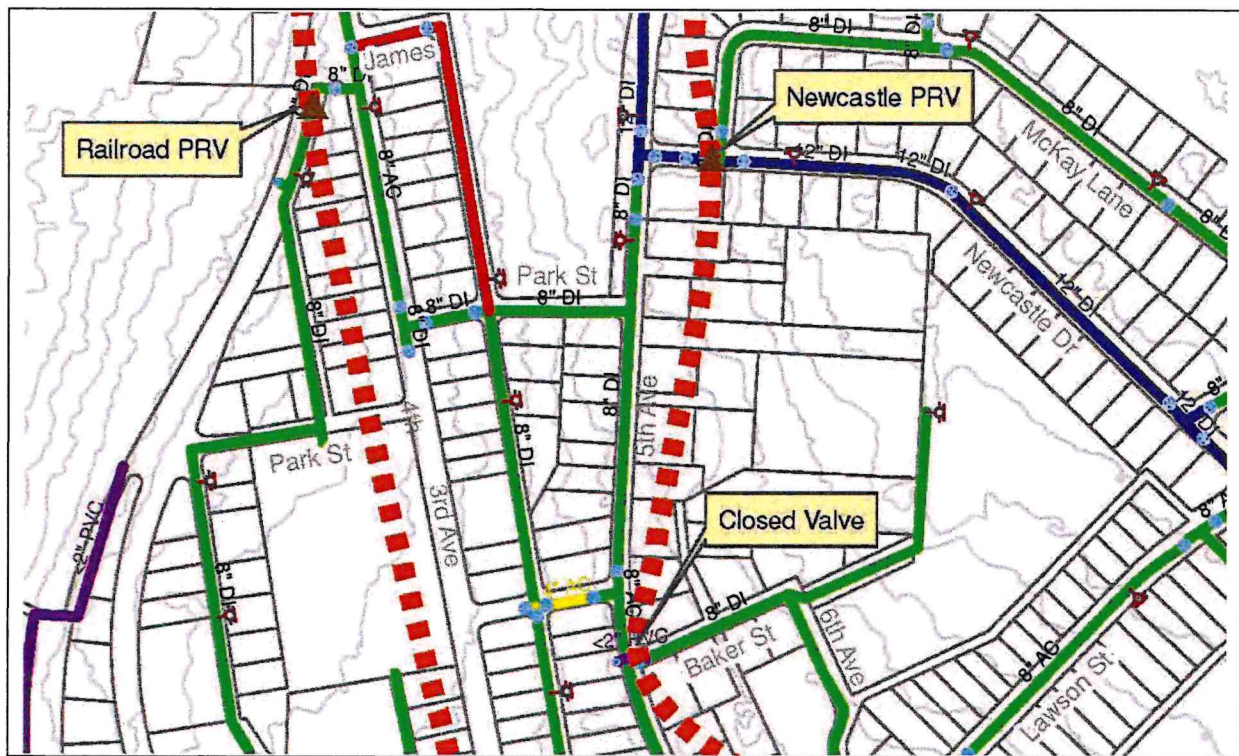


City of Black Diamond

Water System Comprehensive Plan



PACWEST ENGINEERING LLC

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CITY OF BLACK DIAMOND WATER SYSTEM COMPREHENSIVE PLAN

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CERTIFICATE OF ENGINEER

"I hereby certify that this Water System Comprehensive Plan for the City of Black Diamond was prepared under the supervision and direction of the undersigned, whose seals as licensed professional engineers of the State of Washington are affixed below."

Christine J. Smith, P.E.

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TABLE OF CONTENTS

TABLE OF CONTENTS

| | |
|---|------------|
| EXECUTIVE SUMMARY | I |
| CHAPTER 1 – INTRODUCTION | 1-1 |
| LOCATION..... | 1-1 |
| WATER SYSTEM OWNERSHIP..... | 1-1 |
| OVERVIEW OF EXISTING SYSTEM..... | 1-1 |
| AUTHORIZATION AND PURPOSE | 1-4 |
| ORGANIZATION OF PLAN | 1-4 |
| ACRONYMS / ABBREVIATIONS..... | 1-5 |
| DEFINITIONS | 1-6 |
| CHAPTER 2 – DESCRIPTION OF WATER SYSTEM | 2-1 |
| WATER SYSTEM MANAGEMENT | 2-1 |
| SYSTEM BACKGROUND | 2-1 |
| HISTORY OF WATER SYSTEM DEVELOPMENT & GROWTH..... | 2-1 |
| ADJACENT PURVEYORS..... | 2-3 |
| RELATED PLANNING DOCUMENTS | 2-5 |
| CITY OF BLACK DIAMOND PLANNING DOCUMENTS | 2-5 |
| REGIONAL PLANS AND DOCUMENTS..... | 2-6 |
| INVENTORY OF EXISTING FACILITIES..... | 2-8 |
| SYSTEM OVERVIEW | 2-8 |
| SOURCE OF SUPPLY..... | 2-8 |
| PUMPING FACILITIES | 2-14 |
| STORAGE..... | 2-15 |
| PRESSURE ZONES..... | 2-16 |
| PRESSURE REDUCING VALVES | 2-16 |
| TRANSMISSION & DISTRIBUTION..... | 2-16 |
| TELEMETRY & CONTROL SYSTEM..... | 2-19 |
| TREATMENT FACILITIES..... | 2-19 |
| EXISTING SERVICE AREA & CHARACTERISTICS..... | 2-20 |
| WATER SERVICE AREA..... | 2-20 |
| PHYSICAL ENVIRONMENT..... | 2-20 |
| ZONING & LAND USE..... | 2-26 |
| FUTURE SERVICE AREA..... | 2-26 |
| SERVICE AREA AGREEMENTS | 2-30 |
| SERVICE AREA POLICIES..... | 2-30 |
| CHAPTER 3 – BASIC PLANNING DATA & WATER DEMANDS..... | 3-1 |
| CURRENT POPULATION, SERVICE CONNECTIONS, WATER USE, AND EQUIVALENT RESIDENTIAL UNITS | 3-1 |
| CURRENT POPULATION | 3-1 |
| TOTAL SERVICE CONNECTIONS..... | 3-1 |
| EQUIVALENT RESIDENTIAL UNITS..... | 3-2 |
| EXISTING WATER DEMANDS | 3-2 |
| PROJECTED LAND USE, FUTURE POPULATION, AND WATER DEMAND | 3-4 |
| PROJECTED POPULATION & LAND USE..... | 3-4 |
| PROJECTED WATER NEEDS..... | 3-6 |
| CHAPTER 4 – SYSTEM ANALYSIS..... | 4-1 |
| SYSTEM DESIGN STANDARDS..... | 4-1 |

| | |
|---|------------|
| WATER QUALITY ANALYSIS..... | 4-4 |
| WATER QUALITY STANDARDS | 4-4 |
| HISTORICAL REVIEW OF TRENDS | 4-9 |
| SOURCE CAPACITY ANALYSIS..... | 4-10 |
| SOURCE COLLECTION VULNERABILITY..... | 4-11 |
| SOURCE TRANSMISSION VULNERABILITY | 4-11 |
| WATER TREATMENT CAPACITY ANALYSIS | 4-11 |
| STORAGE CAPACITY ANALYSIS | 4-12 |
| ANALYSIS CRITERIA..... | 4-12 |
| STORAGE REQUIREMENTS | 4-15 |
| DISTRIBUTION SYSTEM HYDRAULIC CAPACITY ANALYSIS..... | 4-16 |
| WATER DEMANDS | 4-17 |
| MODEL CALIBRATION | 4-17 |
| PEAK HOUR DEMANDS..... | 4-18 |
| FIRE FLOW ANALYSIS | 4-18 |
| DISTRIBUTION & TRANSMISSION SYSTEM DEFICIENCIES | 4-19 |
| SELECTION AND JUSTIFICATION OF PROPOSED IMPROVEMENTS | 4-19 |
| CHAPTER 5 – CONSERVATION PROGRAM, WATER RIGHT ANALYSIS, SYSTEM RELIABILITY & INTERTIES | 5-1 |
| CONSERVATION PROGRAM DEVELOPMENT & IMPLEMENTATION | 5-1 |
| WATER USE DATA COLLECTION REQUIREMENTS | 5-1 |
| CONSERVATION PROGRAM..... | 5-2 |
| WATER USE EFFICIENCY | 5-3 |
| WATER USE EFFICIENCY GOALS..... | 5-3 |
| WATER USE EFFICIENCY MEASURES | 5-3 |
| CUSTOMER EDUCATION | 5-4 |
| PROJECTED WATER SAVINGS | 5-4 |
| WATER USE EFFICIENCY EFFECTIVENESS | 5-4 |
| DISTRIBUTION SYSTEM LEAKAGE EVALUATION | 5-4 |
| RATE STRUCTURE EVALUATION | 5-4 |
| SUPPLY & WATER RIGHTS EVALUATION..... | 5-5 |
| SYSTEM RELIABILITY..... | 5-5 |
| SOURCE RELIABILITY | 5-5 |
| FACILITY RELIABILITY | 5-5 |
| DESCRIPTION OF EXISTING & PROPOSED INTERTIES | 5-6 |
| EXISTING INTERTIES..... | 5-6 |
| CHAPTER 6 – SOURCE WATER PROTECTION..... | 6-1 |
| WELLHEAD PROTECTION PROGRAM..... | 6-1 |
| OVERVIEW | 6-1 |
| SUSCEPTIBILITY ASSESSMENT | 6-1 |
| WELLHEAD PROTECTION AREA INFORMATION | 6-1 |
| CONTAMINANT SOURCE INVENTORY | 6-3 |
| CONTINGENCY PLAN | 6-4 |
| RECOMMENDATIONS AND NOTIFICATION OF FINDINGS | 6-4 |
| CHAPTER 7 – OPERATION & MAINTENANCE PROGRAM | 7-1 |
| WATER SYSTEM MANAGEMENT & PERSONNEL | 7-1 |
| OPERATOR CERTIFICATION | 7-1 |
| SYSTEM OPERATION AND CONTROL | 7-2 |
| MAJOR SYSTEM COMPONENTS..... | 7-2 |
| ROUTINE SYSTEM OPERATION & MAINTENANCE | 7-3 |
| EQUIPMENT, SUPPLIES, AND CHEMICAL LISTING..... | 7-5 |
| COMPREHENSIVE MONITORING PLAN | 7-6 |

| | |
|---|-------------|
| EMERGENCY RESPONSE PROGRAM..... | 7-6 |
| PRIORITY SERVICES LIST | 7-6 |
| AFTER HOURS EMERGENCY CALLOUT | 7-6 |
| EMERGENCY RESPONSE PLAN | 7-8 |
| SAFETY PROCEDURES | 7-10 |
| CROSS-CONNECTION CONTROL PROGRAM | 7-11 |
| CUSTOMER COMPLAINT RESPONSE PROGRAM | 7-11 |
| RECORDKEEPING AND REPORTING | 7-11 |
| O&M IMPROVEMENTS | 7-11 |
| CHAPTER 8 – DISTRIBUTION FACILITIES DESIGN & CONSTRUCTION STANDARDS..... | 8-1 |
| PROJECT REVIEW PROCEDURES | 8-1 |
| POLICIES AND REQUIREMENTS FOR OUTSIDE PARTIES | 8-1 |
| DESIGN STANDARDS..... | 8-2 |
| CONSTRUCTION STANDARDS..... | 8-2 |
| CONSTRUCTION CERTIFICATION AND FOLLOW-UP PROCEDURES | 8-3 |
| CHAPTER 9 – IMPROVEMENT PROGRAM | 9-1 |
| IDENTIFICATION AND PRIORITIZING OF IMPROVEMENTS..... | 9-1 |
| FUNDING SOURCES..... | 9-1 |
| PROPOSED IMPROVEMENTS | 9-1 |
| DISTRIBUTION SYSTEM IMPROVEMENTS..... | 9-1 |
| IMPROVEMENT SCHEDULE | 9-15 |
| CHAPTER 10 – FINANCIAL PROGRAM | 10-1 |
| INTRODUCTION | 10-1 |
| PAST FINANCIAL STATUS | 10-1 |
| IMPROVEMENT PROGRAM FINANCING | 10-3 |
| AVAILABLE FUNDING SOURCES | 10-5 |
| GRANTS | 10-5 |
| LOANS | 10-6 |
| BONDS | 10-7 |
| FINANCIAL VIABILITY TEST | 10-8 |
| RATE STRUCTURE ANALYSIS | 10-9 |

LIST OF TABLES

| | |
|--|------|
| TABLE 1.1, WATER SYSTEM OWNERSHIP INFORMATION | 1-1 |
| TABLE 1.2, WATER SYSTEM SUMMARY | 1-1 |
| TABLE 2.1, ADDITIONAL WATER SYSTEMS..... | 2-5 |
| TABLE 2.2, BLACK DIAMOND SPRING FIELD CAPACITY..... | 2-13 |
| TABLE 2.3, CITY OF BLACK DIAMOND WATER RIGHTS | 2-13 |
| TABLE 2.4, CITY OF TACOMA INTERTIE MAXIMUM WATER SUPPLY..... | 2-14 |
| TABLE 2.5, CITY OF BLACK DIAMOND RESERVOIRS..... | 2-15 |
| TABLE 2.6, PRESSURE REDUCING VALVES..... | 2-16 |
| TABLE 2.7, PIPE INVENTORY | 2-19 |
| TABLE 2.8, SERVICE AREA POLICIES | 2-31 |
| TABLE 3.1, SERVICE CONNECTIONS | 3-1 |
| TABLE 3.2, EQUIVALENT RESIDENTIAL UNITS (ERUS)..... | 3-2 |
| TABLE 3.3, CONSUMPTION BY CUSTOMER CLASS (2006)..... | 3-2 |
| TABLE 3.4, HISTORICAL CONSUMPTION – M-GAL PER YEAR | 3-3 |
| TABLE 3.5, HISTORICAL CONSUMPTION - GALLONS PER DAY PER ERU..... | 3-3 |

