.04	
Nitrate (as N)	mg/L	10.0	0.2	
Nitrite (as N)	mg/L	1.0	0.2	
Selenium (Se)	mg/L	0.05	0.005	
Sodium (Na)	mg/L	Note[b]	5	Note[b]
Thallium (Tl)	mg/L	0.002	0.001	
Inorganics/Secondary				
Chloride (Cl)	mg/L	250.0	–	
Fluoride	mg/ L	2.0	0.2	
Iron (Fe)	mg/L	0.3	0.03	
Manganese (Mn)	mg/L	0.05	0.01	
Silver (Ag)	mg/L	0.1	0.01	
Sulfate (SO_4)	mg/L	250.0	–	
Zinc (Zn)	mg/L	5.0	0.05	

(Table Continues)

Table 6-9. Primary and Secondary Maximum Contaminant Limits (Continued)

Parameter	Units	MCL	Detection Limit	Comments
Physical Characteristics/Secondary				
Color	Color Units	15	5.0b	At 25°C
Hardness	mg/L $CaCO_3$	None	N/A	
Specific Conductivity	µmhos/cm	700	–	
TDS	mg/L	500	–	Note[c]
Disinfection By-Products/Primary				
Total Trihalomethanes (TTHMs)	mg/L	0.080	–	
Haloacetic Acids (HAA5)	mg/L	0.060	–	
Pesticides				
Endrin	mg/L	0.0002	0.00001	
Lindane	mg/L	0.004	–	
Methoxychlor	mg/L	0.1	0.0001	
Toxaphene	mg/L	0.005	0.001	
2,4-D	mg/L	0.1	–	
2,4,5-TP (Silvex)	mg/L	0.01	–	
Radionuclides/Primary				
Radium-226	PCi/L	3.0		
Combined Radium –226 and Radium 228	PCi/L	5.0		
Gross Alpha Particle Activity	PCi/L	15.0		
Uranium	µg/L	30		
Volatile Organic Chemicals/Primary				
Vinyl Chloride	mg/L	0.002	0.0005	
Benzene	mg/L	0.005	0.0005	
Carbon Tetrachloride	mg/L	0.005	0.0005	
1,2-Dichloroethane	mg/L	0.005	0.0005	
Trichloroethylene	mg/L	0.005	0.0005	
1,4-Dichlorobenzene	mg/L	0.075	0.0005	
1, 1-Dichloroethylene	mg/L	0.007	0.0005	
1, 1, 1-Trichloroethane	mg/L	0.2	0.0005	
Cis-1, 2-Dichloroethylene	mg/L	0.07	0.0005	
1, 2-Dichloropropane	mg/L	0.005	0.0005	
Ethylbenzene	mg/L	0.7	0.0005	
Monochlorobenzene	mg/L	0.1	0.0005	
o-Dichlorobenzene	mg/L	0.6	0.0005	
Styrene	mg/L	0.1	0.0005	
Tetrachloroethylene	mg/L	0.005	0.0005	
Toluene	mg/L	1	0.0005	
Trans-1, 2-Dichloroethylene	mg/L	0.1	0.0005	
Xylenes (total)	mg/L	10	0.0005	
Dichloromethane	mg/L	0.005	0.0005	
1, 2, 4-Trichlorobenzene	mg/L	0.07	0.0005	
1,1,2-Trichloroethane	mg/L	0.005	0.0005	

(Table Continues)

Table 6-9. Primary and Secondary Maximum Contaminant Limits (Continued)

Parameter	Units	MCL	Detection Limit	Comments
Synthetic Organic Compounds/Primary				
Alachlor	mg/L	0.002	0.0004	
Aldicarb	mg/L	0.003	0.001	
Aldicarb Sulfoxide	mg/L	0.004	0.0018	
Aldicarb Sulfone	mg/L	0.002	0.0007	
Atrazine	mg/L	0.003	0.0002	
Carbofuran	mg/L	0.04	0.002	
Chlordane	mg/L	0.002	0.0004	
Dibromochloropropane	mg/L	0.0002	–	
2,4-D	mg/L	0.07	0.0002	
Ethylene Dibromide	mg/L	0.00005	–	
Heptachlor	mg/L	0.0004	0.00008	
Heptachlor Epoxide	mg/L	0.0002	0.00004	
Lindane	mg/L	0.0002	0.00004	
Methoxychlor	mg/L	0.04	0.0002	
Polychlorinated Biphenyls	mg/L	0.0005	–	
Pentachlorophenol	mg/L	0.001	0.00008	
Toxaphene	mg/L	0.003	0.002	
2,4,5-TP	mg/L	0.05	0.0004	
Benzo[a]pyrene	mg/L	0.0002	0.00004	
Dalapon	mg/L	0.2	0.002	
Di (2-ethylhexyl) Adipate	mg/L	0.4	0.0013	
Di (2-ethylhexyl) Phthalate	mg/L	0.006	0.0013	
Dinoseb	mg/L	0.007	0.0004	
Diquat	mg/L	0.02	–	
Endothall	mg/L	0.1	–	
Endrin	mg/L	0.002	0.00004	
Glyphosate	mg/L	0.7	–	
Hexachlorobenzene	mg/L	0.001	0.0002	
Hexachlorocyclopentadiene	mg/L	0.05	0.0002	
Oxamyl (Vydate)	mg/L	0.2	0.004	
Picloram	mg/L	0.5	0.0002	
Simazine	mg/L	0.004	0.00015	
2,3,7,8-TCDD (Dioxin)	mg/L	3E-8	–	

a Systems using sources certified as complete prior to January 22, 2004, must demonstrate compliance with this MCL by January 23, 2006.

b Although the state board of health has not established MCLs for copper, lead, and sodium, there is sufficient public health significance connected with these elements to require inclusion in inorganic chemical and physical source monitoring. Action levels for lead and copper are 0.015 mg/L and 1.3 mg/L, respectively.

c Required only when specific conductivity exceeds 700 µmhos/cm.

6.5.2 Lead and Copper

Lead is a highly toxic metal now banned for use in new public water system pipes, flux, and solder. Infants and pregnant women are especially susceptible to [illegible]

Systems determine initial compliance with the revised rule by collecting four consecutive quarterly samples at each entry point to the water distribution system. Compliance is determined based on the annual average of the quarterly samples. Systems exhibiting annual average radionuclide concentrations below the MCL will be eligible for reduced monitoring as follows:

- If an annual average concentration for gross alpha, uranium, and combined radium-226/228 at an entry point is below the detection limit, the system will be allowed to reduce monitoring to one sample every 9 years at that entry point (40 CFR 141.26[a][3][i]).
- If an annual average concentration for gross alpha, uranium, and combined radium-226/228 at an entry point is at or above the detection limit, but at or below one-half the MCL, the system will be allowed to reduce monitoring to one sample every 6 years at that entry point (40 CFR 141.26[a][3][ii]).
- If an annual average concentration for gross alpha, uranium, and combined radium-226/228 at an entry point is above one-half the MCL, but at or below the MCL, the system will be allowed to reduce monitoring to one sample every 3 years at that entry point (40 CFR 141.26[a][3][iii]).

Systems that exhibit an average radionuclide concentration exceeding the MCL will be required to continue sampling and coordinate with DOH to develop treatment strategies.

Prior to implementation of the revised Radionuclide Rule, radionuclides were monitored every 4 years in McCleary. The most recent radionuclide monitoring for both wells occurred in April 2007. The results of all of the tests were nondetect.

6.5.4 Total Coliform Rule

Coliform bacteria, though not necessarily disease-causing themselves, can be indicators of organisms that can cause gastroenteric infections, dysentery, hepatitis, typhoid fever, cholera, and other infectious diseases. Coliform bacteria reside in the intestinal tracts of warm-blooded mammals and are excreted in large numbers with feces. Fecal coliforms are a subset of total coliforms and are generally a better indicator of direct fecal contamination. *Escherichia coli* (*E. coli*) is a subset of fecal coliforms and is an even better indicator of fecal contamination. Coliforms can be found in sewage, soils, surface waters, and vegetation.

The coliform rule, WAC 246-290-310, is based on a presence/absence of total coliforms in routine samples. If coliforms are detected in a routine sample, the sample must be analyzed for fecal coliforms or *E. coli* and four repeat samples collected within 24 hours of the original sample. The first repeat sample is collected at the site of the sample with coliform presence. The second repeat sample is collected within five active service connections upstream of the sample with coliform presence. The third repeat sample is collected within five active service connections downstream of the site with coliform presence. The fourth repeat sample is performed at any other active service or from a location most susceptible to contamination (i.e., well or reservoir). Other follow-up actions are stipulated in WAC 246 290 320, including department notification, public notification, and correction procedures. A minimum of five routine samples are required the month following one or more positive samples.

All public water systems are required to collect samples for coliform bacteria analysis. For Group A systems, coliform bacteria sample collections are based upon a written monitoring plan. The sampling sites and monitoring frequency indicated in the plan must be representative of the water throughout the distribution system. Coliform monitoring plans are subject to review and to revision as directed by DOH. The plan must be kept on file with the water system and made available to DOH at the time of any routine evaluation or special site visit. The McCleary's Coliform Monitoring Plan is in Appendix M.

The City of McCleary collects a minimum of two samples every month. Bacteriological samples are collected at one of four sampling sites in the distribution system:

- Wastewater Treatment Plant.
- Well House No. 3.
- City Hall.
- William McCleary Road.

The sampling sites are rotated numerically with every sampling.

Any additional bacteriological monitoring is based upon the presence or absence of coliforms. A positive test will trigger repeat sampling requirements pursuant to WAC 246 290-320. McCleary has had false positive tests for bacteria, but after repeat sampling, the results were found satisfactory and attributed to pollen or dust in the original sample.

In the event of a repeat positive test result, McCleary will respond pursuant to WAC 246 290 320 requirements, and will notify DOH as well as the public.

6.5.5 Groundwater Disinfection

The purpose of disinfection is to destroy organisms that cause disease. Without appropriate disinfection, a water supply can be susceptible to contamination. Two types of disinfection are normally practiced, primary and secondary. Primary disinfection is applied at the source. This is usually accomplished by maintaining a disinfectant residual in a tank for a period of time necessary to kill pathogenic organisms. Secondary disinfection is maintained in the distribution system. This is accomplished by assuring disinfectant residual remains after primary disinfection to kill pathogenic organisms that may be introduced after the source through cross connections, subsequent regrowth, etc.

Per WAC 246-290-251, all groundwater sources not under the influence of surface water shall have continuous disinfection consistent with the following requirements:

- The combination of free chlorine residual concentration (Cmg/ℓ) and chlorine contact time (Tminutes) CT product (C x T) shall be greater than or equal to 6, prior to or at the first water customer.
- A free chlorine residual, measured as total chlorine, free chlorine, combined chlorine, or chlorine dioxide, shall be detectable throughout all active portions of the distribution system (a system with a heterotrophic plate count of 500 organisms/ml or less is considered to have detectable chlorine residual).

DOH may require increased chlorine residual concentrations, increased contact times, or additional treatment as necessary to protect public health.

Systems using chemical disinfectants such as McCleary must monitor residuals on a daily basis and at the same time and location of routine and repeat coliform sampling. McCleary monitors chlorine residual every weekday at the wastewater treatment plant.

6.5.6 Inorganic Chemical and Physical Characteristics Monitoring

Inorganic chemicals (IOCs) and physical characteristics are monitored every 3 years. The most recent full sampling was conducted in November 2007. Consistent reductions in iron and manganese below the MCLs for both wells after treatment indicate the proper functioning of sequestering systems, and DOH has permitted iron and manganese sampling to occur on the same schedule as all other inorganic chemicals. McCleary meets all Maximum Contaminant Levels (MCLs) for IOCs and physical characteristics identified in Table 6-9. See Section 6.6.1 for information about the new MCL for arsenic and the impact to McCleary.

6.5.7 Nitrate and Nitrite Monitoring

Nitrate is a chemical found in most fertilizers, in manure, and in the liquid waste discharged from septic tanks. Nitrates are converted into nitrites once consumed in the body. Nitrate can affect red blood cells and reduce their ability to carry oxygen to the body. Excessive levels of nitrate in drinking water have caused serious illness and sometimes death.

Nitrates are required for testing every year. McCleary has consistently monitored for nitrates yearly and with results consistently well below the MCL. The most recent nitrite sampling available at the time of this report was performed in November 2007.

6.5.8 Asbestos Monitoring

Asbestos fibers may be released from natural sources such as erosion of asbestos-containing ores, but the primary source is through the wear or breakdown of asbestos-containing materials, particularly from the wastewaters of mining and other industries, and by the use of asbestos cement pipes in water supply systems. The regulation for asbestos monitoring in water became effective in 1992. Between 1993 and 1995, water suppliers were required to collect a single water sample and analyze it for asbestos above 7 million fibers/L. If present above this level, the system must continue to monitor for asbestos in accordance with 40 CFR 141.23(b). DOH is allowed to waive this testing if the system is reliably and consistently below the MCL level for asbestos.

McCleary is scheduled to perform another asbestos monitoring in 2009. Results may then again qualify McCleary for a 9-year monitoring waiver from the Department of Health.

6.5.9 Synthetic Organic Chemicals Monitoring

Synthetic Organic Chemicals (SOCs) are manmade chemicals (i.e., pesticides and herbicides) that can appear in drinking water as a result of careless application or improper disposal. SOCs are typically monitored every 3 years in accordance with WAC 246-290-300(8)(c); however, The City of McCleary falls within an area waiver and does not require routine testing.

6.5.10 Volatile Organic Compound Monitoring

Like SOCs, volatile organic compounds (VOCs) can appear in drinking water as a result of careless application or improper disposal. VOCs combust or flash when heated. These chemicals are generally found in cleaning solvents, oil-based lubrication products, adhesives, and plastic and petroleum alloys. To date, VOCs have not been detected at any of the McCleary sources. The most recent VOC sampling was conducted for both wells in November 2004. The results indicated that no contaminants were detected. VOCs are monitored every 3 years.

6.5.11 Stage 2 Disinfectants and Disinfection Byproducts Rule (DDBPR)

The Stage 2 DDBPR was proposed in August 2003 and promulgated on December 15, 2005. This rule builds on the premise of Stage 1 by further monitoring microbial and disinfection byproducts.

Under the Stage 2 DDBPR, systems conduct an evaluation of their distribution systems, known as an Initial Distribution System Evaluation (IDSE), to identify the locations with high disinfection byproduct concentrations. These locations will then be used by the systems as the sampling sites for Stage 2 DDBPR compliance monitoring. A system can fulfill the IDSE requirements by certifying that all individual TTHM and HAA5 monitoring results for compliance with the Stage 1 DDBPR are less than or equal to 0.040 mg/L for TTHM and 0.030 mg/L for HAA5 during a prescribed 2-year time period. In addition, the system must not have had any Stage 1 DDBPR monitoring violations for TTHM and HAA5 during the same period. McCleary will likely be able to certify such compliance. EPA will require certification by April 1, 2008. Monitoring under Stage 1 compliance must continue until additional sampling under Stage 2 begins in October 2013. A Stage II compliance-monitoring plan, similar to the Stage I plan, must be developed prior to any monitoring and must be kept on file for state and public review. EPA has published additional information regarding the details of this new rule on their website: http://www.epa.gov/safewater/ disinfection/stage2/index.html.

6.5.12 Water Quality Customer Complaints

The City of McCleary has received very few complaints regarding its water. When a complaint is received, a complaint form is filled out by the Water System Manager. Typically, when a complaint is received, a representative of the City contacts the citizen as soon as possible to try to resolve the issue. Complaints generally have been about the color of the water due to high concentrations of iron and manganese.

6.6 UPCOMING WATER QUALITY REGULATIONS

6.6.1 Groundwater Rule

An informal draft Groundwater Rule was posted for comment by the EPA on May 10, 2000. No implementation schedule was available at the writing of this plan. The Groundwater Rule proposal is based on the need to protect against bacteria and viruses found in drinking water. The draft rule establishes protective measures and target systems to identify water systems at high risk for contamination. The proposed rule is based on the ideas within the following regulations:

- Total Coliform Rule.
- Surface Water Treatment Rule.
- Interim Enhanced Surface Water Treatment Rule.
- Stage 1 Disinfection/Disinfection Byproducts Rule.
- Underground Injection Control Program.
- Source Water Assessment and Protection/Wellhead Protection Program.

The requirements of the proposed Groundwater Rule are outlined below.

Sanitary Surveys

The state shall conduct sanitary surveys on all community water systems every 3 years. During the survey, the state will compile a list of observed system deficiencies to be provided

to the system within 30 days of the survey. The codification of this rule will provide the state with the authority to enforce all corrective action required to remedy all system deficiencies defined during sanitary surveys.

Hydrological Sensitivity Assessment

The state shall perform a one-time assessment of sensitivity for all systems that are unable to maintain a minimum 4-log removal (99.99 percent virus inactivation through disinfection). A system that is determined to be hydrologically sensitive must be monitored monthly as outlined under "Source Water Monitoring."

Source Water Monitoring

Groundwater systems that are determined to be located within sensitive aquifers shall conduct monthly sampling for fecal indicators. The sampling frequency may be reduced after 12 consecutive months of negative results. Additionally, if routine coliform sampling within the distribution system yields coliform-positive results, then the system shall, as a supplement to the additional sampling required by the Total Coliform Rule, collect a source water sample and monitor for fecal indicator.

Corrective Actions

If a system is notified by the state that a significant deficiency is present within the distribution system or that a fecal indicator is present within the system, then corrective action must be taken within 90 days of notification. If corrective action includes treatment implementation or expansion, then the system must monitor to ensure that a 4-log inactivation is maintained.

Compliance Monitoring

Compliance monitoring applies to all water systems that disinfect as a corrective action or to avoid source water monitoring. As written, disinfection system monitoring must be conducted as outlined in Table 6-12.

Table 6-12. Groundwater Rule Compliance Monitoring Requirements

System Size	Monitoring Frequency
<3,300	Daily disinfection treatment monitoring.
>3,300	Continuous disinfection treatment monitoring.

If monitoring shows the disinfection concentrations within the distribution system to be below the required level, then the system must notify the state or restore the required disinfection level within 4 hours.