| | |
|--|-------|
| TABLE 3.6, PRODUCTION (2006) | 3-4 |
| TABLE 3.7, HISTORICAL PRODUCTION (M-GAL) | 3-4 |
| TABLE 3.8, PROJECTED POPULATIONS | 3-6 |
| TABLE 3.9, PROJECTED ERU'S | 3-6 |
| TABLE 3.10, KING COUNTY GROWTH PROJECTIONS | 3-6 |
| TABLE 3.11, PROJECTED WATER DEMANDS | 3-7 |
| TABLE 3.12, PROJECTED WATER DEMANDS (INCLUDING CONSERVATION) | 3-8 |
| TABLE 4.1, MINIMUM DESIGN STANDARDS | 4-1 |
| TABLE 4.2, MICROBIOLOGICAL CONTAMINANTS | 4-4 |
| TABLE 4.3, DISINFECTANTS & DISINFECTANT BYPRODUCTS CONTAMINANTS | 4-5 |
| TABLE 4.4, LEAD AND COPPER | 4-5 |
| TABLE 4.5, INORGANIC CONTAMINANTS | 4-6 |
| TABLE 4.6, VOLATILE ORGANIC CONTAMINANTS | 4-7 |
| TABLE 4.7, SYNTHETIC ORGANIC CONTAMINANTS | 4-8 |
| TABLE 4.8, RADIOACTIVE CONTAMINANTS | 4-9 |
| TABLE 4.9, BLACK DIAMOND ANNUAL WATER SUPPLY NEEDS | 4-11 |
| TABLE 4.10, ERU DISTRIBUTION BY PRESSURE ZONE | 4-13 |
| TABLE 4.11, STORAGE FACILITY DATA | 4-13 |
| TABLE 4.12, MAXIMUM FIRE FLOWS BY RESERVOIR | 4-14 |
| TABLE 4.13, EXISTING STORAGE EVALUATION | 4-15 |
| TABLE 4.14, 2013 (YR 6) STORAGE EVALUATION | 4-15 |
| TABLE 4.15, 2027 (YR 20) STORAGE EVALUATION | 4-16 |
| TABLE 4.16, CALIBRATION RESULTS – SYSTEM PRESSURES | 4-17 |
| TABLE 4.17, CALIBRATION RESULTS – TANK LEVELS | 4-18 |
| TABLE 4.18, MINIMUM FIRE FLOW DESIGN REQUIREMENTS | 4-18 |
| TABLE 4.19, FIRE FLOW ANALYSIS RESULTS | 4-19 |
| TABLE 5.1, WATER USE DATA COLLECTION REQUIREMENTS | 5-1 |
| TABLE 5.2, CONSERVATION PROGRAM | 5-2 |
| TABLE 5.3, BLACK DIAMOND ANNUAL WATER SUPPLY | 5-5 |
| TABLE 6.1, WELLHEAD DELINEATION FACTORS | 6-3 |
| TABLE 7.1, BLACK DIAMOND ROUTINE OPERATIONS & PREVENTATIVE MAINTENANCE | 7-4 |
| TABLE 7.2, OPERATION AND MAINTENANCE EQUIPMENT | 7-5 |
| TABLE 7.3, CHEMICAL SUPPLIES | 7-5 |
| TABLE 7.4, EMERGENCY CALL LIST | 7-7 |
| TABLE 7.5, POWER FAILURE EMERGENCY RESPONSE | 7-8 |
| TABLE 7.6, SEVERE EARTHQUAKE EMERGENCY RESPONSE | 7-8 |
| TABLE 7.7, SEVERE SNOWSTORM EMERGENCY RESPONSE | 7-9 |
| TABLE 7.8, CONTAMINATION OF WATER SUPPLY EMERGENCY RESPONSE | 7-9 |
| TABLE 7.9, SAFETY PROCEDURES | 7-10 |
| TABLE 9.1, IMPROVEMENT PROJECT TYPES | 9-2 |
| TABLE 9.2, PROPOSED IMPROVEMENT PROJECTS | 9-2 |
| TABLE 9.3, SIX-YEAR CAPITAL IMPROVEMENT PROGRAM | 9-15 |
| TABLE 9.4, ANNUAL TOTALS BY FUNDING SOURCE | 9-16 |
| TABLE 10.1, HISTORICAL REVENUES | 10-2 |
| TABLE 10.2, HISTORICAL EXPENSES | 10-3 |
| TABLE 10.3, PROPOSED CAPITAL PROJECT FUNDING SOURCES | 10-4 |
| TABLE 10.4, MONTHLY WATER CONSUMPTION RATES | 10-9 |
| TABLE 10.5, WATER CAPITAL FACILITY CONNECTION RATES | 10-9 |
| TABLE 10.6, OTHER WATER SYSTEM FEES | 10-10 |

LIST OF FIGURES

| | |
|--|------|
| FIGURE 1.1, VICINITY MAP (WASHINGTON STATE) | 1-2 |
| FIGURE 1.2, VICINITY MAP (KING COUNTY)..... | 1-3 |
| FIGURE 2.1, ANNEXATION AREAS..... | 2-2 |
| FIGURE 2.2, ADJACENT WATER SYSTEMS | 2-4 |
| FIGURE 2.3, COMPREHENSIVE WATER SYSTEM MAP | 2-9 |
| FIGURE 2.4, BLACK DIAMOND SPRING FIELD COLLECTION SYSTEM | 2-11 |
| FIGURE 2.5, EXISTING HYDRAULIC PROFILE | 2-17 |
| FIGURE 2.6, PRESSURE ZONES | 2-18 |
| FIGURE 2.7, WATER SERVICE AREA..... | 2-21 |
| FIGURE 2.8, CITY OF BLACK DIAMOND DRAFT LAND USE | 2-27 |
| FIGURE 2.9, UNINCORPORATED KING COUNTY LAND USE | 2-28 |
| FIGURE 2.10, KING COUNTY ZONING | 2-29 |
| FIGURE 3.1, SERVICE CONNECTIONS BY CUSTOMER CLASS..... | 3-1 |
| FIGURE 3.2, CONSUMPTION (2006)..... | 3-3 |
| FIGURE 6.1, WELLHEAD PROTECTION ZONES..... | 6-2 |
| FIGURE 9.1, PROPOSED IMPROVEMENT PROJECTS..... | 9-13 |

LIST OF APPENDICES (AT SCOTT'S DESK)

APPENDIX A – WATER FACILITIES INVENTORY (WFI) FORM
APPENDIX B – BLACK DIAMOND URBAN GROWTH AREA AGREEMENT
APPENDIX C – AGENCY REVIEW COMMENTS
APPENDIX D – DOH CHECKLISTS AND CORRESPONDENCE
APPENDIX E – SEPA CHECKLIST
APPENDIX F – SKCRWA JOINT OPERATING AGREEMENT
APPENDIX G – WATER SYSTEM MAP
APPENDIX H – WATER RIGHTS
APPENDIX I – CITY OF TACOMA WHOLESALE AGREEMENT
APPENDIX J – PUMP CURVES
APPENDIX K – SKC-CWSP SERVICE AREA AGREEMENT
APPENDIX L – POPULATION FORECAST DOCUMENTS
APPENDIX M – WATER SUPPLY AND FACILITIES FUNDING AGREEMENT
APPENDIX N – PLUM CREEK LAND CO. WATER FUNDING AGREEMENT
APPENDIX O – PALMER COKING COAL CO. WATER FUNDING AGREEMENT
APPENDIX P – BLACK DIAMOND PUBLIC WORKS STANDARDS
APPENDIX Q – SKC-CWSP DESIGN STANDARDS
APPENDIX R – LEAD & COPPER BILATERAL COMPLIANCE AGREEMENT
APPENDIX S – DRINKING WATER QUALITY REPORT
APPENDIX T – CROSS CONNECTION CONTROL PROGRAM
APPENDIX U – COLIFORM MONITORING PLAN
APPENDIX V – WATER QUALITY TESTING
APPENDIX W – SPRINGS VULNERABILITY AND FEASIBILITY STUDY
APPENDIX X – H2ONET HYDRAULIC ANALYSIS
APPENDIX Y – OPERATIONS & MAINTENANCE FORMS
APPENDIX Z – DEVELOPER EXTENSION CHECKLIST AND AGREEMENT
APPENDIX AA – PROPOSED IMPROVEMENT PROJECT MAP
APPENDIX BB – CITY OF BLACK DIAMOND BUDGET
APPENDIX CC – FINANCIAL VIABILITY TESTS
APPENDIX DD – PUBLIC INVOLVEMENT PROCESS
APPENDIX EE – CITY OF BLACK DIAMOND APPROVAL

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This City of Black Diamond Water System Plan provides a long-term planning document for the City of Black Diamond's water system. It evaluates the system over a twenty-year planning horizon, and develops a list of recommended project improvements with a six-year financing plan. This plan has been prepared in accordance with Department of Health requirements as outlined in the Washington Administrative Code Chapter 246-290.

The Black Diamond water system is primarily served by the Black Diamond Spring Field, located approximately two miles southeast of the City. Water from the Black Diamond Spring Field is pumped to a 4.3 MG Reservoir by an electric pump station located on the north side of the river. An additional source of water for the City is a recent intertie with the City of Tacoma Second Supply Pipe Line (SSPL).

The City has two reservoirs which serve the City of Black Diamond. The City's distribution system currently operates with three pressure zones – the upper pressure zone at a pressure head of approximately 965 feet, the middle pressure zone at a pressure head of approximately 850 feet, and the lower pressure zone at a pressure head of approximately 750 feet. The system operates with high pressures, so there are individual pressure-reducing valves (PRV's) on all service connections throughout the city. The transmission and distribution system for the City consists of 108,000 lineal feet of pipe ranging from less than 2-inches to 20-inches.

The City of Black Diamond currently serves 846 connections, over 94% of which are single-family residences. The City has been under a development moratorium for several years which is expected to be removed in 2009. The City is anticipating that several large master-planned communities will submit development applications in the near future. The City is preparing to experience substantial growth. The City's water system is expected to expand from serving 1,130 Equivalent Residential Unit's (ERU's) in 2007 to serving over 6,900 ERU's in 2027.

A complete hydraulic analysis of the system has been conducted and numerous projects are recommended to improve the system. Projects selected for the program are: 1) Growth related projects associated with extensions to the existing system in order to serve proposed new development; 2) Growth related projects associated with upsizing and improving portions of the existing system that will not be able to adequately serve the system with the anticipated growth; 3) System improvements to address existing system deficiencies such as inability to meet minimum fire flow requirements; 4) Projects to replace small-lines that are 4-inches and smaller; and 5) Projects to replace waterlines constructed of Asbestos Cement material.

A six-year funding program has been developed using three funding sources: 1) Projects to be funded outright by development as extensions to the system; 2) Projects to be funded by connection charges to the existing system to address growth-related deficiencies; and 3) Projects to be funded by customer rates to address existing system deficiencies.

The City of Black Diamond is committed to providing its customers with a safe and reliable source of drinking water. The City is anticipating substantial growth in population over the twenty-year planning period and this plan provides a means for ensuring that the City water system is able to accommodate current and future customers.

CHAPTER 1

INTRODUCTION

CHAPTER 1 – INTRODUCTION

LOCATION

The City of Black Diamond is located approximately 30 miles southeast of Seattle, Washington. Black Diamond was established in 1880 and developed as a coal mining town over the next fifty years. The City is located along Highway 169 (also known as Maple Valley-Black Diamond Road), just west of the Cascade Mountains. **Figure 1.1, Vicinity Map (Washington State)** illustrates the location of Black Diamond in the State of Washington. **Figure 1.2, Vicinity Map (King County)** illustrates the location of Black Diamond within King County.

WATER SYSTEM OWNERSHIP

The City of Black Diamond owns and operates a public water system. Water system data on file at the Department of Health (DOH) for the Black Diamond System is shown below in **Table 1.1, Water System Ownership Information**.

Table 1.1, Water System Ownership Information

| INFORMATION TYPE | DESCRIPTION |
|----------------------|---------------------------------------|
| System Type | Community – Group A |
| System Name | Black Diamond Water Dept |
| County | King |
| DOH System ID Number | 07220 7 |
| Owner Number | 000513 |
| Address | PO Box 599 Black Diamond, WA 98010 |
| Contact | Dan DalSanto |
| Contact Phone Number | (253) 631-0351 |

OVERVIEW OF EXISTING SYSTEM

A summary of water system data for the City's system is shown below in **Table 1.2, Water System Summary**.

Table 1.2, Water System Summary

| DESCRIPTION | DATA |
|------------------------|--------------|
| Population | 4,120 people |
| Total Connections | 846 |
| Total Customers (ERUs) | 1130 |
| Demand per ERU | 187 gpd |

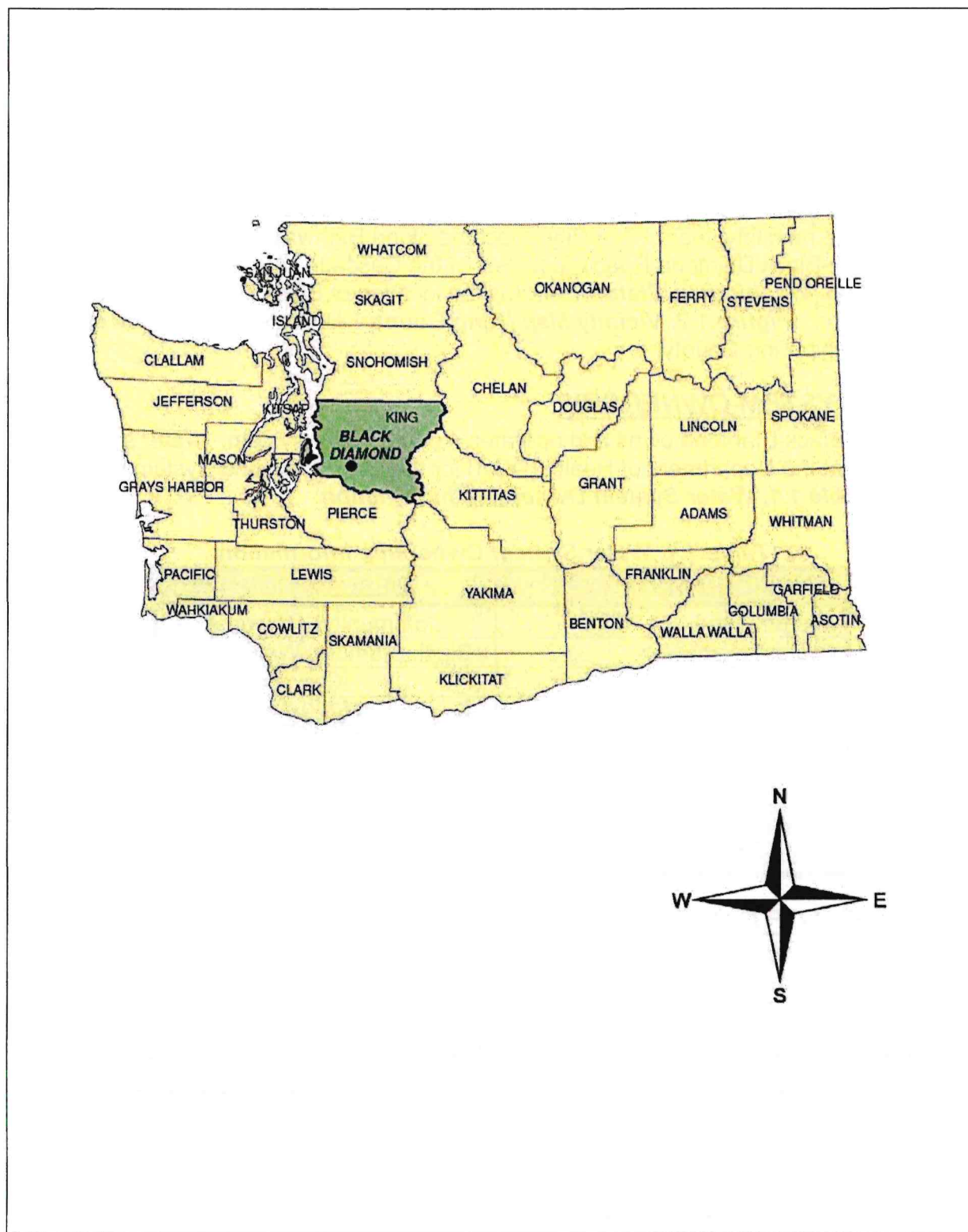


Figure 1.1, Vicinity Map (Washington State)