Communication with DOH personnel indicates that the schedule for finalizing and enacting the Groundwater Rule is unknown. With the promulgation of the rule, it may be necessary to adjust the chlorine dosages as needed to maintain a 4-log (99.99 percent removal) inactivation and/or removal of viruses.

6.6.2 Radon Rule

Radon is a colorless, odorless naturally forming gas produced by uranium decay. Radon intake, from both drinking water and indoor air, is thought to increase the risk of cancer. In November 1999, EPA proposed a general Radon 222 MCL of 300 pCi/L for all Group A water systems, unless the system develops and implements a radon "multimedia mitigation"

program. Communities with a multimedia mitigation program in place will be subject to a less stringent MCL of 4,000 pCi/L for radon in drinking water. The proposed Radon Rule does not specify all aspects to be included in a multimedia mitigation program, simply stating that only plans incorporating the following components shall be approved:

- Public involvement in program development.
- Quantitative goals for reducing radon in new and existing homes.
- Strategies to achieve said quantitative goals.
- Plans for tracking and reporting project results.

The Radon Rule was originally scheduled for promulgation in 2001. It is unclear at this time when this rule will be finalized and become effective for water systems in Washington State. Upon final ruling, however, McCleary will be required to collect quarterly water samples at each of the water distribution system entry points for 1 year, and then once every year thereafter.

If the radon concentration at the sources is found to be below the proposed MCL, McCleary would be allowed to request a reduced sampling frequency. If sample analyses indicate radon concentrations greater than the proposed MCL, then a choice must be made whether to implement treatment at the source, or to develop a multimedia mitigation program. Per an initial EPA benefit-cost analysis, the implementation of radon treatment at the source may be cost prohibitive at five times greater than the development and implementation of a multimedia mitigation program.

McCleary conducted preliminary Radon testing in April 2007. Test results indicated that the levels of Radon were below detection limits.

6.7 EMERGENCY RESPONSE PROGRAM

All Group A water systems are required to develop an Emergency Response Program (ERP) in accordance with WACs 246-290-100 and -440. The purpose of the ERP is to guide personnel through system malfunctions or natural disasters that affect routine system operation. All water systems experience emergencies, including pipe breaks, hydrant ruptures, and short-term power outages. Less frequently, water utilities must deal with natural and manmade disasters. These include earthquakes, brush or watershed fires, hazardous material spills, vandalism, extended sub-zero weather, extended droughts, flooding, major power outages, and windstorms. Less extensive emergencies include injury to water system staff and large mechanical failures. The City of McCleary should be prepared for all of these types of disasters and should be able to prevent serious impacts to the public health, wide-scale impacts to the water service and reduction of fire fighting capabilities.

To establish an effective emergency response program, all utility, police, and fire department staff must be trained and assigned specific duties. All personnel should be assigned specific duties for each type of emergency, but the assignments should not be so rigid that another staff member could not also perform the function. All staff should be cross-trained in assignments in case of the following:

- A staff member is absent or injured and unable to perform their assigned duties.
- A disaster occurs which the City is unprepared to handle.
- More staff is required to handle a duty than was anticipated during planning.

The City of McCleary routinely discusses emergency response procedures at their monthly safety meetings.

6.7.1 Water System Personnel Emergency Call-Up List

An emergency call up list is contained in Table 6-13. A copy of the emergency call-up list with up-to-date contact information is to be kept and displayed at the wastewater treatment plant, City Hall, and police and fire departments. Additionally, the 911 Emergency Center should be provided a copy of the contact list. It is the duty of the City Administrator to make sure the lists are kept up to date, as well as discuss the process periodically at the safety meetings.

In the event of an emergency, customers should call 911.

Table 6-13. Emergency Call List

Title	Name	Work	After Hours
CITY OF MCCLEARY			
Mayor	Wallace Bentley	360.495.3667	360.495.3521
City Administrator	Busse Nutley	360.495.3667	360.943.6784
Water and Wastewater	Vern Merryman	360.495.3217	360.520.9494 (c)
On-Call Operator			800.281.6944
McCleary Light and Power	Jeff Gustafson	360.495.4533	360.470.9228 (c)
Police	Chief George Crumb	360.495.4568	360.310.0017 (c) or 911
ADJACENT WATER PURVEYORS			
City of Elma	Jim Stark	360.482.2212	
Thurston PUD	Kim Grubbe	360.357.8783	
UTILITY PROVIDERS			
Natural Gas		800.244.4351	
Telephone		800.201.4099	611
STATE OFFICES			
Department of Health (Office of Drinking Water)		360.236.3030	
Department of Ecology		360.407.6300	
Washington State Patrol		360.533.9332	911

6.7.2 Notification Procedures

Public notification requirements are mandated by the Safe Drinking Water Act and the Environmental Protection Agency. These requirements apply whenever a system is in violation of:

- Drinking water quality or monitoring requirements;
- Operating under a variance or exemption; or
- Other situations that pose a public health risk, i.e. disruption of service.

Public notification also provides the City with an opportunity to educate their customers about their drinking water quality, thereby building trust through sharing information openly. Notices used in this positive way can help customers understand the basis for rate increases that may be needed for additional drinking water treatment and protection.

Very specific details regarding the text, timing, and distribution of notices are detailed in the latest edition of EPA *Revised Public Notification Handbook,* EPA Publication 816-R-07-003, March. In general, violations and events are separated into three tiers based on the potential health impacts due to the violation or event. The definitions for each tier are:

- Tier 1: Acute health concerns; notification is required within 24 hours.
- Tier 2: Chronic health concerns; notification is required within 30 days.
- Tier 3: Reporting and monitoring violations; notification is required within 365 days.

The City Administrator or his/her designee will immediately notify the Department of Health District Engineer when any of the above listed violations or events occur.

6.7.3 Vulnerability Analysis

A vulnerability analysis is required in accordance with WAC 246-290-100. The assessment should estimate the degree to which the water system might be adversely affected in various emergency situations. The emergency situations may be caused by the following events: earthquakes, brush or watershed fires, hazardous materials spills, vandalism, extended sub-zero weather, extended droughts, flooding, major power outages, and windstorms.

The emergency response contingency plans in Appendix N describe the corrective measures for damage caused by the most likely disasters to affect the water system.

6.7.4 Contingency Operational Plan

A contingency plan is the back-up plan for operation of the system when normal operational procedures are not available. Again, the emergency response contingency plan is included in Appendix N of this report.

6.8 SAFETY PROCEDURES

The City currently conducts monthly safety meetings to address material and chemical safety; emergency response procedures; equipment maintenance for normal and emergency use; review of any accidents that may have occurred by the City staff or contractors to identify and prevent their re-occurrence; and update procedures as necessary.

6.8.1 Material/Chemical Safety

A copy of the safety procedures for the chemicals and equipment used by the City of McCleary are included in Appendix O.

6.8.2 Emergency Response Procedures

The emergency response contingency plan is included in Appendix N of this report.

6.9 RECORD KEEPING AND REPORTING

Information relating to the various aspects of the water system is extremely helpful in planning future improvements and projects within the water system. In order to avoid duplication of effort, all water system information must be kept in an organized fashion. The more organized and available the information is, the more easily that information can be located and processed when needed.

There are two sources that outline the record keeping requirements for public water systems. These sources are Guidelines and Requirements for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology, and Conservation Programs: September 1993 (Ecology, DOH, and Washington Water Utilities Council), and WAC 246-290-480 Record Keeping and Reporting.

Water systems are required to keep records of water usage as outlined in the Guidelines and Requirements. The City of McCleary water system has less than 1,000 service connections. According to the Guidelines and Requirements, the minimum reporting requirements are as follows:

- Source of supply meters (master meter) – Monthly and annual totals in cubic feet.
- Imported and exported water from emergency interties – Monthly total in cubic feet.
- Imported and exported wholesale water – Monthly total in cubic feet.
- Peak day and month totals – Each year's peak month total in cubic feet.
- Service meter usage – Monthly total, in cubic feet.
- Unaccounted-for water – Annual total in cubic feet.
- Accounted for non-revenue water – Annual total in cubic feet.
- Population served – Annual total, by single family, commercial, industrial, etc.
- Economic data – Existing water rates for each customer class.
- Conservation data – Annually, indicating type of measure, level of implementation, duration, and date begun.

Table 6-14 has been prepared to outline the applicable record-keeping requirements of WAC 246-290-480.

Table 6-14. Record-Keeping Requirements

Records to be Maintained	Length of Time Records Must be Maintained
Bacteriological monitoring.	5 years
Chemical analysis (IOCs, VOCs, radionuclide monitoring).	Life of the system
Additional records of operations and/or analysis completed at the request of DOH.	3 years
Records of action taken to correct violations of primary drinking water standards and public notifications of such violations.	3 years after the last corrective action
Project reports, construction documents and drawings, and construction inspection reports and approvals.	Life of the facility
Daily chlorine residual, turbidity, source meter readings, and treatment plant performance.	3 years
Copies of written reports, summaries, or communication relating to sanitary surveys.	10 years

All records shall bear the signature of the operator responsible for the water system or his/her representative. Systems shall keep these records available for inspection by DOH and shall send the records to DOH, if requested. Actual lab reports may be kept or data may be transferred to tabular summaries provided the following information is available:

1. Time, date, place of sampling, and name of person sampling.
2. Sample Type ID.
3. Analysis data.
4. Lab and person responsible for analysis.

7. DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS

7.1 INTRODUCTION

The objective of the chapter is to describe and provide guidance for the inclusion of water system distribution facilities design and construction standards to enable the City of McCleary to utilize an alternative approval process. By obtaining advanced approval of design and construction standards (i.e., performance standards, sizing criteria, construction methods, and construction materials) along with an approved Water System Plan, the City will not need to obtain written DOH approval of individual project reports and construction documents for distribution and other distribution related facilities. The City must still comply with all applicable sections of the regulations, including project report and construction document requirements listed under WACs 246-290-110 and -120, whether or not the documents are submitted to DOH for approval.

7.2 MINIMUM DESIGN CRITERIA AND ANALYSIS METHODS

McCleary's system is a Group A Level 1 Community System, in accordance with the requirements of WAC Chapter 246-290. As such, the system is subject to federal regulations, WAC, and DOH guidelines.

Federal regulations that apply to McCleary include the Federal Safe Drinking Water Act (1986).

WACs that apply to McCleary's system include:

- Chapter 246-290, "Group A Water Systems."
- Chapter 246-292, "Water Works Operator Certification."
- Chapter 246-294, "Drinking Water Operating Permits."

The objectives of the design criteria are:

- To provide adequate quantities of safe and palatable drinking water to the people within the water service area.
- To provide adequate water for fire protection to the community.
- To provide sufficient quantities of water to industry and commerce for production processes.

7.3 PROJECT REVIEW PROCEDURES

The City Engineer or a qualified engineering firm will prepare all projects constructed by the City. These projects will be prepared per the standards established by the City and consistent with the requirements of WAC 246-290. The performance and sizing criteria established in the City's 2007 *Development Standards* will be the basis for all expansions and modifications to the system.

DOH will be contacted and given opportunities for comments at various project phases, i.e., report preparation, predesign, final design, and construction review and closeout. The McCleary Fire Chief will also be provided with a copy of construction documents for distribution system improvements and other projects that may impact fire flow. Ecology will be provided with copies of all reports and plans related to source expansion or modification.

7.4 POLICIES AND REQUIREMENTS FOR OUTSIDE PARTIES

7.4.1 Requirements for Developer Improvements

All water system facilities needed within a new development will be installed and paid for by the developer. Distribution improvements needed beyond the existing distribution system to directly supply a new development will also be installed by and paid for by the developer. A Developer's Extension Agreement will be required for all developer-financed projects. The Developer Extension Process Outline and other related forms have been included in the 2007 *Development Standards* included in Appendix P.

Where an improvement to the existing distribution system will be required to supply a new development, the developer will be required to install and pay for the improvement to the distribution system. Distribution improvements will include, but not be limited to, the following items:

- Pipelines and associated appurtenances.
- Meters required for new services.
- Fire hydrants.

If the developer is required to complete improvements within the existing distribution system, the City may request that the developer install additional improvements such as new service connections, fire hydrants, or service meters. The developer may be reimbursed for the added costs associated with the additional improvements.

Under certain situations, the City may request that a developer install a pipeline of a size greater than that required by the development to accommodate hydraulics or future growth as determined by the City of McCleary. In order to receive service, the developer will be required to install the pipeline size and type requested by the City. The City may NOT reimburse the developer for those costs over and above the cost that would have been incurred if a smaller size or different type of main had been installed. See additional explanation about pipe oversizing in Chapter 1.

All water system improvements shall meet the requirements of the City of McCleary Standard Specifications. All water system improvements installed by developers will be inspected by a City-appointed construction inspector. The developer will be required to reimburse the City for the costs of this inspection. All developer-installed improvements within the city shall be deeded over to the City of McCleary.

7.4.2 Service Connection Meters

All service connections to the water system shall be metered, and all meters shall be owned and operated by the City. Water meters shall be sized to provide adequate domestic water to the customer. In accordance with McCleary Municipal Code 13.04.180, all single-family residences and duplexes will be required to have a meter for each unit, except multifamily units and apartment buildings, which shall have minimum water meter sizes determined from the number of units served as follows:

- 1 through 2 Units: 3/4-inch meter.
- 3 through 5 Units: 1-inch meter.
- 6 through 10 Units: 1-1/4-inch meter.
- 11 through 20 Units: 1-1/2-inch meter.

Requests for service to six or more units through a single meter shall be subject to review and approval of the City Council upon review and recommendation of the City Engineer.

Water meters for commercial establishments and services larger than 20 units shall be sized by the City Engineer. Replacement of existing water meters shall comply with minimum sizes listed in this section.

7.4.3 Cross-Connection Control

An assessment will be completed to determine potential cross-connection hazards for all commercial users. The inventory will be completed prior to hookup of any nonresidential users. This will provide assurance that there is compliance with the cross-connection control policies of the City. The developer will be responsible for installing the cross-connection control device required by the City, at the developer's expense. The developer shall provide the City with a copy of certification for the cross-connection control device.

7.5 DESIGN STANDARDS (PERFORMANCE STANDARDS AND SIZING CRITERIA)

7.5.1 General Design Standards

There are several regulations that affect water system performance standards and sizing criteria, *Group A Public Water Systems*, WAC 246-290. In addition, there are publications that provide guidance for system design criteria, such as DOH's *Water System Design Manual*, August 2001, and *Recommended Standards for Water Works*, 2003, from the Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers (the "Ten-State Standards").

7.5.2 Source Capacity

The total source capacity must be sufficient to meet the peak day demand placed upon a system by its customers per WAC 246-290-222(4).

The Great Lakes-Upper Mississippi Board of State Public Health and Environmental Managers' *Recommended Standards for Water Works* ("Ten-State Standards"), 2003, recommends total groundwater sources shall meet or exceed design maximum-day demand and equal or exceed average-day demand with the largest producing source out of service.

7.5.3 Water Quality Parameters

The following minimum standards apply to quality and treatment of water provided:

- WAC 246-290.
- Safe Drinking Water Act, Public Law 104-182.

The City of McCleary will meet the state or federal Standards for Primary Constituents, whichever is greater.

7.5.4 Storage Requirements

System storage must meet the requirements of WAC 246-290-235 and will be sized in accordance with DOH's *Water System Design Manual*, August 2001. Storage tanks shall be sized to include the following elements:

- Operating Storage – The volume of water used under normal operating procedures. Normally it is the volume of water that is used between the top of the tank and a pump-on-float switch.

- Equalizing Storage – Water volume required to meet peak demands when the source capacity is less than peak hourly demands.
- Standby Storage – The volume used during power outages or when a source is unable to operate.
- Fire Flow – Required in order to deliver the appropriate level of fire flow for the required duration.
- Dead Storage – Unusable water necessary to maintain minimum system pressures and to provide chlorine contact time (CT).

Sizing of storage facilities shall be adequate to provide for the sum of equalizing storage, standby storage, and fire storage requirements for all pressure zones. Fire storage volumes shall be determined using the fire flow and duration outlined in Table 7-1 of this chapter.

Table 7-1. Minimum Fire Flow Requirements

Type of Development	Fire Flow Required (gpm)	Minimum Duration (minutes)	Minimum Fire Hydrant Spacing (feet)
One- and Two-Family, Urban	500	30	750
Multifamily, Urban	750	60	300
Commercial, Urban	750	60	300
Industrial, Urban	1,000	60	300

The above minimum fire flow requirements are in accordance with the proposed County standards as previously explained in Section 2.4.4 of this report.

7.5.5 Fire Flow Rate and Duration

Sufficient fire-flow capability is a major concern for all combined water systems. New distribution facilities shall be designed to provide a level of service assigned to designated land uses within the town. Table 7-1 outlines the fire-flow volume and duration requirements. The City of McCleary is required to provide these fire flows simultaneously with maximum day demand, while maintaining a residual pressure of at least 20 psi throughout the system.

7.5.6 Distribution System

There are two basic aspects of a distribution system that must be considered in design, system pressure and flow rate. System pressures are determined by pipe sizes, system demands, and delivery pressure. Flow rate is based on potable needs and fire flow demands.

System Pressure

System pressures shall not be less than 30 psi at all nodes during peak hourly demand (WAC 246-290-230). Minimum system pressures should not be less than 20 psi during fire flows at maximum day demand (Washington Athletic Code [WAC] 246-290-230). Normal pressures shall be between 40 psi and 80 psi.

The *Uniform Plumbing Code* requires installation of pressure-reducing valves (PRV) in the water service pipe downstream from the service meter for new construction when street main pressure exceeds 80 psi. It is also recommended that individuals install their own PRVs as necessary for existing services in high-pressure areas.

Flow Rate

A minimum velocity of 2.0 feet per second (fps) and a maximum velocity of 8.0 fps are recommended.

Minimum Pipe Sizes

In addition to the required fire flow, minimum service line sizes ensure that the water system will have sufficient capacity in order to meet current and future service requirements. WAC 246-290-230 specifies a minimum of a 6-inch-diameter main unless a smaller main can be justified through a hydraulic analysis. City of McCleary requires a minimum pipeline size of 6-inch diameter for all system looped expansions and main replacements. Larger than minimum line sizes may be required for some locations due to hydraulic considerations.