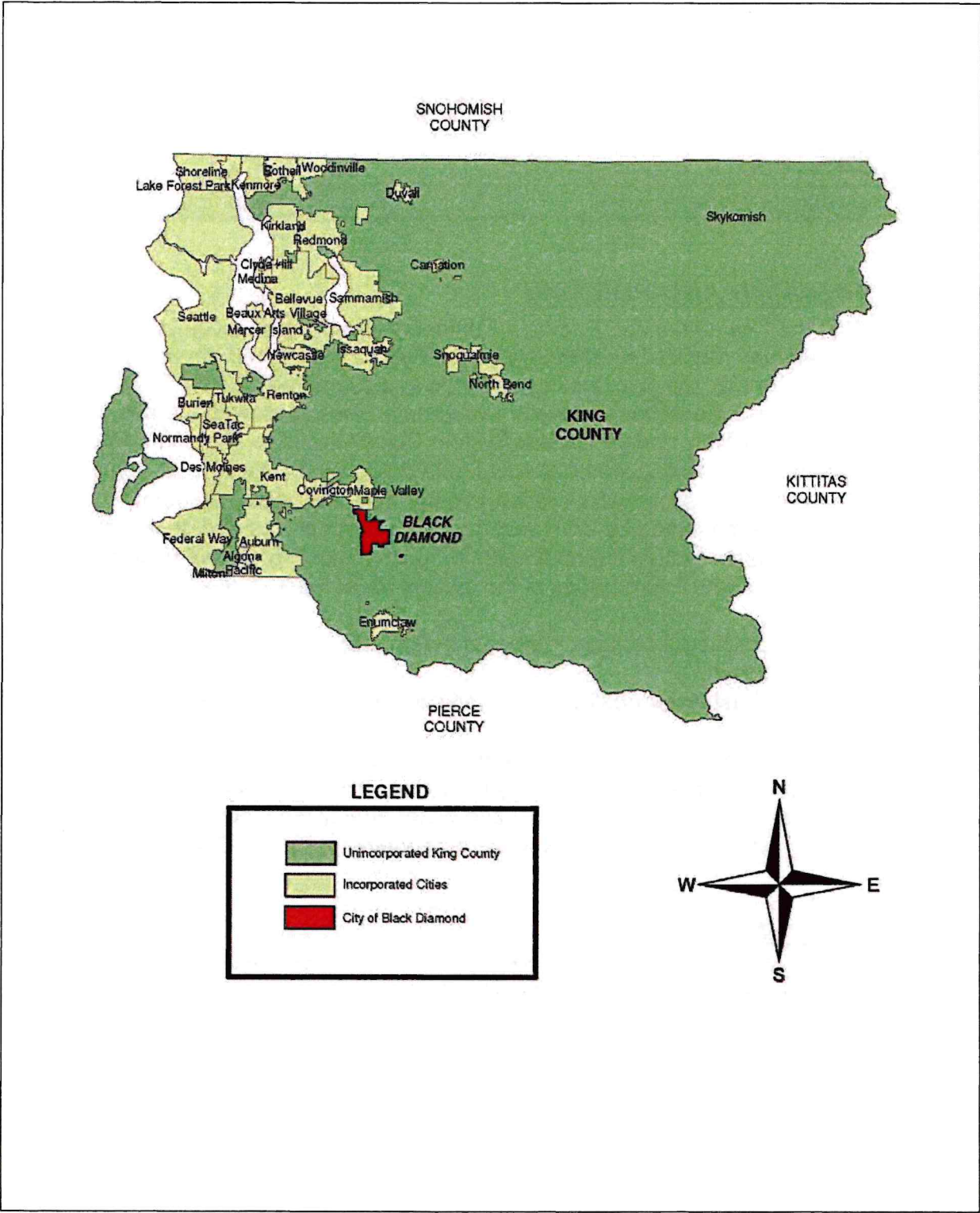


Figure 1.2, Vicinity Map (King County)

| | |
|---|-----------------|
| Number of Pressure Zones | 3 |
| Number of Spring Fields & Annual Withdrawal | 1 – 179.5 MG/yr |
| Number of Wholesale Interties & Production Capacity | 1 – 807.4 MG/yr |
| Number of Pressure Reducing Valves | 4 |
| Total Length of Water Main | 108,000 ft |

AUTHORIZATION AND PURPOSE

In June 2007, the City authorized PacWest Engineering to prepare a comprehensive water system plan as required by state law under WAC 246-290-100. In accordance with WAC 246-290-100, the plan shall be updated and submitted to DOH every six years. The previous comprehensive water system plan was approved and adopted in 2000. The purpose of this updated Water System Comprehensive Plan is as follows.

- To evaluate the existing water demand data and project future water demands.
- To analyze the existing water system to determine if it meets minimum requirements mandated by DOH and the City's own policies and design criteria.
- To identify water system improvements to resolve existing system deficiencies and accommodate future needs of the system for at least 20 years into the future.
- To prepare a schedule of improvements that meets the goals of the City's financial program.
- To evaluate past water quality and identify water quality improvements, as necessary.
- To document the City's operations and maintenance program.
- To prepare conservation, emergency response, cross connection control, wellhead and watershed protection, and water quality monitoring plans.
- To comply with all other water system plan requirements of DOH.

ORGANIZATION OF PLAN

A brief summary of the content of the chapters in the plan is as follows:

- The **Executive Summary** provides a brief summary of the key elements of this plan.
- **Chapter 1** introduces the reader to the City's water system, the objectives of the plan, and the plan organization.
- **Chapter 2** presents the water service area, describes the existing water system, and identifies the adjacent water purveyors.
- **Chapter 3** presents related plans, land use, and population characteristics.
- **Chapter 4** identifies existing water demands and projected future demands.
- **Chapter 5** presents the City's system analyses and existing system deficiencies.
- **Chapter 6** discusses the City's water source and water quality monitoring program.

- **Chapter 7** discusses the City's operations and maintenance program.
- **Chapter 8** discusses the City's operational policies and design criteria.
- **Chapter 9** presents the proposed water system improvements, their estimated costs, and implementation schedule.
- **Chapter 10** summarizes the financial status of the water utility and presents a plan for funding the water system improvements.
- The **Appendices** contain additional information and plans that supplement the main chapters of the plan.

ACRONYMS / ABBREVIATIONS

| | |
|---------|--|
| ADD | Average Day Demand |
| AWWA | American Water Works Association |
| CIP | Capital Improvement Program |
| City | City of Black Diamond |
| CFS | Cubic Feet per Second |
| County | King County |
| CT | Contact Time |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | Environmental Protection Agency |
| ERU | Equivalent Residential Unit |
| Fps | Feet per Second |
| GMA | Growth Management Act |
| GPD | Gallons per Day |
| gph | Gallons per Hour |
| Gpm | Gallons per Minute |
| HP | Horsepower |
| MCL | Maximum Contaminant Level |
| MDD | Maximum Day Demand |
| PDD | Peak Day Demand |
| PHD | Peak Hour Demand |
| PRV | Pressure Reducing Valve |
| PSI | Pounds per Square Inch |
| RCW | Revised Code of Washington |
| SDWA | Safe Drinking Water Act |
| SEPA | State Environmental Policy Act |
| SKCCWSP | South King County Coordinated Water System Plan |
| SKCWUCC | South King County Water Utilities Coordinating Committee |
| SSPL | Second Supply Pipeline (City of Tacoma) |
| SWDA | Safe Water Drinking Act |
| TDH | Total Dynamic Head |
| UGA | Urban Growth Area |
| WAC | Washington Administrative Code |

DEFINITIONS

Annual Demand: The total water system demand for one calendar year.

Average Day Demand (ADD): The total amount of water delivered to the system in a year divided by the number of days in the year. ADD is typically expressed as gallons per day per ERU (gpd/ERU).

Consumption: The true volume of water used by the water system's customers. The volume is measured at each customer's connection to the distribution system.

Contaminant: A substance present in drinking water that may adversely affect the health of the consumer or the aesthetic qualities of the water.

Critical Water Supply Service Area (CWSSA): A geographical area which is characterized by a proliferation of small, inadequate water systems, or by water supply problems which threaten the present or future water quality or reliability of service in a manner that efficient and orderly development may best be achieved through coordinated planning by the water utilities in the area.

Cross-Connection: Any physical connection, actual or potential, between a water system and any source of non-potable substance which, therefore, presents the potential for contaminating the public water system.

Dead Storage: The volume of stored water not available to all consumers at the minimum design pressure.

Demand: The quantity of water required from a water supply source over a period of time necessary to meet the needs of domestic, commercial, industrial, and public uses, and to provide enough water to supply fire fighting, system losses, and miscellaneous water uses. Demands are normally discussed in terms of flow rate, such as million gallons per day (mgd) or gallons per minute (gpm), and are described in terms of a volume of water delivered during a certain time period.

Demand Forecast: An estimate of future water system water supply needs assuming historically normal weather conditions and calculated using numerous parameters, including population, historic water use, local land use plans, water rates and their impacts on consumption, employment, projected water use efficiency savings from implementation of a water use efficiency program, and other appropriate factors.

Disinfection: The use of chlorine or other agent or process for killing or inactivating microbiological organisms, including pathogenic and indicator organisms.

Equalizing Storage: The volume of storage needed to supplement supply to consumers when the peak hourly demand exceeds the total source pumping capacity.

Equivalent Residential Units (ERUs): One ERU represents the amount of water used by one single-family residence for a specific water system. The demand of other customer classes can be expressed in terms of ERUs by dividing the demand of each of the other customer classes by the demand represented by one ERU.

Fire Flow: The rate of flow of water required during fire fighting, which is usually expressed in terms of gallons per minute (gpm).

Fire Suppression Storage: The volume of stored water available during fire suppression activities to satisfy minimum pressure requirements.

Head: A measure of pressure or force exerted by water. Head is measured in feet and can be converted to pounds per square inch (psi) by dividing feet by 2.31.

Head Loss: Reduction in pressure resulting from pipeline wall friction, bends, physical restrictions, or obstructions.

Hydraulic Analysis: The study of a water system's distribution main and storage network to determine present or future adequacy for provision of service to consumers within the established design parameters for the system under peak flow conditions, including fire flow. The analysis is used to establish any need for improvements to existing systems or to substantiate adequacy of design for distribution system components such as piping, elevated storage, booster stations or similar facilities used to pump and convey water to consumers.

Hydraulic Elevation: The height of a free water surface above a defined datum; the height above the ground to which water in a pressurized pipeline would rise in a vertical open-end pipe.

Maximum Contaminant Level (MCL): The maximum permissible level of contaminant in the water that the purveyor delivers to any public water system user, measured at the locations identified under WAC 246-290-300, Table 3.

Maximum Day Demand (MDD): The highest water demand anticipated for any given day.

Operational Storage: The volume of distribution storage associated with source or booster pump normal cycling times under normal operating conditions and is additive to the equalizing and standby storage components, and to fire flow storage if this storage component exists for any given tank.

Peak Day Demand (PDD): The maximum amount of water delivered to the system during a 24-hour time period of a given year.

Peak Hour Demand (PHD): The maximum amount of water delivered to the system, excluding fire flow, during a one hour time period of a given year. A system's peak hour demand usually occurs during the same day as the peak day demand.

Potable: Water suitable for human consumption.

Pressure Zone: A portion of the water system that operates from sources at a common hydraulic elevation. For example, 748 Zone refers to a pressure zone that has water tanks with an overflow elevation of 748 feet.

Purveyor: An agency, subdivision of the State, municipal corporation, firm, company, mutual or cooperative association, institution, partnership, or persons or other entity owning or operating a public water system. Purveyor also means the authorized agents of such entities.

Reclaimed Water: Effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for beneficial use or a controlled use that would not otherwise occur, and it is no longer considered wastewater.

Standby Storage: The volume of stored water available for use during a loss of source capacity, power, or similar short-term emergency.

Supply: Water that is delivered to a water system by one or more supply facilities which may consist of supply stations, booster pump stations, springs, and wells.

Storage: Water that is "stored" in a reservoir to supplement the supply facilities of a system and provide water supply for emergency conditions. Storage is broken down into the following five components – operational storage, equalizing storage, standby storage, fire flow storage, and dead storage.

Unaccounted-for Water: Water that is measured as going into the distribution system but not metered as going out of the system.

Water Right: A permit, claim, or other authorization, on record with or accepted by the Department of Ecology, authorizing the beneficial use of water in accordance with all applicable State laws.

Zone of Contribution: The area surrounding a pumping well or spring that encompasses all areas or features that supply ground water recharge to the well or spring.

CHAPTER 2

DESCRIPTION OF WATER SYSTEM

CHAPTER 2 – DESCRIPTION OF WATER SYSTEM

WATER SYSTEM MANAGEMENT

The Black Diamond Water System is operated and maintained by the City of Black Diamond, a municipal corporation. The City is governed by a Mayor-Council form of government and the water system is operated and maintained by the City's Public Works Department. The Washington State Department of Health (DOH) water system identification number is 07220 7. A copy of the Water Facilities Inventory (WFI) Form is included in **Appendix A – Water Facilities Inventory (WFI) Form**.

SYSTEM BACKGROUND

HISTORY OF WATER SYSTEM DEVELOPMENT & GROWTH

The City of Black Diamond's original water supply system was built prior to 1915 by the Pacific Coast Coal Company. The Pacific Coast Coal Company owned and operated the system until 1943. From 1943 to 1968, the system was owned and operated by King County Water District No. 66. In 1968, ownership was transferred to the City of Black Diamond.

The City of Black Diamond was established in the late 1800's as a coal mining town. The City has maintained a rural atmosphere and has a 2007 estimated population of 4,120. The city encompasses just over 4,250 acres or 6.6 square miles which includes the Lake Sawyer annexation area. This portion of the City was annexed in 1998 and has a population of approximately 1,500. The Lake Sawyer area is currently served by the Covington Water District and is not included in the existing Black Diamond Water Service Area.

There are several other large annexation areas which have been recognized in the City of Black Diamond's Urban Growth Area Agreement. A copy of this agreement has been provided in **Appendix B – Black Diamond Urban Growth Area Agreement**. These annexation areas include the "West Annexation Area" which has been annexed into the City limits in recent years. Additionally, the "South Annexation Area", the "East Annexation Area", and the "Lake 12 Annexation Area" are all designated annexation areas which are located within the City of Black Diamond Urban Growth Area boundary, but have not yet been annexed into the City limits. **Figure 2.1, Annexation Areas** shows the location of these annexation areas.

Within the last several years, Ordinance 700 was passed by the City which placed a moratorium on the development of new lots within the City. Thus, there has been a very limited increase in the number of water connections in recent history. The development moratorium was enacted in response to several large-scale development proposals in order to provide the City with the opportunity to evaluate and update its development regulations.

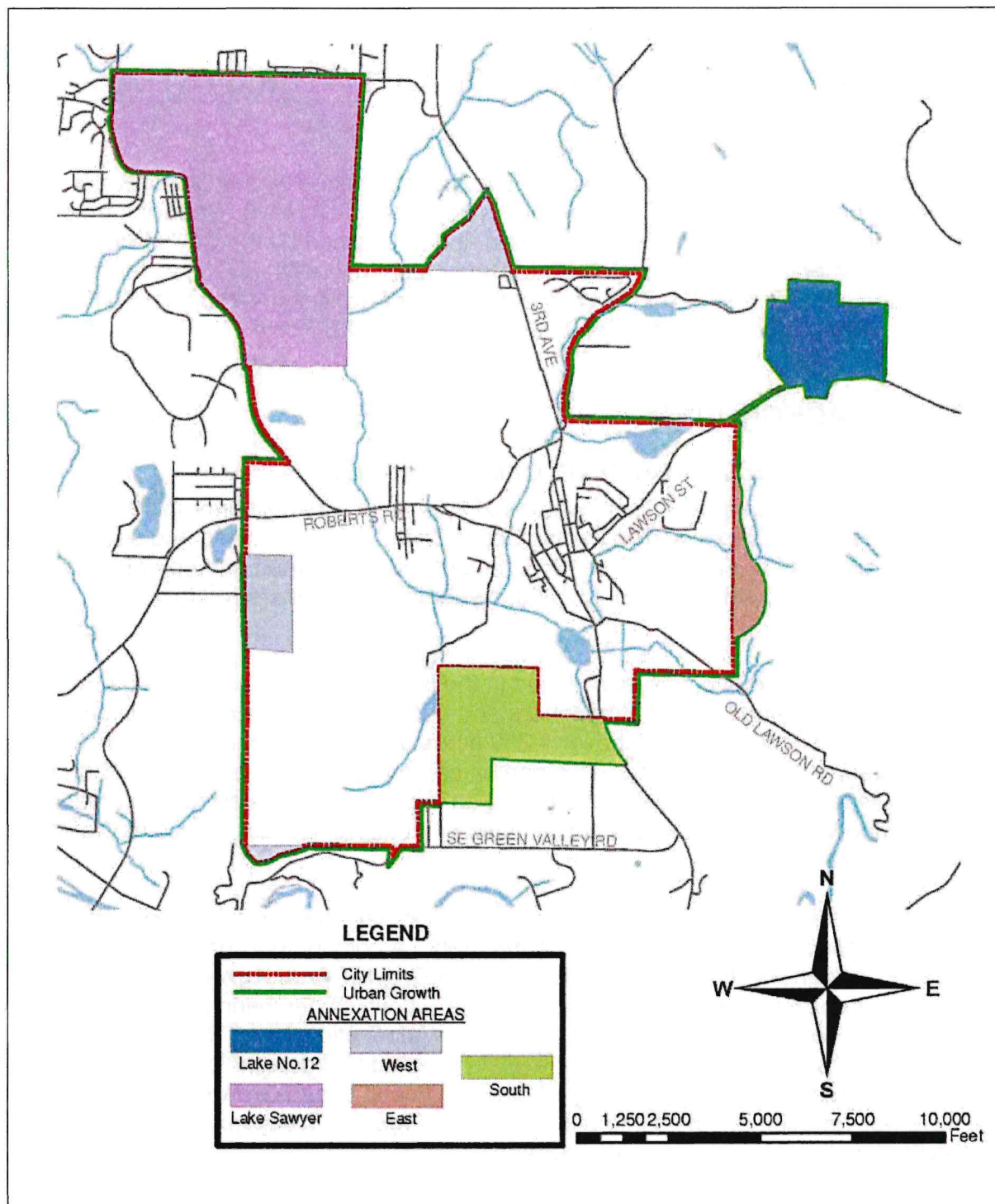


Figure 2.1, Annexation Areas

Although formal development applications have not been submitted due to the moratorium, the City is aware of two large-scale developments within the city limits that are being planned by YarrowBay Communities. “Lawson Hills at Black Diamond” is a master planned community which is expected to include approximately 1,200 new residences, as well as retail development. “Lawson Hills at Black Diamond” is anticipated to be located on over 325 acres, east of Highway 169 and south of Lawson Street.