7.5.7 Telemetry Systems

There is no standard for telemetry systems in McCleary. The existing telemetry system is limited to on/off operations of the well pumps. The current telemetry system does not gather water system information.

7.5.8 Backup Power Requirements

The *Recommended Standards for Water Works* ("Ten-State Standard") (Great Lakes-Upper Mississippi Board of State Public Health and Environmental Managers, 2003), recommends power sources to include connection to at least two independent public power sources or auxiliary power.

The *Water System Design Manual* (DOH August 2001) recommends protection of sources against loss of power and potential system depressurization. The following criteria have generally been applied to decisions regarding the reduced need for alternate power when the power grid is capable of providing service such that:

1. Outages would average three or fewer per year based on data for the previous 3 years with no more than six outages in a single year. (NOTE: Power loss for at least 30 minutes is usually what qualifies as an outage.)
2. Outage duration averages less than 4 hours based on data for the previous 3 years, with not more than one outage during the previous 3-year period exceeding 8 hours.

Consideration must be given however, regardless of the power grid reliability, to the possibility for system depressurization under conditions of power outages, or other source-related failures, that may cause concern for cross connection problems.

7.5.9 Valve and Hydrant Spacing

Hydrant spacing is as specified in Section 7.5.5 above, "Fire Flow Rate and Duration." Per WAC 246-290-230, installation of new standard fire hydrants is not allowed on mains less than 6 inches in diameter. Blow-offs should be installed at low points and dead-ends in the distribution system to allow for sufficient flushing and proper disinfection of distribution mains. Valves on distribution mains of 12 inches and smaller should be located at least every 1,000 feet.

7.6 CONSTRUCTION STANDARDS (MATERIALS AND METHODS)

Selection of materials and construction of water system facilities shall conform to the following, in order of hierarchy:

1. City of McCleary Ordinances and Resolutions.
2. City of McCleary 2007 Standard Specifications.
3. Standard Specifications for Road, Bridge, and Municipal Construction, Washington State Department of Transportation/APWA, latest edition.
4. Standards of the American Water Works Association (AWWA).
6. National Fire Protection Association (NFPA) Standards.
7. Manufacturer materials and equipment specifications and recommendations. The specific materials and methods are presented in Appendix P. The City Engineer shall make the final determination of all applicable standards.

7.7 CONSTRUCTION CERTIFICATION AND FOLLOW-UP PROCEDURES

Upon award of contract or execution of a developer extension agreement, the City will require the following from the contractor:

1. Photocopy of all recorded easement agreements.
2. Acceptance from an authorized City representative for all buried portions of projects prior to backfill.
3. Disinfection testing in the presence of authorized City representative with samples tested by a City and DOH approved laboratory.
4. Hydrostatic testing in the presence of authorized City representative.
5. Certified record drawings from the contractor utilizing the following standards:
    - Yellow marking or highlight – For items that are consistent with construction documents.
    - Red Markings – For new or modified items.
    - Green Markings – For deleted items.
6. Certified fixed-line Mylar record drawings of completed project from the design engineer showing:
    - Easement(s) with recording number(s).
    - All fittings, valves, hydrants, and services.
    - Pipe lengths and number of joints on mainline sections.
    - Distance to mainline from property corner or right-of-way monument line.
    - Distance to services as measured from mainline valves.
    - Distance to hydrant tees as measured from mainline valves.
    - Distance to mainline fittings as measured from mainline valves.
    - Depths of bury at hydrants.
    - AutoCAD compatible "as-built" drawing files on CD ROM.
    - Completion of DOH Construction Report form.

8. IMPROVEMENT PROGRAM

8.1 INTRODUCTION

The Capital Improvement Plan (CIP) has been developed to plan for system-wide improvements. These projects have been selected to not only meet the anticipated needs of a growing system, but also to improve the infrastructure of the existing system. Figure 8-1 and Figure 8-2 summarize the recommended CIP projects based upon the type of project, the proposed implementation/construction schedule, and the project cost in 2007 and at the expected time of completion. Table 9-4 also prioritizes the projects based on anticipated growth and needs. The detailed project cost estimates for each project are included in Appendix Q. The improvements are classified in the following manner:

- Distribution System.
- Source/Storage Improvements.
- Operations and Maintenance Improvements.

8.2 DISTRIBUTION SYSTEM IMPROVEMENTS

The following distribution system improvements are required to loop the system and thus provide better fire flows, water pressure, and prevent low chlorine residuals in the pipes. The City also has existing pipes that are in need of replacement due to age, disrepair, and vulnerability to the overall system.

The City anticipates continued growth and this will require installation of additional water lines. Some of these lines will be installed at the developer's expense. Existing lines within the city will be replaced as needed. Many of the existing lines in the city are made of asbestos concrete cement (AC) and have reached the end of their design life. These water lines are proposed to be replaced as significant repairs are made or leaks are found on a segment, in coordination with street improvements, or as needed due to inadequate sizing.

8.2.1 Main Replacement Program

Using the water system drawings prepared by John Allardin and Table 1-2, it was identified that approximately 45,400 linear feet of the City's distribution system existed or was built in 1952. This means that approximately 70 percent of the City's distribution system is beyond the normal 50-year useful life expectancy.

If the City elects to replace just 5 percent of this number annually over the next 20 years, it would require the replacement or rehabilitation of 2,270 linear feet each year. Replacement costs for 6-inch-diameter water main within paved city streets typically costs between $105 and $110 per linear feet for installation and street restoration; therefore a 5-percent main replacement program would need a City investment of $238,000 to $250,000 annually, plus the cost of design and plan preparation.

It is recommended that the City schedule replacement of 2.5 percent of the distribution system that is beyond the normal 50-year useful life. The 2.5 percent replacement program still requires a City investment of $119,000 to $125,000 annually, plus design and plan preparation costs.

The Main Replacement Program should also be used as a method to replace the undersized 2-inch and 4-inch diameter mains with 6-inch-diameter looped or 8-inch-diameter mains.

8.2.2 Project 001: Lynch Road Improvements Phase I

Install approximately 710 feet of 8-inch-diameter water main along Lynch Road from the intersection of Summit Road west. This project will provide fire flow for this area.

Annexation by City will be required prior to extension of mains along Lynch.

8.2.3 Project 002: Larsen Road

Install approximately 3,000 feet of 8-inch-diameter water main from the intersection of Summit and Larsen west to the log sorting yard. This project will provide fire flow and allow for the re-development of the log sorting yard into some sort of viable commercial entity.

Annexation by City will be required prior to extension of this main.

8.2.4 Project 003: West Simpson Water Extension Phase I

Install approximately 1,150 feet of 8-inch-diameter water main west from the western SR 8 intersection to Church Road. This project will probably be installed as a developer extension.

8.2.5 Project 004: West Ash Street Improvements

Replace approximately 234 feet of 4-inch-diameter water main and 273 feet of 2-inch-diameter water main with 6-inch-diameter water main along west Ash Street. In addition, the project includes the installation of approximately 520 feet of 6-inch-diameter water main from Simpson north along the western edge of the cemetery to loop the system. This project will improve fire flow and water quality issues.

8.2.6 Project 005: South 6th Street Improvements

Install approximately 400 feet of 6-inch-diameter water main on 6th Street between Fir Street and Pine Street. This project improves fire flow capabilities along Pine Street and water system circulation within this region.

8.2.7 Project 006: East Mommsen Street Improvements

Replace approximately 860 feet of 4-inch-diameter water main on Mommsen east of the intersection with Birch Street with 6-inch-diameter water main. This project improves fire flow along Mommsen.

8.2.8 Project 007: Main Street to 4th Street Improvements

Install approximately 580 feet of 8-inch-diameter water main from Main Street to 4th Street. This project will probably be included in the McCleary School Improvements project.

8.2.9 Project 008: McCleary SR 8 Bore and Extension

Install approximately 1,280 feet of 12-inch-diameter water main from intersection of McCleary Road and McCleary-Sine Road south under SR 8 to the intersection of Heslop and McCleary-Sine Road (approximately 260 linear feet). Additionally, install approximately 3,500 feet of 8-inch-diameter main east to the intersection of Mox Chehalis and Mox Chehalis Branch Road. This project will probably be installed via developer extension.

8.3 SOURCE AND STORAGE IMPROVEMENTS

The City may need to increase storage to meet forecasted demands. The City's storage facilities and main transmission line vulnerability were reduced when the 10-inch-diameter main was installed from the reservoir site to Pine Street (Evergreen Heights Phase II). Without these facilities, the City would be unable to provide fire flow, storage, or necessary pressures in the system.

The City must assess the existing wells and refurbish them if necessary. The pumps and motors at both Well No. 2 and No. 3 have exceeded their useful life; therefore, the improvements include recommendation for replacement of pumps, motors, and electrical systems.

8.3.1 Project 009: 150,000- to 200,000-Gallon Storage Reservoir

Install a 150,000- to 200,000-gallon storage reservoir adjacent to the existing reservoirs. The reservoir will allow the City of McCleary to increase the maximum number of Equivalent Residential Units (ERU) allowed by the DOH. Additionally, it is recommended that a radio telemetry system be installed between the reservoirs and WWTP. Initial studies indicate that the least expensive alternative for reservoir installation appears to be a cast-in-place concrete storage reservoir.