The second large scale development is “The Villages at Black Diamond”. This master planned community is expected to include over 4,000 new residences, as well as retail, office, and other amenities. “The Villages at Black Diamond” is anticipated to be located on 950 acres, west of Highway 169 and south of Black Diamond-Auburn Road.

With the prospect of the city population more than doubling in the near future, the City of Black Diamond is facing unique challenges in ensuring that their water system will be prepared to accommodate such intense growth.

ADJACENT PURVEYORS

Water systems adjacent to the City of Black Diamond Water System include the Covington Water District. **Figure 2.2, Adjacent Water Systems** shows the location of water purveyors adjacent to the Black Diamond Service Area. Adjacent purveyors have been afforded the opportunity to comment on this Water System Comprehensive Plan. Comments received from adjacent purveyors have been included in **Appendix C – Agency Review Comments**.

Covington Water District

The Covington Water District is the purveyor for the areas to the north and to the west of the City of Black Diamond’s water service area. The Covington Water District has a service area of approximately 53 square miles and provides water to the Cities of Covington, Maple Valley, and Black Diamond, as well as unincorporated areas of King County. The District is a member of the Cascade Water Alliance. The District’s primary water supply comes from nine production wells located at two well-field sites. The District has 18 million gallons of storage in ground level steel tanks at five sites and 210 miles of pipeline. As previously mentioned, the Covington Water District is the current purveyor for the Lake Sawyer Area within the city limits of Black Diamond.

Additional systems

Additionally, there are several private wells and small public water systems served by wells and springs located within the City of Black Diamond as shown in **Table 2.1, Additional Water Systems**. The City of Black Diamond desires to discontinue the use of such systems. The City’s 1996 Comprehensive Plan outlined the City’s policy to require any new developments to hook up to the municipal water system. Additionally, the Comprehensive Plan outlines the City’s policy to prohibit new private water systems.

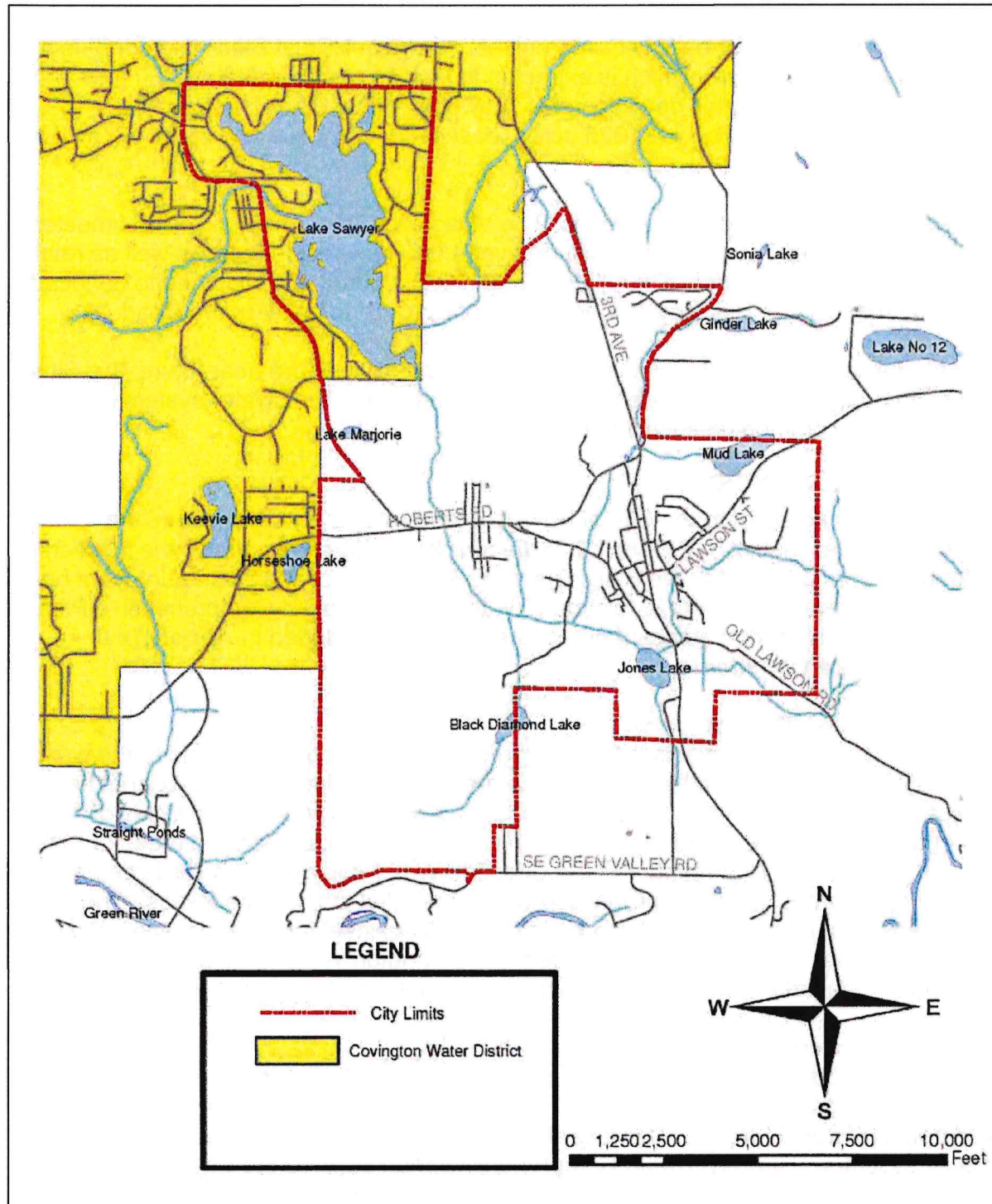


Figure 2.2, Adjacent Water Systems

Table 2.1, Additional Water Systems

| WATER SYSTEM NAME | WATER SYSTEM TYPE | # OF CONNECTIONS | SOURCE TYPE |
|-----------------------------------|-------------------|------------------|-------------|
| Diamond Springs Water Association | A | 43 | Groundwater |
| Sawyerwood Estates Water System | A | 22 | Well |
| Sawyerwood Water System | A | 11 | Well |
| Aqua Dolce Water System | B | 6 | Well |
| Beadle Freshwater Water System | B | 3 | Well |
| Boondocks Tavern | B | 2 | Well |
| Britton/Lenton Water System | B | 2 | Well |
| Callero, A | B | 4 | Well |
| Diamond Acres | B | 4 | Well |
| Diamond Ridge | B | 5 | Well |
| Henry Community WS | B | 2 | Well |
| Joyce Water System | B | 1 | Well |
| Maier / Brazier Water System | B | 7 | Groundwater |
| Oosterink Water System | B | 2 | Well |
| Pacific Coast Coal Company | B | 1 | Well |
| Palmer Spring | B | 9 | Groundwater |
| Smith, Claude | B | 3 | Well |
| Stuth Company | B | 3 | Well |
| W. & S. #1 | B | 5 | Groundwater |
| Williams, C. (Comm.) Water System | B | 4 | Well |

RELATED PLANNING DOCUMENTS

The following related planning documents were examined in the preparation of the City of Black Diamond Water System Comprehensive Plan to ensure consistency with the land use policies of all involved agencies. Comments received from these agencies have been included in **Appendix C – Agency Review Comments**. Comments and correspondence with the Department of Health, including review checklists, are included in **Appendix D – DOH Checklists and Correspondence**. Additionally, a copy of the environmental determination for this water system plan has been included in **Appendix E – SEPA Checklist**.

CITY OF BLACK DIAMOND PLANNING DOCUMENTS

City of Black Diamond Final Comprehensive Water System Plan

This document, approved by DOH in 2000, presented system improvements and projects necessary to update and enhance the existing water system facilities.

City of Black Diamond Comprehensive Plan

This document includes chapters regarding the City's urban growth area, population and employment characteristics, and land use. This plan was adopted in 1996, and amended in 2001. The City is currently in the process of updating this document.

City of Black Diamond Development Guidelines and Public Works Standards

This document, adopted by Ordinance 533 in 1995, outlines the minimum design standards and requirements for the City's water system. The City is currently in the process of updating this document.

REGIONAL PLANS AND DOCUMENTS**King County Comprehensive Plan**

The King County Comprehensive Plan was adopted in 2004 and amended in 2006. This document identifies the City of Black Diamond as a Rural City. This document also includes the City of Black Diamond within the Urban Growth Area of King County for purposes of planning land use and facility needs. The Black Diamond Water System Comprehensive Plan has been developed consistent with the King County Comprehensive Plan. A summary of the policies affecting water systems, as outlined in the King County Comprehensive Plan, have been provided by King County and are included in **Appendix C – Agency Review Comments**.

King County Code

The King County Code contains details in Chapter 13.24 regarding Water and Sewer Comprehensive Plans. A listing of the applicable code sections has been provided by King County and is included in **Appendix C – Agency Review Comments**. The Black Diamond Water System Plan has been developed in conformance with these codes.

Regional Water Supply Planning – Climate Change Technical Memorandums

The Regional Water Supply Planning Group includes a technical committee to study the regional effects of climate change. They produced a series of technical memorandums outlining anticipated regional effects. Based on a review of these memorandums, it is not anticipated that there will be any significant impacts due to climate changes during the planning period covered in this Water System Plan. However, the City of Black Diamond is committed to investigating potential impacts that future climate changes may have on its water system and proactively preparing for these impacts.

WRIA 9 Plans

King County has produced several documents regarding watershed and salmon recovery issues such as the "Final WRIA 9 Near-term Action Agenda for Salmon Habitat Recovery Planning" and "WRIA 9 Strategic Assessment Report – Scientific Foundation for Salmonid Habitat Conservation". These plans address interim and long-term conservation plans for salmon habitat in the Green/Duwamish watershed. The Black Diamond Water System Plan does not propose any improvements that are known to be in conflict with these planning documents.

South King County Coordinated Water System Plan

The South King County Coordinated Water System Plan (SKCCWSP) was approved in 1990. It was developed by King County and the South King County Regional Water Association (SKRWA). The SKRWA is a group of water purveyors who assumed the responsibility of obtaining grant funding from the DOH for preparation of the South King County CWSP. The Plan consists of a regional plan, as well as individual water system plans prepared by the utilities for their designated service areas. The purpose of the plan was to assure an adequate supply of potable water for domestic, commercial, and industrial use through coordinated water supply planning and development. Furthermore, the South King County Coordinated Water System Plan provided minimum planning and design standards to ensure individual water systems are developed consistent with regional needs. The Black Diamond Water System Comprehensive Plan has been developed consistent with the South King County Coordinated Water System Plan. A copy of the SKCRWA Joint Operating Agreement has been included in **Appendix F – SKCRWA Joint Operating Agreement**.

South King County Groundwater Management Plan

The South King County Groundwater Management area encompasses nearly 260 square miles mostly within the Green-Duwamish Watershed. The City of Black Diamond is located within the plan area, near the eastern boundary. The majority of the water used for private, municipal, industrial, and agricultural purposes in the South King County Groundwater Management Area is provided by groundwater sources. The City of Black Diamond recognizes the importance of protecting groundwater sources. The Black Diamond Water System Plan does not propose any improvements that are known to be in conflict with groundwater management planning documents.

Cascade Water Alliance 2004 Transmission and Supply Plan

The Cascade Water Alliance was formed through an interlocal agreement by eight public water systems in King County. Cascade Water Alliance serves as a regional water supplier to the following eight members: City of Bellevue, City of Tukwila, City of Kirkland, City of Issaquah, City of Redmond, Covington Water District, Sammamish Plateau Water and Sewer District, and the Skyway Water and Sewer District. In January 2004, the Cascade Water Alliance began delivering regional water supplies to its members.

This Transmission and Supply Plan meets the requirement of DOH for public water systems to prepare a water system plan every six years. The Cascade Water Alliance Transmission and Supply Plan addresses water supply and transmission needs. Local distribution of the water supply is covered in the separate Water System Plans prepared by the members of the Cascade Water Alliance.

The Cascade Water Alliance Plan was reviewed because one of the members of the Cascade Water Alliance, Covington Water District, is an adjacent purveyor to the City of Black Diamond and serves the Lake Sawyer area within the City of Black Diamond. This Black Diamond Water System Plan has been developed consistent with the Cascade Water Alliance Transmission and Supply Plan.

Covington Water District Water System Plan Update

Covington Water District is an adjacent purveyor to the Black Diamond Water System. The Covington Water District Water System Plan Update was prepared in February 2007. This plan identifies present and future needs for the District and outlines a plan for achieving these goals. This Black Diamond Water System Comprehensive Plan has been developed consistent with the Covington Water District Water System Plan Update.

City of Tacoma Water Plan Update

The City of Black Diamond has negotiated a long-term supply of water with the City of Tacoma. The City of Tacoma Water Plan Update was approved by the Department of Health on January 23, 2008. This Black Diamond Water System Comprehensive Plan has been developed consistent with the City of Tacoma Water Plan Update.

INVENTORY OF EXISTING FACILITIES

This section provides a detailed description of the existing water system and the current operation of the facilities. The analysis of the existing water system is presented in **chapter 4– System Analysis**.