8.3.2 Project 010: Well No. 2 and Well No. 3 Investigation

Inspect existing well casings and screens using remote video inspection equipment. Based upon the results of this investigation, additional work at each well may include well shocking and screen cleaning.

8.3.3 Project 011: Well No. 2 Improvements

Replace the existing well vertical turbine pump and motors that have been in service since 1952. Improvements will include replacement of existing autodialer system with radio telemetry system. Electrical system improvements should include installation of standby generator or portable generator receptacle.

8.3.4 Project 012: Well No. 3 Improvements

Replace the existing well vertical turbine pump and motors that have been in service since 1962. Improvements will include replacement of existing autodialer system with radio telemetry system. Electrical system improvements should include connection to standby generator or installation of portable generator receptacle.

8.3.5 Project 013: Well No. 1 Relocation and Water Rights Transfer

This project has been recommended to reduce the potential for contamination of the single City water source. Coordinate with DOH to investigate possible locations for the re-development of Well No. 1. Prior to full development of Well No. 1, the associated certified water rights will need to be transferred to the proposed site.

8.3.6 Project 014: Well No. 1 Reinstallation

This project has been recommended to reduce the potential for contamination of the single City water source. Well No. 1 will be reinstalled based upon results of Project No. 013. Well installation will include development of the well (12-inch minimum diameter); installation of pump and motor; and construction of well house, electrical system, and radio telemetry system.

8.4 OPERATIONS AND MAINTENANCE IMPROVEMENTS

The following operations and maintenance (O&M) program activities are required to modernize the operations and maintenance program, increase the operational effectiveness and reliability of the system, and address deficiencies. The costs necessary to complete these projects are *in addition* to the existing operating budget requirements.

8.4.1 Project 015: 150,000-Gallon Reservoir Interior Painting

The interior of the reservoir is in need of sandblasting and recoating to prevent corrosion. Since this reservoir is not scheduled for replacement, this project is recommended to further extend the useful life of the reservoir. ,Typically re-coating should be scheduled on a 10- to 15-year cycle depending on results of the reservoir cleaning and inspection.

8.4.2 Project 016: 500,000-Gallon Reservoir Interior Painting

The interior of the reservoir is in need of sandblasting and recoating to prevent corrosion. Since this reservoir is not scheduled for replacement, this project is recommended to further extend the useful life of the reservoir. Typically, re-coating should be scheduled on a 10- to 15-year cycle depending on results of the reservoir cleaning and inspection.

8.4.3 Project 017: Iron and Manganese Treatment System

Replace the existing sequestering system with an iron and manganese treatment system. Pilot studies done in 1995 indicate that an ATEC treatment system worked extremely well. Treatment system installation should include reconfiguration of well field piping, electrical improvements, telemetry improvements, treatment system building, and piping of treatment waste to the sanitary sewer system.

8.4.4 Project 018: Meter Replacement Program – 15 Years

This project will include replacing a number of service meters throughout the system each year. Aging meters become less accurate and read lower than actual usage. The manufacturer recommends the Sensus meters be replaced every 15 years or 1.5 mg of water demand. In-house staff should replace the meters.

8.4.5 Project 019: Meter Reading/Billing Software and Equipment

This project will include upgrading the current meters with registers for reading via radio transmission. Associated equipment, meter reading software, and billing software will also be included. This will increase the accuracy and efficiency of reading meters, improve customer awareness of water usage, provide technical support when problems are encountered using billing software, and provide increased data availability for future updates to the Water System Plan.

8.5 PROJECTED 20-YEAR GROWTH IMPROVEMENTS

The following distribution improvements have been proposed to provide adequate water and fire flow to the region currently considered most likely to expand in the 20-year planning cycle. Again, please refer to Figure 8-2.

8.5.1 Project 020: Lynch Road Improvements Phase II

Extend approximately 1,800 linear feet of 8-inch-diameter water main west from the end of the Lynch Road Phase I Improvements to the end of Lynch Road.

8.5.2 Project 021: Wildcat Drive to East Beck Street Loop

Install approximately 3,550 linear feet of 8-inch-diameter water main from the northeast corner of Wildcat Drive development east approximately 720 linear feet and then south approximately 2,800 linear feet to East Beck Street. This project requires replacing 192 linear feet of 2-inch–diameter water main.

8.5.3 Project 022: West Simpson Improvements Phase II

Install approximately 1,420 linear feet of 8-inch-diameter water main from Church Road and West Simpson Street west along Church (includes RR bore). In addition, install approximately 1,600 linear feet of 8-inch-diameter water main from the intersection of Church Road and West Simpson Street west along Elma-McCleary Road.

8.5.4 Project 023: Oak Street Loop

Install approximately 343 linear feet of 8-inch-diameter water main from the existing reservoir site east then south approximately 1,150 linear feet and connect to the existing system. This improvement requires the replacement of approximately 177 linear feet of 2-inch-diameter main with 8-inch-diameter main.

8.5.5 Project 024: Mox Chehalis Road Improvements – South

Install approximately 8,580 linear feet of 8-inch-diameter water main to complete the Mox Chehalis Improvements. This project will connect to CIP Project 008 at the intersection of Heslop Lane and Mox Chehalis Road, then install 1,920 linear feet of water main south to the intersection of Mox Chehalis and Foreman Roads; then east approximately 870 linear feet to Mox Chehalis Road East; then northeast along Mox Chehalis Road East approximately 1,600 linear feet to a point of connection again with CIP Project 008.

8.5.6 Project 025: William McCleary Road and Mox Chehalis Road East Loop

Connect onto the eastern most portion of the existing water system along William McCleary Road and extend east approximately 1,380 linear feet with 12-inch–diameter water main; then bore under SR 8 with approximately 260 linear feet of 12-inch–diameter water main; then west along Mox Chehalis Road East with 8-inch-diameter main to the eastern most terminus of CIP Project 008.

9. FINANCIAL PROGRAM

Effective implementation of the Water System Plan for the City of McCleary depends upon developing improvements that the water utility can financially support, meet state and local regulatory requirements, and provide the flexibility to accommodate growth and unforeseen changes. This section presents a review of the past financial status of the City, the water utility monthly rate structure, and possible improvement program financing. Also included in this section, as required by the Department of Health for water systems with less than 1,000 connections, is a Financial Viability Test.

9.1 PAST FINANCIAL STATUS

9.1.1 Balance Statement

The City of McCleary maintains a single fund for operating expenses and capital improvements of the water utility. Table 9-1 lists revenues and expenditures for the water utility from 2004 through 2007.

Table 9-1. Water Utility Revenue and Expenditures (2004 through 2007)

	2004	2005	2006	2007
REVENUES				
Beginning Balance	$26,787.00	$24,626.00	$97,358.00	$213,375.67
Water Rates	193,521.73	206,034.96	230,114.05	225,159.51
Fees and Service	13,555.27	74,250.00	24,757.73	33,972.45
Other Revenue	280.00	11,131.17	13,862.70	13,971.56
TOTAL REVENUE:	**$234,144.31**	**$316,042.13**	**$366,092.48**	**$486,479.19**
EXPENSES				
Total O&M Expenses	$136,011.53	$166,721.46	$171,560.60	$203,088.76
Total General and Administration	51,950.80	30,081.51	32,556.98	111,792.57
Taxes (Property, B&O, etc.)	9,700.82	12,841.58	11,585.51	11,978.34
Annual Debt Payments (Loans/Bonds)	11,979.51	11,979.51	11,979.51	11,979.51
Reserve Funds	–	–	–	–
TOTAL EXPENSES:	**$209,642.66**	**$221,624.06**	**$227,682.60**	**$338,839.18**

Historically, grants, loans, and occasional in-house reserves funded water system improvements.

9.1.2 Debt and Debt Service Obligations

Currently, the City's water fund has the outstanding balance of LID #96-01 (Simpson Avenue water main extension) as the only debt service.

9.2 WATER UTILITY MONTHLY RATE REVIEW

The largest source of revenues for the water system is from monthly water rates. Residential/ commercial, and nonresidential accounts are billed under two different rate structures, both of which are a fixed fee (base rate) based on the size of the water service meter. An additional usage rate is charged per 100 cubic feet of water consumption. The flat fee is for the first 1,000 cubic feet of water; thereafter, the customer pays $0.05 per 100 cubic feet.

Table 9-2 lists the billing rate schedule as of 2006, connections outside the city limits are billed under the same rate structure as those within city limits, but are assessed an additional 50 percent over the base rate. The City's ordinance details future rate increases to account for inflation. Chapter 10 explains increases or modifications to water rates as a source for potential income to offset the cost of the City's capital improvement plan and to promote water conservation.

Table 9-2. Current McCleary Water Rates

	Meter Size (in inches)	Monthly Charge ($/1,000 cu. ft.)	Consumption Charge
Within City Limits			
Commercial and Residential	1-inch or less	$24.30	$0.05 per 100 cu. ft
	Over 1-inch	$32.25	$0.05 per 100 cu. ft
Outside City Limits	1-inch or less	$36.60	$0.05 per 100 cu. ft

9.3 IMPROVEMENT PROGRAM FINANCING

The following sections detail potential sources of funding for the City's capital improvement program. A variety of funding opportunities through loans, grants, and bonds will be pursued for each project depending upon the City's debt capacity and availability of funds as a result of any rate increases. Therefore, no single association has been made between any one funding program and a specific project.