SYSTEM OVERVIEW

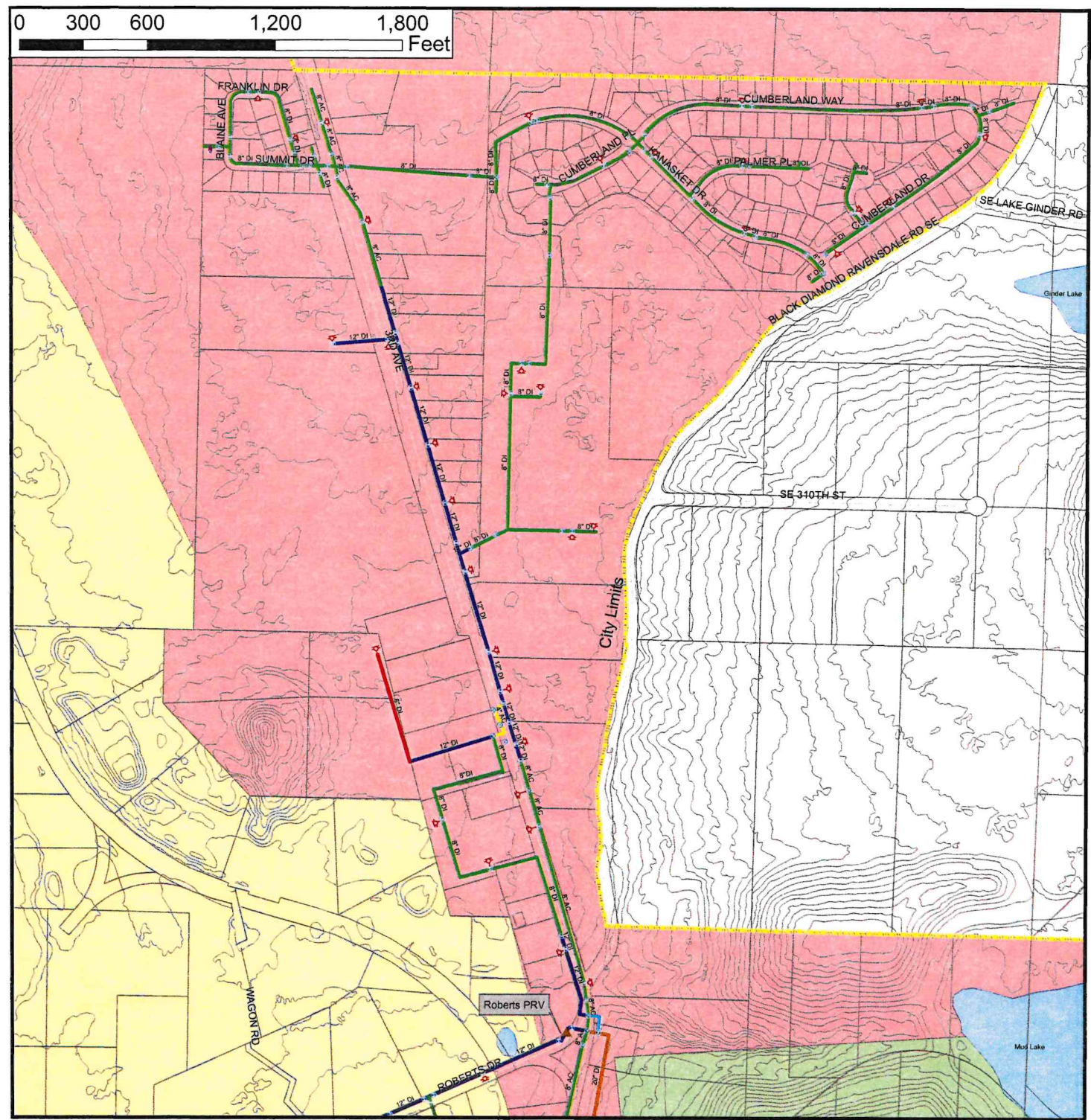
The Black Diamond water system is primarily served by the Black Diamond Spring Field, located approximately two miles southeast of the City. Water from the Black Diamond Spring Field is pumped to the 4.3 MG Reservoir by an electric pump station located on the north side of the river. An additional source of water for the City is a recent intertie with the City of Tacoma Second Supply Pipe Line (SSPL).

The City has two reservoirs which serve the City of Black Diamond. The City's distribution system currently operates with three pressure zones – the upper pressure zone at a pressure head of approximately 965 feet, the middle pressure zone at a pressure head of approximately 850 feet, and the lower pressure zone at a pressure head of approximately 750 feet. The system operates with high pressures, so there are individual pressure-reducing valves (PRV's) on all service connections throughout the city. **Figure 2.3, Comprehensive Water System Map** illustrates the existing configuration of the Black Diamond Water Distribution System. A full size copy of this map has also been provided in **Appendix G –Water System Map**.

SOURCE OF SUPPLY**Black Diamond Spring Field**

The City of Black Diamond's primary source of water is from a series of natural springs. This area has been officially designated as a spring field as shown on the Water Facilities Inventory form which has been included in **Appendix A – Water Facilities Inventory (WFI) Form**. **Figure 2.4, Black Diamond Spring Field Collection System** shows the configuration of the Black Diamond Spring Field. The springs are located

NORTH BLACK DIAMOND



Matchline "SOUTH BLACK DIAMOND" (See Sheet 2)

BLACK DIAMOND SPRINGFIELD

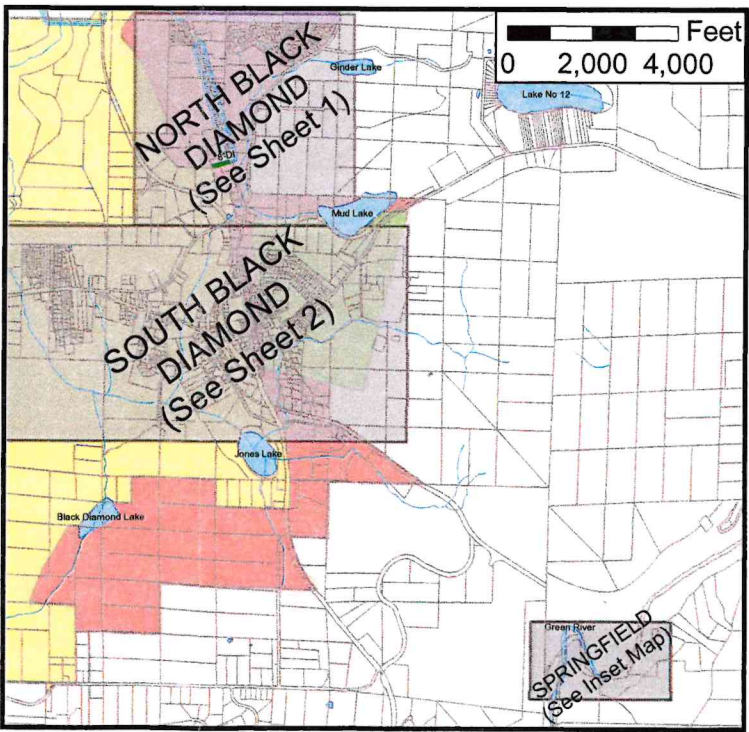
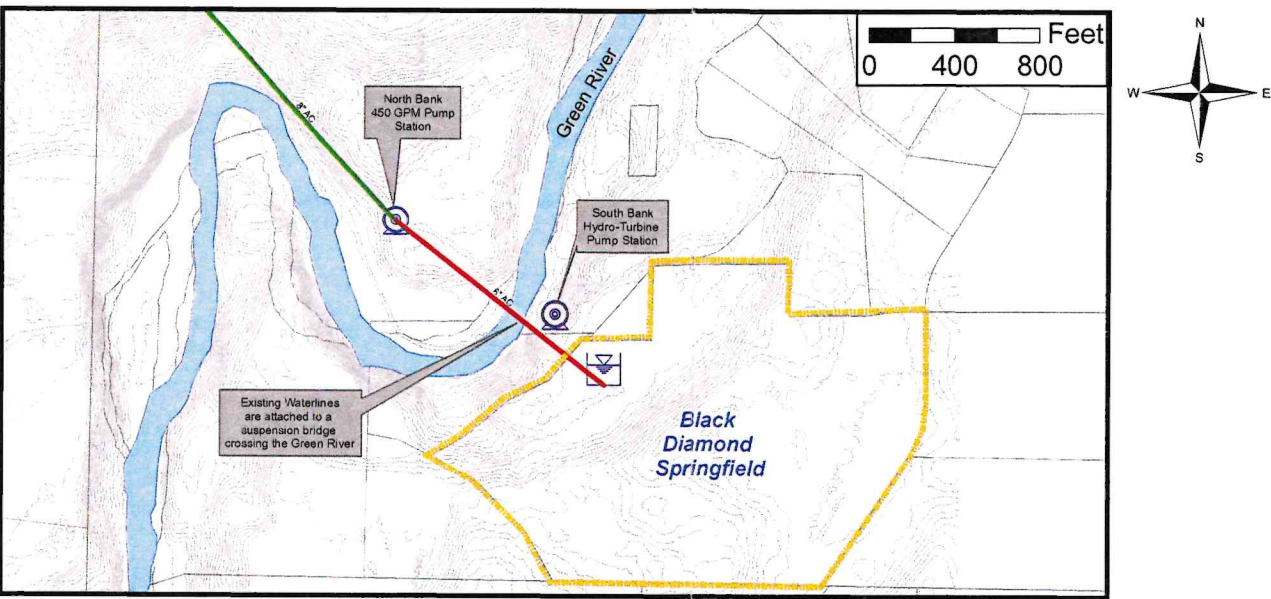


FIGURE 2.3a
CITY OF BLACK DIAMOND
COMPREHENSIVE WATER
SYSTEM MAP



PacWest Engineering, LLC
5009 Pacific Highway East, Unit 9-0
Fife, WA 98424
Phone (253) 926-3400
Fax (253) 926-3402

- LEGEND**
- Tank
 - Hydrant
 - Pressure Reducing Valve
 - Valve
 - Pump Station

- 750 Pressure Zone
- 850 Pressure Zone
- 965 Pressure Zone

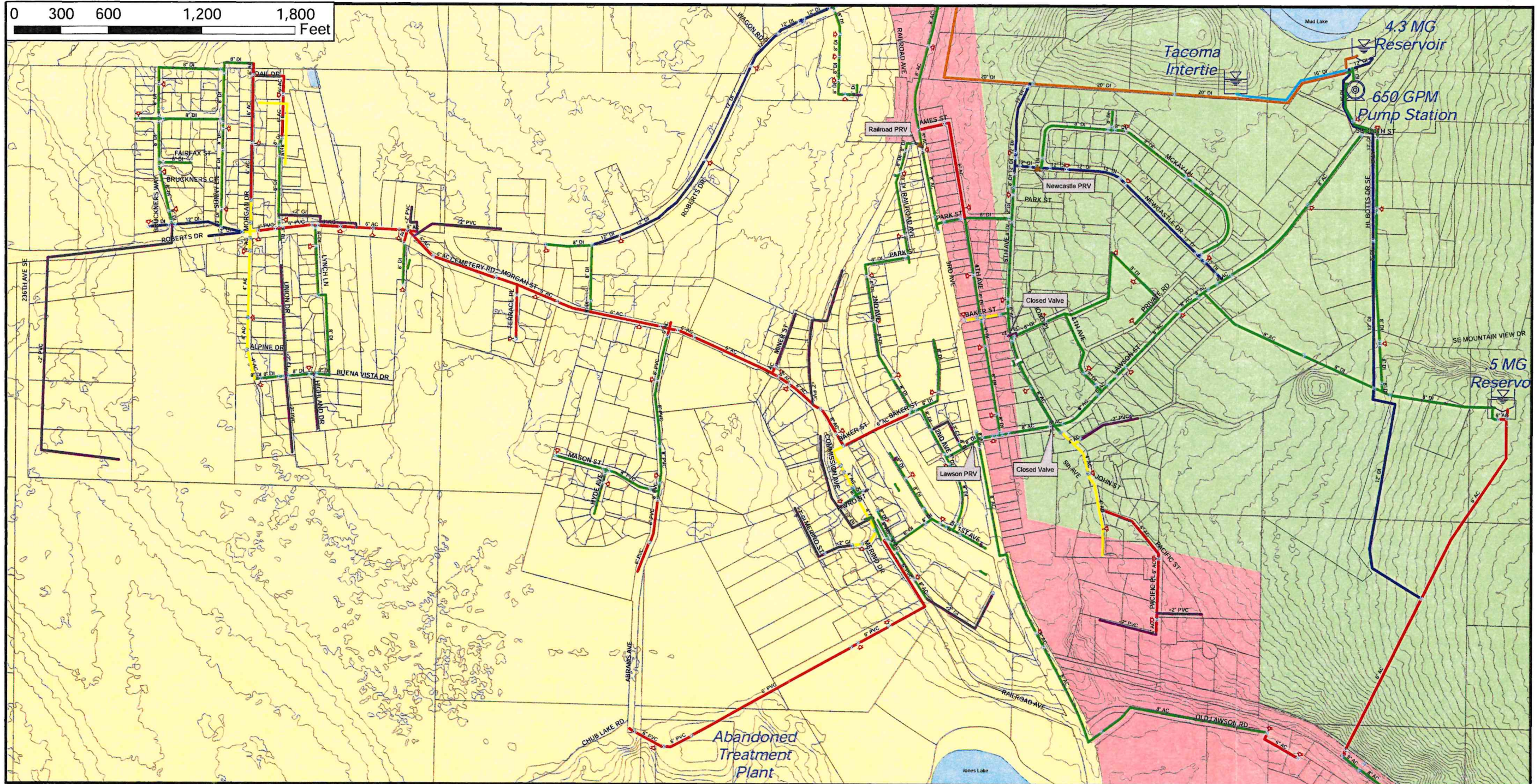
- City Limits
- 2" or Smaller Waterline
- 4" Waterline
- 6" Waterline
- 8" Waterline
- 12" Waterline
- 16" Waterline
- 20" Waterline

SOUTH BLACK DIAMOND

Matchline "NORTH BLACK DIAMOND" (See Sheet 1)



0 300 600 1,200 1,800 Feet



Approximately 1.3 miles
to Black Diamond Springfield
(See inset map on sheet 1)

Sheet 2



PacWest Engineering, LLC
5009 Pacific Highway East, Unit 9-0
Fife, WA 98424
Phone (253) 926-3400
Fax (253) 926-3402

FIGURE 2.3b
CITY OF BLACK DIAMOND
COMPREHENSIVE WATER
SYSTEM MAP

- LEGEND**
- Tank
 - Hydrant
 - Pressure Reducing Valve
 - Valve
 - Pump Station

- 750 Pressure Zone
- 850 Pressure Zone
- 965 Pressure Zone

- City Limits
- 2" or Smaller Waterline
- 4" Waterline
- 6" Waterline

- 8" Waterline
- 12" Waterline
- 16" Waterline
- 20" Waterline

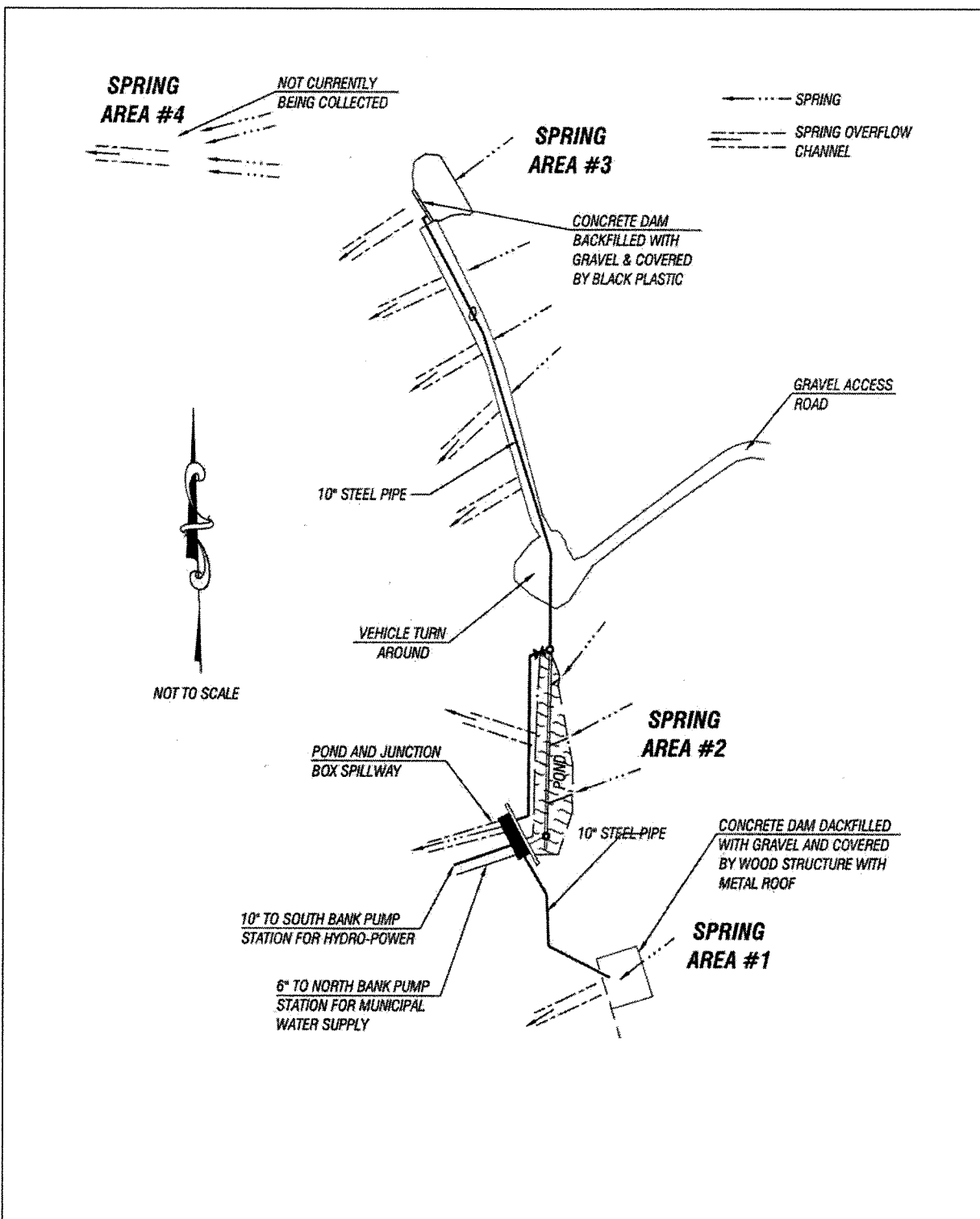


Figure 2.4, Black Diamond Spring Field Collection System

approximately two miles southeast of the City on a large city-owned parcel. The City has attempted to limit unauthorized entry to this property by fencing the site with a chain-link and barbwire fence, as well as locked access gates. Accessibility to the Black Diamond Spring Field is limited and difficult. There are steep, narrow roadways which are inaccessible at times of the year. Access by construction vehicles is difficult as dump-trucks must back into the site for extended distances.

There are four major collection areas associated with the Black Diamond Spring Field. Water from two of the four collection areas is currently used for the City's drinking water system. One of the collection areas has been placed out of service at this time, and the fourth collection area is considered a future source of supply for the City.

Black Diamond Spring Field Collection Area #1, also known as the South Springs, is backfilled with gravel and covered with clear plastic and rocks. The discharge area is covered by a small, wood framed structure with a corrugated metal roof. The roofed structure was constructed in order to minimize rain water infiltration. There is a sample collection tap located at Black Diamond Spring Field Collection Area #1. Excess flow discharges downstream and into the Green River. The land located below Collection Area #1 has eroded significantly within recent years and may become a future concern as to its long-term viability. Water collected flows in a 10" steel pipe towards the Black Diamond Spring Field Collection Area #2.

Black Diamond Spring Field Collection Area #2, also known as the Middle Springs, is comprised of a series of small springs which discharge into a long, narrow pond that is approximately 200 feet in length. This collection area is not currently in use and has been taken off-line because of GWI. The catchment area is currently heavily covered with forest undergrowth and ferns. A pipe, roughly 200' in length, is laid along the length of the pond. The spring water is piped towards a concrete junction box.

Black Diamond Spring Field Collection Area #3, also known as the North Springs, is located at the base of a steep hillside and consists of a concrete dam backfilled with gravel and rocks. The spring area is covered by black plastic in order to protect the collection area. The spring water is collected in a 10" steel pipe and flows towards the junction box.

Black Diamond Spring Field Collection Area #4, also known as the Palmer Spring Area, is not being collected from at this time. Collection Area #4 is considered a potential future source of supply for the City of Black Diamond.

Flow from Collection Areas #1 and #3 is combined at Collection Area #2 and directed to a concrete junction box. This concrete junction box is part of a dam with spillway that was constructed in the late 1890s. There are two discharge pipes (6" and 10" diameters) from this junction box that travel downhill a distance of approximately 460 feet (elevation drop of 150 feet) to a pump house located on the south bank of the Green River, approximately 30 feet above the waterline. The 6" pipe supplies the City

of Black Diamond's municipal water supply. The 10" pipe provides water for hydraulic power.

A hydrogeology report prepared for the City in 1989 estimated that the average total combined discharge from Collection Areas #1, #2, & #3 was approximately 20 cfs (12.9 MGD). The capacity range was estimated from 5 to 40 cfs (3.2 MGD to 25.9 MGD). The discharge flow from Collection Area #4 was estimated to be approximately 10 cfs (6.45 MGD) with a range of 4 to 25 cfs (2.6 MGD to 16.2 MGD). These estimated values are summarized below in **Table 2.2, Black Diamond Spring Field Capacity**.

Table 2.2, Black Diamond Spring Field Capacity

| SPRING COLLECTION AREA(S) | ESTIMATED CAPACITY | ESTIMATED CAPACITY RANGE |
|---------------------------|--------------------|--------------------------|
| 1, 2, & 3 | 20 cfs | 5 – 40 cfs |
| 4 | 10 cfs | 4 – 25 cfs |

Water Rights

The City of Black Diamond has two water right certificates currently on file with the Washington State Department of Ecology (DOE). The source of water for both certificates is the Black Diamond Spring Field. Certificate of Water Right No. 3580 authorizes diversion of 2.93 cfs continuously for production of power to operate a hydro-pump. Certificate of Water Right No. S1-00506C authorizes the diversion of 8.0 cfs with an annual limit of 551 acre-feet. **Table 2.3, City of Black Diamond Water Rights** summarizes the water rights for the City of Black Diamond. Copies of the Water Right Certificates and the Water Rights Self Assessment Form can be found in **Appendix H – Water Rights**.

Table 2.3, City of Black Diamond Water Rights

| CERTIFICATE NUMBER | PRIORITY DATE | SOURCE TYPE | MAX. INSTANTANEOUS WITHDRAWAL | MAX. ANNUAL WITHDRAWAL |
|--------------------|-----------------|---------------|---------------------------------|------------------------|
| | | | (CFS) | (ACRE FT) |
| 3580 | August 22, 1949 | Surface Water | 2.93 (for the purpose of power) | -- |
| S1-00506C | April 15, 1958 | Surface Water | 8.0 | 551 |

City of Tacoma Intertie

Water system interties are physical connections between two adjacent water systems. Interties are normally separated by a closed isolation valve or control valve. Emergency supply interties provide water from one system to another during emergency situations only. An emergency situation may occur when a water system loses its main source of supply or a major transmission main and is unable to provide a sufficient quantity of

water to its customers. Normal supply interties provide water from one system to another during non-emergency situations and are typically supplying water at all times.

The City of Black Diamond negotiated a Wholesale Water Agreement with the City of Tacoma in 2003 wherein the two agencies agreed that the City of Tacoma would supply wholesale water to Black Diamond. The supply quantities are outlined in **Table 2.4, City of Tacoma Intertie Maximum Water Supply**. Under the terms of the agreement, the City of Black Diamond is responsible for significant System Development Charges (SDC's) associated with the connection to the City of Tacoma to be repaid over a ten year period.

The intertie connection to the City of Tacoma's Second Supply Pipeline (SSPL) Project was constructed in 2005. Amendment No. 1 to the agreement was approved in 2007 and included the purchase of additional water. Copies of the 2003 Wholesale Water Agreement and Amendment No. 1 have been included in **Appendix I – City of Tacoma Wholesale Agreement**.

Table 2.4, City of Tacoma Intertie Maximum Water Supply

| AGREEMENT | DATE OF AGREEMENT | MAXIMUM SUPPLY OF WATER PER AGREEMENT |
|---------------------------|-------------------|--|
| Wholesale Water Agreement | 8/1/2003 | 1,712,000 gpd for average day use 3,852,000 gpd for peak day use 3,659,400 gpd for four-day peak use |
| Amendment #1 | 2/1/2007 | 500,000 gpd for average day use 1,125,000 gpd for peak day use 1,068,750 gpd for four-day peak use |

PUMPING FACILITIES

The City currently operates and maintains three pump stations. One is located on the northerly side of the Green River, one is located on the south bank of the Green River, and the third is located at the 4.3 MG Reservoir site. Pump curves for the City of Black Diamond pumping facilities are located in **Appendix J – Pump Curves**

South Bank Pump Station

The pumping facilities on the south bank of the Green River receive water in a 10" diameter line directly from the Black Diamond Spring Field. The hydro-pump is a water-driven centrifugal pump which generates hydraulic power. The hydro-pump facilities face maintenance and repair difficulties due to the fact that the facilities are more than 60 years old. Two 6" waterlines run in parallel across the Green River on a steel suspension bridge from the South Bank Pump Station to the North Bank Pump Station.

The pumping unit at the South Bank Pump Station is a water turbine with a nominal horsepower rating of 39.7 HP at 1,450 rpm. This unit drives a centrifugal pump with a theoretical maximum pump speed of 2,960 rpm, however, the maximum speed

measured on the drive unit is 1,325 rpm with a resultant pump speed of 2,700 rpm. At this maximum speed, the pump produces approximately 160 gpm while the turbine drive uses approximately 1,400 gpm. The South Bank Pump Station is currently not in service by the City. It is recommended that the pump operations and safety be evaluated prior to being considered for use.

North Bank Pump Station

The North Bank Pump Station was constructed in 1997 and replaced an older pump station which was located on the same property. The North Bank Pump Station has a maximum capacity of approximately 450 gpm. The pump station operates two electric pumps with a standby generator system. The two pumps were designed to operate at 450 gpm each. A waterline (varying from 8" AC to 6" AC to 12" DI) runs from the North Bank Pump Station to the 4.3 MG Reservoir.

4.3 MG Reservoir Pump Station

The pump station located at the 4.3 MG Reservoir site was constructed in 2006. This pump station operates two electric pumps with a standby generator system. The two pumps are operating at a capacity of 650 gpm each. An 8" waterline runs from the 4.3 MG Reservoir Pump Station to the City's .5 MG Reservoir.

STORAGE

The City currently is served by two reservoirs. An overview of the City's reservoirs is provided in **Table 2.5, City of Black Diamond Reservoirs**.

.5 MG Reservoir

The .5 MG Reservoir is located on a City parcel which is approximately 1,200 feet easterly up a gravel road from the intersection of HL Botts Dr SE and SE Mountain View Drive. This reservoir was constructed in 1986 and has a capacity of 500,000 gallons. The .5 MG Reservoir is at an approximate elevation of 930 feet¹ with an overflow elevation of approximately 965 feet.

4.3 MG Reservoir

The 4.3 MG Reservoir is located just west of the intersection of Lawson Road and SE Botts Drive on a City parcel. This reservoir was constructed in 2006 and has a capacity of 4.3 Million Gallons. The Lower Reservoir is at an approximate elevation of 770 feet with an overflow elevation of approximately 850 feet.

Table 2.5, City of Black Diamond Reservoirs

| RESERVOIR NAME | VOLUME (GAL) | OVERFLOW ELEV (FT) | MATERIAL | YEAR BUILT |
|------------------|--------------|--------------------|----------|------------|
| .5 MG Reservoir | .5 MG | 965 ft | Steel | 1986 |
| 4.3 MG Reservoir | 4.3 MG | 850 ft | Steel | 2006 |

¹ Prior reports, studies, and designs have shown the Upper Reservoir to be located at an approximate elevation of 915 feet with an overflow elevation of 950 feet. Physical topographic surveying completed for the City of Black Diamond in 2004 resulted in the revised elevations.

PRESSURE ZONES

The City of Black Diamond's Water System consists of 3 pressure zones – the 750 pressure zone, the 850 pressure zone, and the 965 pressure zone. An existing system hydraulic profile is shown on **Figure 2.5, Existing Hydraulic Profile**. This figure shows the vertical relationship of the pressure zones and demonstrates how the water moves throughout the system. Additionally, **Figure 2.6, Pressure Zones** shows the various pressure zones located within the City. These pressure zones have been defined through the use of Pressure Reducing Valves (PRV's) and closed valves in the system. It should be noted the 1175 pressure zone shown on **Figure 2.6, Pressure Zones** is a future pressure zone and is not part of the existing water system.

PRESSURE REDUCING VALVES

Pressure reducing valves (PRV's) are installed between pressure zones to allow water from a higher level pressure zone to flow into the lower level pressure zone at reduced pressures. The pressure reducing valves hydraulically vary the flow rates in order to maintain a constant and preset pressure in the downstream or lower level pressure zone. This results in a safe range of pressures in the lower zone. The City of Black Diamond has several PRV's installed throughout the City to help moderate pressures in the distribution system. Additionally, individual pressure reducing valves are installed on all service meters within the system in order to further control pressures.

Table 2.6, Pressure Reducing Valves summarizes the City's existing PRV's.

Table 2.6, Pressure Reducing Valves

| PRV | LOCATION | ELEV. (FT) | DOWNSTREAM PRESSURE SETTING (PSI) | UPPER PRESSURE ZONE | LOWER PRESSURE ZONE |
|-----|--------------|---------------|---|---------------------------|---------------------------|
| 1 | Lawson Rd | 669 | 40.0 | 850 | 750 |
| 2 | Newcastle Dr | 727 | 53.2 | 965 | 850 |
| 3 | Roberts Dr | 612 | 62.0 | 850 | 750 |
| 4 | Railroad Ave | 634 | 55.0 | 850 | 750 |

TRANSMISSION & DISTRIBUTION

Pipes

The existing transmission and distribution system is shown in **Figure 2.3, Comprehensive Water System Map**. The water system consists of approximately 108,000 lineal feet of pipe, including approximately 10,500 lineal feet of transmission mains. The existing transmission and distribution system consists of pipes ranging in size from 1.5" to 20". The pipes are manufactured from various materials, including asbestos cement (AC), ductile iron, cast iron, and PVC. **Table 2.7, Pipe Inventory** shows a breakdown of the various pipe sizes and materials.