9.3.1 Drinking Water State Revolving Fund (DWSRF)

http://www.doh.wa.gov/EHP/dw/our_main_pages/dwsrf.htm

The Drinking Water State Revolving Fund (DWSRF) program is a competitive, low-interest loan and technical assistance program for local governments and privately owned water systems with projects that improve drinking water infrastructure and increase public health protection. The Washington State Department of Health and Public Works Board, in partnership with the Department of Community, Trade, and Economic Development, jointly manage the DWSRF program.

Eligible projects are projects that address existing water system problems that may cause a drinking water system to exceed health standards or that require replacement of aging infrastructure. Funding requirements include:

Funding for 2008:	$20,000,000	
Loan Limit:	$3,000,000	Interest Rate: 1.5 percent.
Applications Due:	Yearly in May.	
Local Match:	None, but there is a 1 percent loan fee.	
Loan Term:	Life of the project, or 20 years maximum.	
Contact:	Chris Gagnon, (360) 236-3095, chris.gagnon@doh.wa.us.	

9.3.2 Public Works Trust Fund

http://www.pwb.wa.gov/

The Public Works Trust Fund program is a competitive low-interest loan and technical assistance program for public works projects. Eligible applicants include counties, cities, and special purpose districts.

Eligible projects include activities to improve bridges, roads, sanitary sewer, domestic water, storm sewer, and solid waste/recycle. Loans are made available for emergency, planning (long-term capital facilities plans or comprehensive system plans), preconstruction (design, environmental studies, and right-of-way acquisition), and construction activities. Funding requirements include:

Funding for 2005-2007:	$289,000,000	
Loan Limit (Emergency):	$500,000	Interest Rate: 3 percent
Loan Limit (Planning):	$100,000	Interest Rate: 0 percent
Loan Limit (Preconstruction):	$1,000,000	Interest Rate: 0.5 to 2 percent linked to local match
Loan Limit (Construction):	$7,000,000	Interest Rate: 0.5 to 2 percent linked to local match

Applications Due:	Emergency, planning, and preconstruction applications are accepted year-round pending availability of funds. Construction applications are accepted yearly in May.
Local Match (Emergency):	None
Local Match (Planning):	None
Local Match (Preconstruction):	5 to 15 percent linked to interest rate (minimum 5 percent)
Local Match (Construction):	5 to 15 percent linked to interest rate (minimum 5 percent)
Loan Term (Emergency):	Life of the project, or 20 years maximum
Loan Term (Planning):	6 years
Loan Term (Preconstruction):	5 years maximum, or 20 years with proof of construction financing
Loan Term (Construction):	Life of the project, or 20 years maximum
Contact:	Leslie Hafford, (360) 586-4128, Leslie.Hafford@pwb.wa.gov

9.3.3 Community and Economic Revitalization Board Program

http://www.cted.wa.gov

The Community and Economic Revitalization Board Program is a competitive loan and grant program for economic development infrastructure improvements to encourage new development and expansion in areas where growth is desired. Eligible applicants include counties, cities, towns, and many other municipal and quasi-municipal corporations with economic development purposes. Eligible public facilities include bridges, road, domestic and industrial water, sanitary sewer, and other utilities. In addition, pre-development and feasibility studies are opportunities in specific areas of the state. The 2005–2007 funding for this program was $20,448,657. Contact: Kate Rothschild, (360) 725-4058, KareR@cted.wa.gov.

9.3.4 Community Development Block Grant

http://cted.wa.gov/portal/alias__CTED/lang__en/tabID__304/DesktopDefault.aspx

Eligible applicants for the Community Development Block Grant are Washington State cities and towns with less than 50,000 in population or counties with less than 200,000 in population that are non-entitlement jurisdictions or are not participants in a HUD Urban County Entitlement Consortium.

Projects must principally benefit low- and moderate-income persons. Low and moderate income is defined as 51 percent of the population earning 80 percent of county median income. As shown below, McCleary's median income may make the City ineligible for this grant or loan opportunity, and verification should be determined at the time of application:

- McCleary Median Household Income (2005 OFM): $37,617
- Grays Harbor County Median Household Income (2005 OFM): $42,139

9.3.5 USDA/Rural Development/Rural Utilities Service (RUS)

http://www.rurdev.usda.gov/wa/UTLwwdlg.htm

Loan and grant funds in the RUS program are available to public entities including incorporated towns and cities. All applicants with a population of 10,000 or less are eligible, with priority given to those with a population less than 5,500. Grants are considered only after a determination is made on the maximum amount of loan the community can afford and still have reasonable user rates. The EPA and RUS signed a memorandum of agreement in 2002 ensuring maximum possible assistance and gave priority to small systems needing help in achieving compliance with the arsenic standard. Requirements for this program include:

Eligible Projects:	Projects that improve, develop, or upgrade water, wastewater, solid waste disposal, and storm drain systems.
Funding for 2008:	Unknown.
Loan Limit:	75 percent of the project cost. Interest Rate: Currently 4.5 percent
Grant Limit:	No specified maximum.
Applications Due:	Accepted year-round on a fund-available basis.
Local Match (Loan):	25 percent.
Loan Term:	40 years.
Contact:	Sandi Boughton, (360) 704-7737, sandi.boughton@wa.usda.gov.

9.3.6 Financial Viability Test

The financial viability test (in accordance with the DOH Financial Viability Manual) is a way to demonstrate that the total cost of providing service has been considered and the water system meets all regulatory and prudent business practices. The financial viability test consists of four related tests, the first three determining whether the water utility has an adequate 6-Year Operating Budget, Operating Cash Reserve, and Emergency Reserve. The fourth test, the household income index, allows DOH to evaluate the local impact of utility operation and capital funding requirements. The results of this test are included in the following worksheets in Appendix R:

Worksheet 1	6-Year Operating Budget – WITH Rate Increase
Worksheet 2	Projection of Water Rate Revenues – WITH Rate Increase
Worksheet 3	Operating Cash Reserve Disclosure Form
Worksheet 4	Emergency Cash Reserve Disclosure Form
Worksheet 5	Washington State Small Water System Financial Viability Test Summary WITH Rate Increase

Explained below, are various assumptions and clarifications used to populate the fields in the financial viability test.

The current rate system for the water utility does not provide sufficient funds to continue operation of the existing system and implement the recommended system improvements.

Population

In general, water utility revenues increase in proportion to the population served. Section 2.3 describes population projection methodology and results for projected population. The projected population growth is approximately two percent for the next 6 years, and assumed to be constant to meet the population projection of 2,349 people in 2028 (the population as of 2007 was 1,550 people). See Worksheet 2, Projection of Water Rate Revenues – WITH Rate Increase to see how population information resulted in projected water rate revenues.

Projected Water Rates

The City of McCleary's monthly base and usage rate fees are scheduled to increase by 2.5 percent annually (see City Ordinance 493), and population is anticipated to grow at a fairly constant rate over the next 6-year budget period. Revenue from residential usage is anticipated to grow accordingly.

Since the annual increase for inflation and the projected increases in population did not provide sufficient funds to implement the recommended system improvements, the rates were reevaluated based upon modifications to the rates. Rate increases were applied at 6 percent yearly to the base rate and 8 percent yearly to the consumption charge to provide an incentive for conservation. See Worksheet 2, Projection of Water Rate Revenues – WITH Rate Increase.

It is important to note that these rate increases are not specific recommendations to the City, however, could be considered an option for funding the City's capital improvement program. In some cases, increased rates may assist the City in competing for future loan and grant programs as it indicates the City's assertiveness in addressing infrastructure problems. For example, the Department of Health evaluates, or "benchmarks," rates as a percentage of the county's median income, usually 1.5 percent. With Grays Harbor County's median income at $42,139 as of 2005, this would indicate a yearly water utility bill for the average residential customer of $632. McCleary's average annual residential bill is closer to $292 per year (as of 2005) and indicates room for growth.

In addition to rate increases and based upon further study by an independent consulting service provider with expertise in the area of government utility rates and municipal finance, connection charges should also be considered.. A comparison of McCleary's existing rate structure against other cities was made by calling local municipalities to obtain their current rates. The comparison indicates that there is room for potential increases to rates as shown below:

Table 9-3. City Rate Comparison

	McCleary	Elma[a]	Montesano[b]	Milton
Base Rate	$24.30	$41.08	$17.08	NR
Rate per 1,000 cf	$24.30	$41.08	$25.58	NR
Connection Fee	$2,112	$2,437	$151[c] $3,033[c]	$1,550
System Development Charge (also called General Facility Charge)	N/A	N/A	N/A	N/A

[a] Elma's base rate applies up to 1,400 cu ft.; thereafter, the charge is $0.82/100 cu. ft.

[b] Montesano's rate is $0.77/100 cu. ft. inside the city and $0.82/100 cu. ft. outside the city.

[c] Connection fee inside city limits = $151; outside city limits = $3,033.

Table 9-4 is a schedule for the Capital Improvement Plan that outlines the categories for each recommended improvement, proposed improvement costs in 2008 dollars, proposed improvement cost adjusted for inflation, and a timeline for the installation of the improvement.