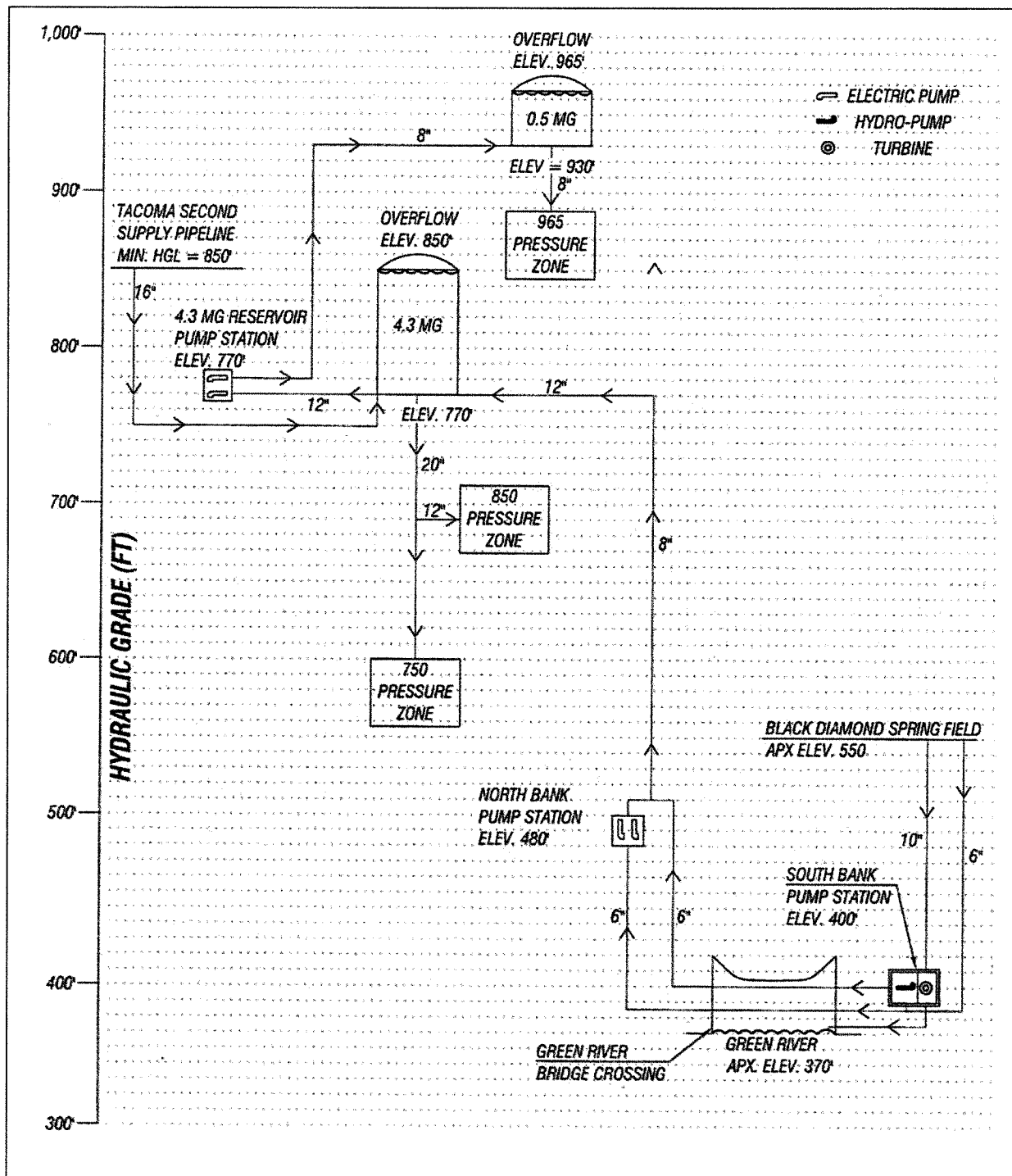


Figure 2.5, Existing Hydraulic Profile

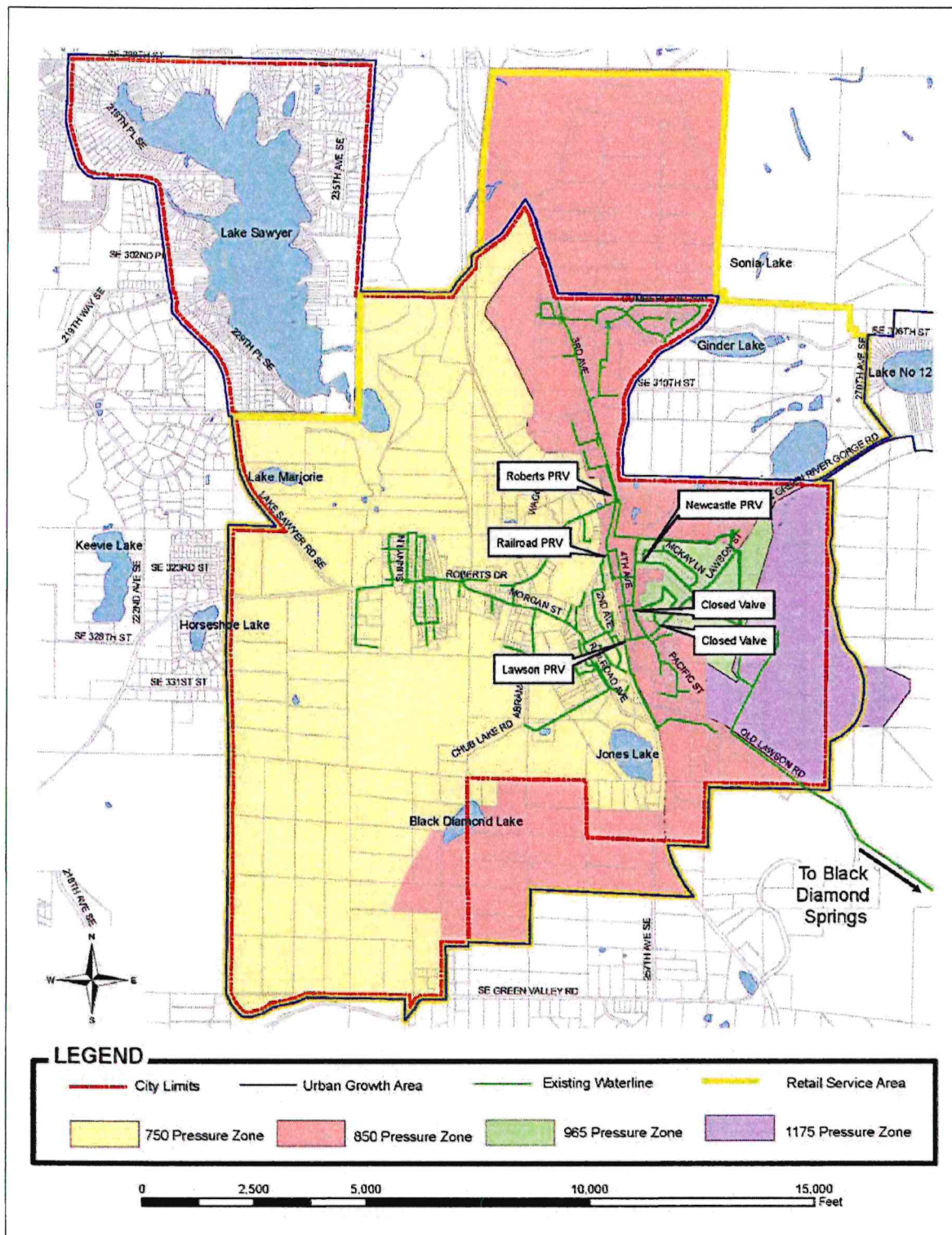


Figure 2.6, Pressure Zones

Table 2.7, Pipe Inventory

| DIAMETER (IN.) | PIPE MATERIAL | APX. LENGTH (LF) | % OF TOTAL |
|---------------------------|----------------------|-----------------------------|-----------------------|
| 2" or smaller | Galvanized Iron | 3,800 | 3.5% |
| | PVC | 6,250 | 5.8% |
| 3" | PVC | 200 | .2% |
| 4" | Ductile Iron | 400 | .4% |
| | Asbestos Cement | 3,600 | 3.3% |
| 6" | Ductile Iron | 550 | .5% |
| | Asbestos Cement | 11,400 | 10.6% |
| | PVC | 3,800 | 3.5% |
| 8" | Ductile Iron | 42,000 | 38.9% |
| | Asbestos Cement | 15,000 | 13.9% |
| | PVC | 2,500 | 2.3% |
| 10" | Steel | 500 | .5% |
| 12" | Ductile Iron | 13,300 | 12.3% |
| 16" | Ductile Iron | 1,000 | .9% |
| 20" | Ductile Iron | 3,700 | 3.4% |
| TOTAL | | 108,000 LF | 100% |

Meters

There are currently 846 metered service connections within the City of Black Diamond. 792 (over 93%) of these connections are for single family residences. The remaining meters are for public buildings and facilities, multi-family residences, a mobile home park, and commercial businesses.

TELEMETRY & CONTROL SYSTEM

A telemetry and supervisory control system collects information and can efficiently control a water system by automatically optimizing facility operations. The telemetry and control system is capable of providing alarm notifications in the event of equipment failure, reservoir overflow, or other emergency situations. The City of Black Diamond has a telemetry and control system that was put into operation in 2006. The operation of the telemetry system is controlled on-site at the 4.3 MG Reservoir.

TREATMENT FACILITIES

The Black Diamond water system is currently disinfected via a hypochloride chlorination system at the North Bank Pump Station. Corrosion treatment is provided at the pump station located at the 4.3 MG reservoir site.

EXISTING SERVICE AREA & CHARACTERISTICS**WATER SERVICE AREA**

The boundaries of the Black Diamond Water System's retail and future service areas are depicted in **Figure 2.7, Water Service Area**.

Retail Service Area

The Municipal Water Supply – Efficiency Requirements Act, Chapter 5, Laws of 2003 (Municipal Water Law), amended the State Board of Health Code (RCW 43.20) to require that municipal water suppliers provide water service to all new retail customers within a retail service area under certain conditions. A retail service area is the area within which water is or will be sold directly to the ultimate consumers.

According to the Municipal Water Law, a municipal water supplier has a duty to serve new water service within the identified retail service area if the utility meets the criteria listed below. Black Diamond meets these criteria and thus has a duty to serve within the retail service area.

- Can provide water service in a timely and reasonable manner;
- Has sufficient water rights, or uses water from a source that has a water right;
- Has sufficient capacity to serve the water in a safe and reliable manner as determined by the Department of Health; and
- Is consistent with the requirements of any comprehensive plans or development regulations adopted under RCW 36.70A or any other applicable adopted comprehensive plans, land use plans, or development regulations.

It should be noted that a portion of the Retail Service Area is outside of the Future Service Area as defined in the SKC-CWSP. The location of this boundary discrepancy is in the western half of the western annexation area as recently annexed by the City. This land is anticipated to be developed in conjunction with the anticipated development in this area. The City and Covington Water District are cooperatively preparing an interlocal agreement reflecting this boundary adjustment. The City of Black Diamond will participate in a future update to the SKC-CWSP to ensure this boundary revision is properly reflected.

PHYSICAL ENVIRONMENT²

Planning for the future water system requires a basic understanding of the physical environment of the service area. A working knowledge is useful in identifying any constraints which may affect the development of the water system. Physical characteristics which influence planning and design include topography, geology and soils, surface water, groundwater, and climate. Descriptions of these characteristics, as well as a summary of environmentally sensitive areas in the City are as follows:

² This section on the Physical Environment is an excerpt from City of Black Diamond, Final Comprehensive Water System Plan, 2000.

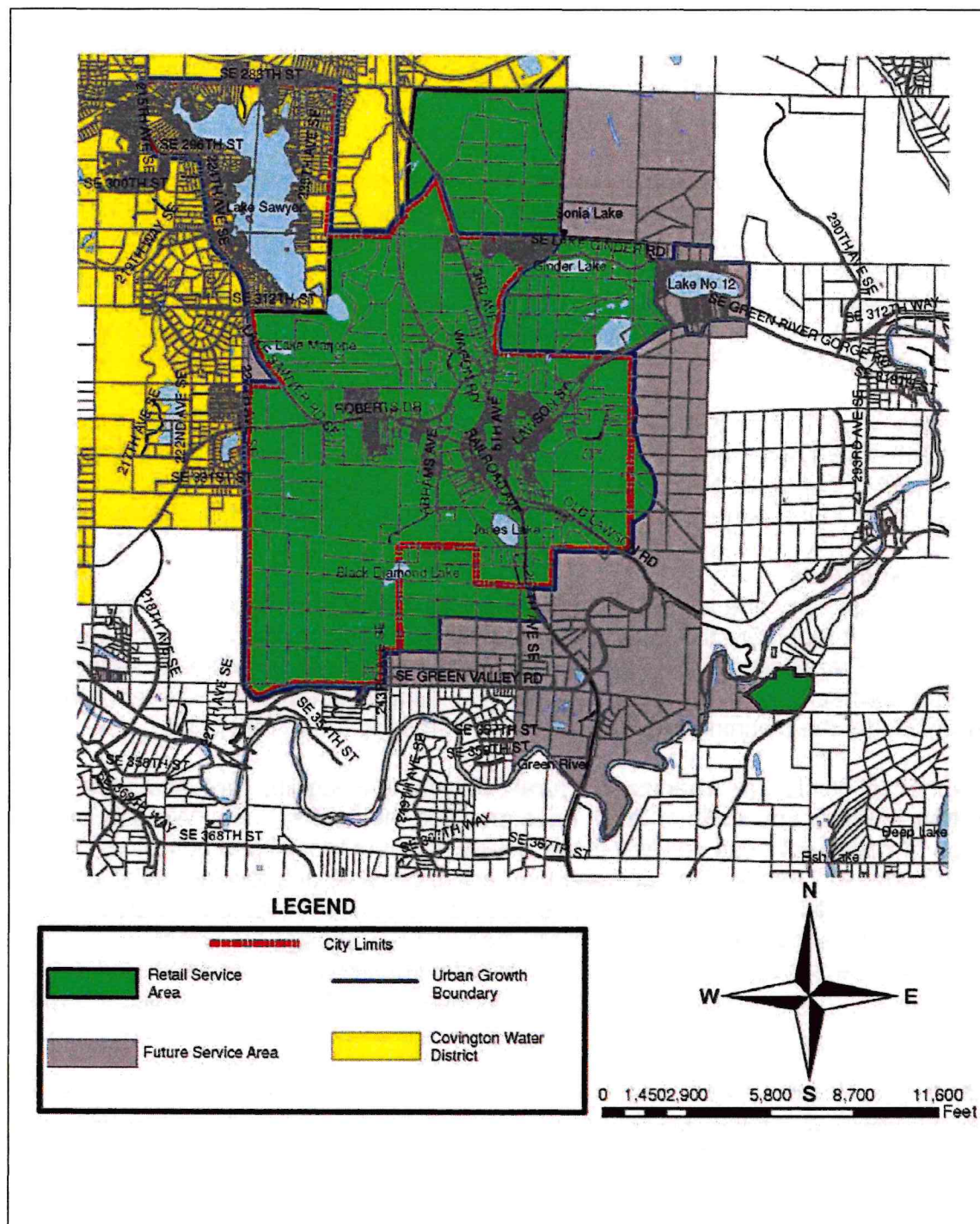


Figure 2.7, Water Service Area

Topography

The City is situated on an upland plateau bounded on the south and southeast by the Green River and on the northeast by the Cascade Range. Depressions and hummocks characterize the rolling glacial terrain.

The plateau is dotted with lakes and cut by numerous streams which drain to the Green River. The plateau is deeply incised by the Green River gorge located approximately two miles south of the City. The descent to the River is steep with a maximum slope of approximately 55%.

Elevations within the existing City limits vary between approximately 500 feet at Morganville to 1,000 feet at the eastern perimeter. Most of the existing buildings within the City are located at lower elevations, between approximately 500 and 700 feet.

Elevations within the study area range from approximately 300 feet in the southwestern corner of the study area near the banks of the Green River, to over 1,200 feet in the eastern part of the study area outside the City limits. Elevations of at least 1,000 feet are also found in the northeast corner of the study area, northeast of Lake No. 12.

Geology and Soils

The surficial geology and landforms in the Black Diamond area, located on the Covington Drift Plain, are the result of the most recent regional glaciation, the Vashon Stade of the Fraser glaciation. The Vashon ice sheet completely melted from the Black Diamond area approximately 10,000 years ago. During the maximum extent of the Vashon Stade, the planning area was covered with up to 2,000 feet of ice.

Since the last glaciation, urbanization, rural development, logging, gravel mining activities, erosion, and sedimentation have modified the land surface. Weathering and erosion of native soils has resulted in the development of topsoil and colluvium at the ground surface. The topsoil in undeveloped areas consists of a few inches of silt and sand with decayed roots and leaves. The weathered soils underlying the topsoil consists of silty sand and gravel with roots, generally extending 2 to 6 feet. Topographic depressions and low gradient stream channels have accumulated soft organic silt and peat. In general, the areas underlain by organic silt and peat are within wetland areas.

Vashon recessional outwash mantels the west portion of the City. The soil consists of sand and gravel with variable amounts of silt and cobbles deposited by the rivers emanating from the melting front of the Vashon ice sheet. This soil is considered a valuable gravel resource in this area depending on its thickness and silt content.

Vashon till is at the ground surface in some areas of the east portion of the City. Till consists of unstratified silt, sand, gravel and cobbles that are in a very dense condition because of being overridden by the glacial ice. Till is usually 20 to 40 feet thick and probably underlies the recessional outwash but may be absent where eroded during deglaciation meltwater runoff episodes.

Pre-Vashon glacial and interglacial sediments underlie the Vashon till in the west portion of the City area where bedrock is deep. The pre-Vashon glacial and interglacial sediments consist of interbedded and/or stratified silt, gravel and till. These soils are not exposed at the ground surface in the City, but are exposed in the upper walls of the Green River gorge, south of the City, and are penetrated by water wells in the west portion of the area.

Bedrock of the Puget Group underlies the City and surrounding area. The bedrock is locally exposed at the surface in the east portion of the area and in the walls of the Green River gorge. The bedrock consists of sedimentary sandstone, mudstone, shale and coal. Based on elevations of surface exposures and the interpretation of well water logs by Icicle Creek Engineering, Inc., bedrock underlies the property at a depth of 200 feet or more in the west portion of the City.