Table 9-4. City of McCleary
Capital Improvement Plan Schedule

Project No. - Description	Funding Source	Total Cost Year 2008 ($)	Year of Completion 2009 ($)	2010 ($)	2011 ($)	2012 ($)	2013 ($)	2014 ($)	2015 ($)	2016-2028 ($)
Seattle Construction Cost Index (increases at 2.5%)		8606	*8821*	*9042*	*9268*	*9499*	*9737*	*9980*	*10230*	*10486*
Distribution System Improvements										
Main Replacement	O	$223,000	228,575	234,289	240,147	246,150	252,304	258,612	265,077	271,704
001- Lynch Road Improvements Phase I	D	$113,000					127,849		134,321	
002- Larsen Road	D	$447,000				493,404				
003 - West Simpson Water Extension Phase I	D	$199,000			214,301					
004 - West Ash Street Improvements	C	$168,000			180,918					
005 - South 6th Street Improvements	C	$181,000		190,163						
006 - East Mommsen Street Improvements	C	$141,000				155,638				
007 - Main St. to 4th St. Improvements	C	$122,000	125,050							
008 - McCleary SR 8 Bore and Extension	D	$572,000					647,165			
Subtotal		**$2,166,000**	**$353,625**	**$424,453**	**$635,365**	**$895,192**	**$1,027,319**	**$258,612**	**$399,398**	**$271,704**
Source and Storage Improvements										
009 - 150,000 to 200,000-Gallon Storage Reservoir	C	$537,000	550,425							
010 - Well No. 2 and No. 3 Investigation	O	$18,000	18,450							
011 - Well #2 Improvements	O	$142,000		149,189						
012 - Well No. 3 Improvements	O	$150,000			161,534					
013 - Well No. 1 Relocation and Water Rights Transfer	O	$59,000	60,475							
014 - Well No. 1 Re-development	O	$416,000			447,987					
Subtotal		**$1,322,000**	**$629,350**	**$149,189**	**$609,520**	**$0**	**$0**	**$0**	**$0**	**$0**
Operations and Maintenance Improvements										
015 - 150,000-Gallon Reservoir Interior Painting	O	$133,000				146,807				
016 - 500,000-Gallon Reservoir Interior Painting	O	$247,000					279,458			
017 - Iron and Manganese Treatment System	C	$548,000						635,512		
018 - Water Meter Replacement Program	O	$70,000	7,175	7,354	7,354	7,354	7,354	8,118	8,321	8,529
019 - Meter Reading /Billing Software and Equipment	O	$117,000	119,925							
Subtotal		**$1,115,000**	**$127,100**	**$7,354**	**$7,354**	**$154,161**	**$286,812**	**$643,630**	**$8,321**	**$8,529**
Growth										
020 - Lynch Road Improvements Phase II	D	$316,000								385,015
021 - Wildcat Drive to East Beck Loop	D	$599,000						694,656		
022 - West Simpson Improvements Phase II	D	$517,000							614,551	
023 - Oak Street Loop	D	$266,000						308,478		
024 - Mox Chehalis Road Improvements - South	D	$742,000								904,055
00025 - William McCleary Road and Mox Chehalis Road East Loop	D	$563,000								685,961
Subtotal		**$5,233,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$2,290,395**	**$631,192**	**$1,992,089**
TOTAL - OPERATION & MAINTENANCE FUNDS		$1,516,000	$374,125	$390,833	$857,021	$400,312	$539,116	$266,729	$273,398	$280,233
TOTAL - DEVELOPER EXTENSION		$4,393,000	$60,475	$0	$214,301	$493,404	$775,015	$1,003,135	$748,872	$1,975,031
TOTAL - CAPITAL ASSET FUNDS		$1,697,000	$675,475	$190,163	$180,918	$155,638	$0	$635,512	$0	$0
TOTAL - WATER SYSTEM INVESTMENT		$7,606,000	$1,110,075	$580,996	$1,252,240	$1,049,354	$1,314,131	$1,905,376	$1,022,270	$2,255,264

10. MISCELLANEOUS DOCUMENTS

10.1 STATE ENVIRONMENTAL POLICY ACT (SEPA)

Appendix S includes a SEPA checklist and a Determination of Non-Significance for this Water System Plan. Signed copies will be included in the final publication of the Water System Plan.

10.2 LOCAL GOVERNMENT CONSISTENCY REVIEW CHECKLIST

Health

Local Government Consistency Review Checklist

A consistency review between DOH planning and engineering documents and adopted comprehensive plans and development regulations is required in certain situations. This checklist may be used to document the consistency review as required in WAC 246-290-108. A consistency review is required for each local government with jurisdiction over the applicable service area.

Water System Name: City of McCleary PWS ID: 52250A

Planning Document Title: Water System Plan Plan Date: May 2008

Local Government with Jurisdiction: Grays Harbor County

Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
The applicable service area is consistent with the land use and zoning in the adopted comprehensive plan and adopted development regulations.	1-2, 1-7	Yes
For Water System Plans: The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection was used, the alternative growth projection and methodology proposed is acceptable based on explanation given.	2-1 through 2-4	Yes
For Water System Plans: Provisions of water service for new service connections are consistent with the adopted comprehensive plan and adopted development regulations.	1-14 through 1-19	Yes
For city-owned systems only: All utility service extension ordinances regarding water service are included in the plan. These policies are consistent with the adopted comprehensive plan and adopted development regulations.	Appendix C	Yes
Other relevant elements related to water supply (as determined by DOH) is consistent with the adopted comprehensive plan and adopted development regulations.	-----	N/A
Where the local government with jurisdiction did not provide a Consistency Review: Provide documentation of efforts taken and amount of time provided. Include: name of contact, date, type of effort attempted, and response from local agency.	-----	N/A

I certify that the above statements are true to the best of my knowledge and that these statements support the conclusion that the subject-planning document is consistent with adopted comprehensive plans, development regulations, and other policies.

Signature 7-22-08
Date

Brian Shea, Planning and Building Director, Grays Harbor County
Printed Name, Title, & Jurisdiction

For any issues of inconsistency, please document the inconsistency, including the citation from the comprehensive plan or development regulation. Provide direction on how this inconsistency can be resolved.

1

Consistency Review Guidance

This checklist may be used to meet the requirements of WAC 246-290-108.

For water system plans, a consistency review is required for the retail service area and any additional areas where a municipal water supplier wants to expand their water right's place of use.

For small water system management programs, a consistency review is only required for areas where a municipal water supplier wants to expand its water right's place of use. If no water right place of use expansion is requested, a consistency review is not required.

For engineering documents, a consistency review is only required for areas where a municipal water supplier wants to expand its water right's place of use. This is only allowed for non-community water systems.

Documenting consistency:

- Provide a copy of the adopted land use/zoning map that corresponds to the service area. The uses provided in the WSP should be consistent with the adopted land use/zoning map.
- Include a copy of service area policies on how new water service will be provided to new customers. Cities and towns must include all service extension ordinances.
- Include a copy of the growth projections that corresponds to the service area. If the local population growth rate projections are not used, provide a detailed explanation on why the projections chosen more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.
- Include any other portions of comprehensive plans or development regulations which are related to water supply.

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

Health

Local Government Consistency Review Checklist

A consistency review between DOH planning and engineering documents and adopted comprehensive plans and development regulations is required in certain situations. This checklist may be used to document the consistency review as required in WAC 246-290-108. A consistency review is required for each local government with jurisdiction over the applicable service area.

Water System Name: CITY OF MCCLEARY PWS ID: 52250U

Planning Document Title: WATER SYSTEM PLAN Plan Date: SEPTEMBER 2008

Local Government with Jurisdiction: CITY OF MCCLEARY

Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
The applicable service area is consistent with the land use and zoning in the adopted comprehensive plan and adopted development regulations.	1-2, 1-7	YES
For Water System Plans: The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection was used, the alternative growth projection and methodology proposed is acceptable based on explanation given.	2-1 THRU 2-4	YES
For Water System Plans: Provisions of water service for new service connections are consistent with the adopted comprehensive plan and adopted development regulations.	1-14 THRU 1-19	YES
For city-owned systems only: All utility service extension ordinances regarding water service are included in the plan. These policies are consistent with the adopted comprehensive plan and adopted development regulations.	APPENDIX C	YES
Other relevant elements related to water supply (as determined by DOH) is consistent with the adopted comprehensive plan and adopted development regulations.		N / A
Where the local government with jurisdiction did not provide a Consistency Review: Provide documentation of efforts taken and amount of time provided. Include: name of contact, date, type of effort attempted, and response from local agency.		N / A

I certify that the above statements are true to the best of my knowledge and that these statements support the conclusion that the subject-planning document is consistent with adopted comprehensive plans, development regulations, and other policies.

Signature — DECEMBER 8, 2008 Date

BUSSE NUTLEY - CITY ADMINISTRATOR - CITY OF MCCLEARY

Printed Name, Title, & Jurisdiction

****For any issues of inconsistency, please document the inconsistency, including the citation from the comprehensive plan or development regulation. Provide direction on how this inconsistency can be resolved.****

11. REFERENCES

American Water Works Association. 1993. Water conservation guide book for small and medium sized utilities.

Washington Department of Ecology. 1994. Guidelines and requirements for public water systems regarding water use reporting, demand forecasting methodology, and conservation programs.

Washington Department of Ecology. 1991. Water conservation planning handbook for public water systems.