Surface Water

The City's service area lies within the Duwamish/Green River drainage basin. A number of lakes, wetlands, and creeks lie within the service area.

Black Diamond Lake and Jones Lake are located in the southern part of the City limits. Ginder Lake and Lake No. 12 are located east of the City limits within the future service area. Two smaller lakes, Oak Lake and Frog Lake, are located within the western part of the City limits. Lake Sawyer is one of the largest lakes in terms of size and volume in the Green River basin and is located in the recently annexed portion of the City but outside the future service area. It discharges to Covington Creek which in turn discharges to Big Soos Creek. The Big Soos Creek flows into the Green River near the town of Auburn. Lake levels of Lake Sawyer are controlled by a privately owned and operated concrete dam at the entrance of Covington Creek.

Rock Creek is the principal drainage basin in the City and flows north to Lake Sawyer. Ginder Creek, Lawson Creek and three smaller creeks drain into Rock Creek. Existing development in the City is located in the central portion of the drainage basin. All development within the Rock Creek basin (including that outside of City limits) is preferred by the County and City to be served by public sewer. Land use control within the basin is also viewed by the City as critical in order to promote open space and protect the drainage basin from future degradation.

The Green River originates in the western Cascade range approximately 30 linear miles east of the City. Flows in the river result largely from rainfall runoff and snowmelt. Flows are regulated approximately 20 miles upstream of the City by a flood control structure operated by the Corps of Engineers known as the Howard Hanson Dam. Approximately 3 miles downstream from the dam, the City of Tacoma operates a water intake structure capable of diverting water to the McMillin Reservoir near Tacoma.

Groundwater

Groundwater occurs in three aquifer systems beneath the service area. These aquifer systems include (1) a seasonal shallow, or "perched", unconfined aquifer in the

weathered soil and recessional outwash overlying till of bedrock, (2) an intermediate depth, regional, unconfined and confined aquifer system within the pre-Vashon glacial and interglacial sediments, and (3) a confined regional aquifer system within the bedrock.

The shallow aquifer system is the primary water resource penetrated by most of the domestic wells in the service area. At least seven water wells penetrate the intermediate depth aquifer in the area. The intermediate depth aquifer has for development as a water resource based on limited available information regarding this aquifer. The deep bedrock aquifer is controlled by fractures in the bedrock. Several domestic wells penetrate the bedrock aquifer in the east portion of the area, but are typically very low in yield.

A potential groundwater resource was recently identified in the southwest portion of the area, on the Black Diamond Associates property. Preliminary studies of this groundwater resource by others indicate its potential to supplement the City's public water supply system, subject to securing water rights.

Groundwater Quality

The shallow aquifer is particularly vulnerable to contamination from the surface and may dry out seasonally in some areas. The intermediate depth aquifer is recharged over a very large area and is generally protected from contamination from the surface. The bedrock aquifer often contains water with elevated levels of minerals, such as iron and sulfur, that may affect water quality.

Groundwater Flow Patterns

Groundwater flow patterns have both horizontal and vertical components. In the Black Diamond area, the primary vertical component of flow is downward percolation from the shallow aquifer, through the underlying till or fractures in the bedrock, and into the intermediate or deep bedrock aquifer. Horizontal groundwater flow in the shallow aquifer discharges to surface water features Rock Creek, Ravensdale Creek and Crisp Creek.

Groundwater Recharge

Groundwater recharge to the shallow aquifer is primarily from precipitation or infiltration of surface water runoff from adjacent areas. As precipitation falls on the ground surface, a portion infiltrates the soil. Precipitation that does not infiltrate remains on the surface, filling small depressions or moving downslope as surface runoff. Some shallow infiltrated water is used by plants and returns to the atmosphere by evapotranspiration. When the soil moisture content is high, such as occurs after a long period of rainfall, some water within the soil migrates downward. Downward percolation of water is impeded by relatively impermeable till or bedrock that underlies most of the area. Where water is concentrated within topographic low areas such as wetland or streams, there is generally more recharge than in topographic high area, where the surficial aquifer is dry much of the time.

The intermediate depth and deep bedrock aquifer systems are recharged by infiltrating water over an area much larger than the City area.

Information regarding groundwater wells in the area was collected for the Brown and Caldwell hydrogeology report of the Black Diamond Springs (1989) and well log information collected by Robinson & Noble, Inc. (1990) regarding well development in the southeastern corner of the City limits.

Climate

The Pacific Ocean and Puget Sound moderate temperature extremes in the region while the Cascade Mountains influence the area's precipitation. Precipitation in the area occurs primarily due to cooling of moisture-laden air masses as they flow and rise over the Cascade Mountains.

Annual precipitation ranges from 45 to 70 inches, averaging approximately 55 inches. More than 80% of the precipitation occurs October through May and 50% from November through February. Total evaporation averages approximately 25 inches per year with approximately 75% occurring during the months of May through August. Precipitation and evaporation were measured at the Landsburg weather station located approximately 5 miles north northeast of the City of Black Diamond.

Available temperature data is also from the Landsburg weather station. Low temperatures in December and January average 30° to 33° F and the highs range from 41° to 46° F. In July and August the average low temperature is approximately 50° F and the high 75° F. The lowest recorded temperature from 1976 to 1993 was 0° F in February 1989 and the highest recorded temperature was 102° F in August 1981 and May 1983.

Prevailing wind direction is from the south to the southwest during the rainy season and from the west or northwest in summer. Average wind velocity is less than 10 mph.

Mining Activity

Abandoned coal mines underlie at least 50,000 acres in western and central Washington. Many of the abandoned, underground mines present in the Black Diamond area have been documented by the State. Applicants for building permits in abandoned coal mine areas are required to demonstrate the safety of the proposed project. Mitigation of a mine may be required, and a horizontal buffer of 500 feet from the vertical projection of the mine is required, regardless of depth, unless otherwise recommended by a geotechnical report by a professional engineer with expertise in geotechnical engineering. High hazard areas are typically those areas underlain by mine workings shallower than 200 feet or fifteen times the knees of the coal seam for gently dipping seams. Moderate hazard areas are areas where more workings are deeper than 200 feet or deeper than fifteen times the knees of the seam or workings for gently dipping seams. The study by professional engineers should detail the presence of surface openings, potential sinkholes, depth of working, and a detailed examination of historic mine maps and records.

Environmentally Sensitive Areas

The Black Diamond Municipal Code Chapter 19.12 establishes regulations for development in environmentally sensitive areas. These regulations were developed in order to prevent action undertaken by any person or entity resulting in a substantial environmental alteration. Specific information on the location and extent of sensitive areas within the City can be obtained from the City while sensitive area information for other areas is available from King County. Any development should be coordinated with the City's Wellhead Protection Map.

Environmentally sensitive areas include wetlands, fish and wildlife habitat conservation areas and geologically hazardous areas. Geologically hazardous areas include areas that are not suitable to development due to their susceptibility to erosion, sliding, earthquake or other geological events. A geotechnical report prepared by a licensed professional engineer is required prior to any development in these areas.

Fish and wildlife conservation areas within the City include Rock Creek and Ginder Creek corridors, open water ponds, lakes and riparian forests. Geologically hazardous areas include steep slopes (greater than 25%) and past coal mine working areas. Development around wetland areas requires buffer zones in order to reduce or mitigate any adverse impact. Permitted activities within the buffer zones include passive recreation, parks, pedestrian and bicycle trails and road and utility facilities when necessary.

ZONING & LAND USE

Land use and zoning play an important role in determining growth patterns, and therefore future water requirements. Future land use, variations in use, and changing population densities, as determined by applicable zoning ordinances, can significantly impact the City of Black Diamond's ability to provide adequate water service.

Figure 2.8, City of Black Diamond Draft Land Use is the proposed land use for the City as included in the City of Black Diamond Draft Comprehensive Plan. This figure shows designated land use within incorporated Black Diamond and the portions of unincorporated King County that are within the City's water service area. Current land uses are primarily residential uses, with some light industrial and commercial areas.

Figure 2.9, Unincorporated King County Land Use includes the designated land uses for the area of unincorporated King County within the Black Diamond water service area. **Figure 2.10, King County Zoning** includes the zoning designations as defined by King County.

FUTURE SERVICE AREA

The City of Black Diamond's future service area has been modified from the previous future water service area as identified in the South King County Coordinated Water System Plan (SKCCWSP). The SKCCWSP established future water service areas for

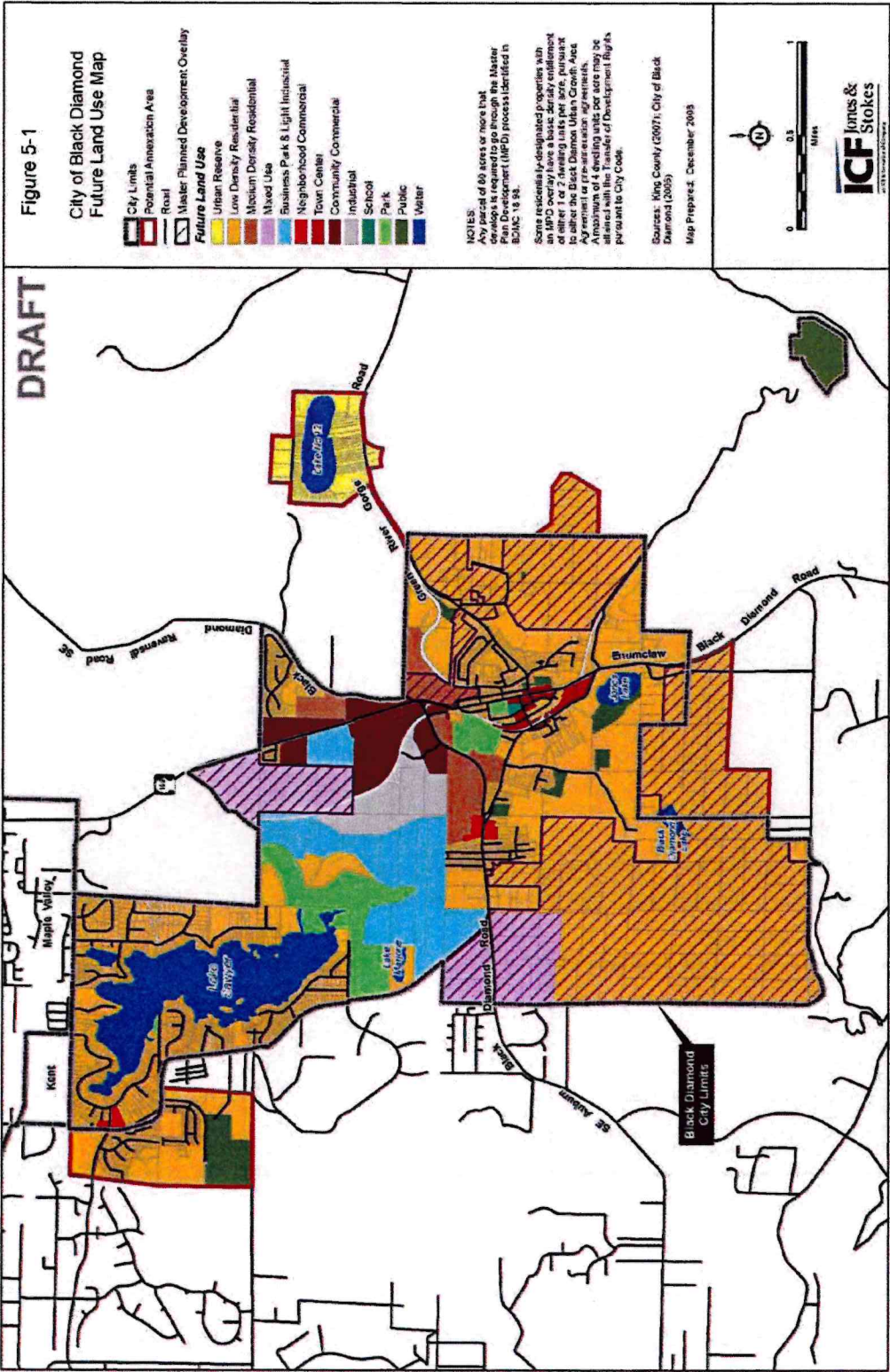


Figure 2.8, City of Black Diamond Draft Land Use

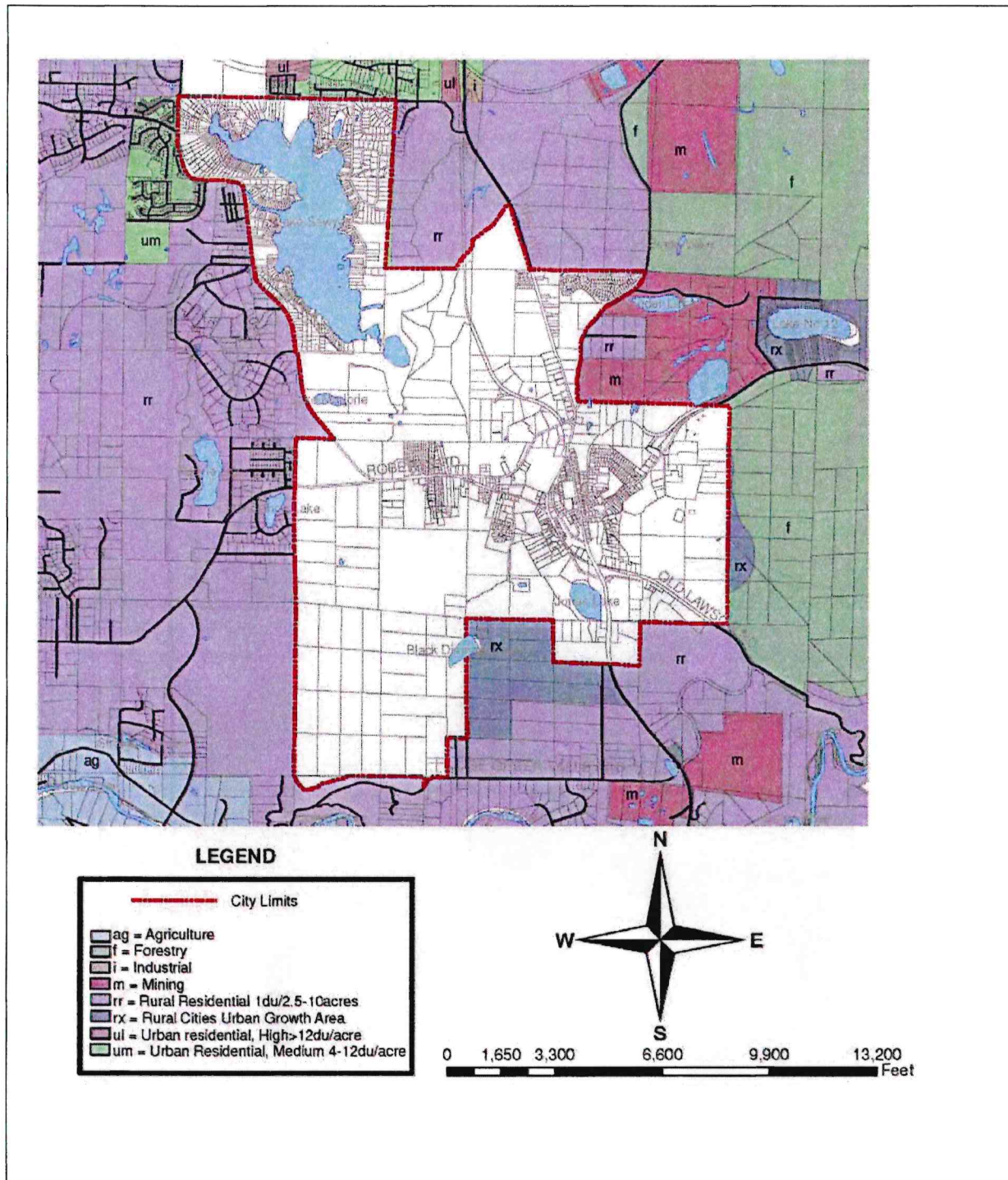


Figure 2.9, Unincorporated King County Land Use

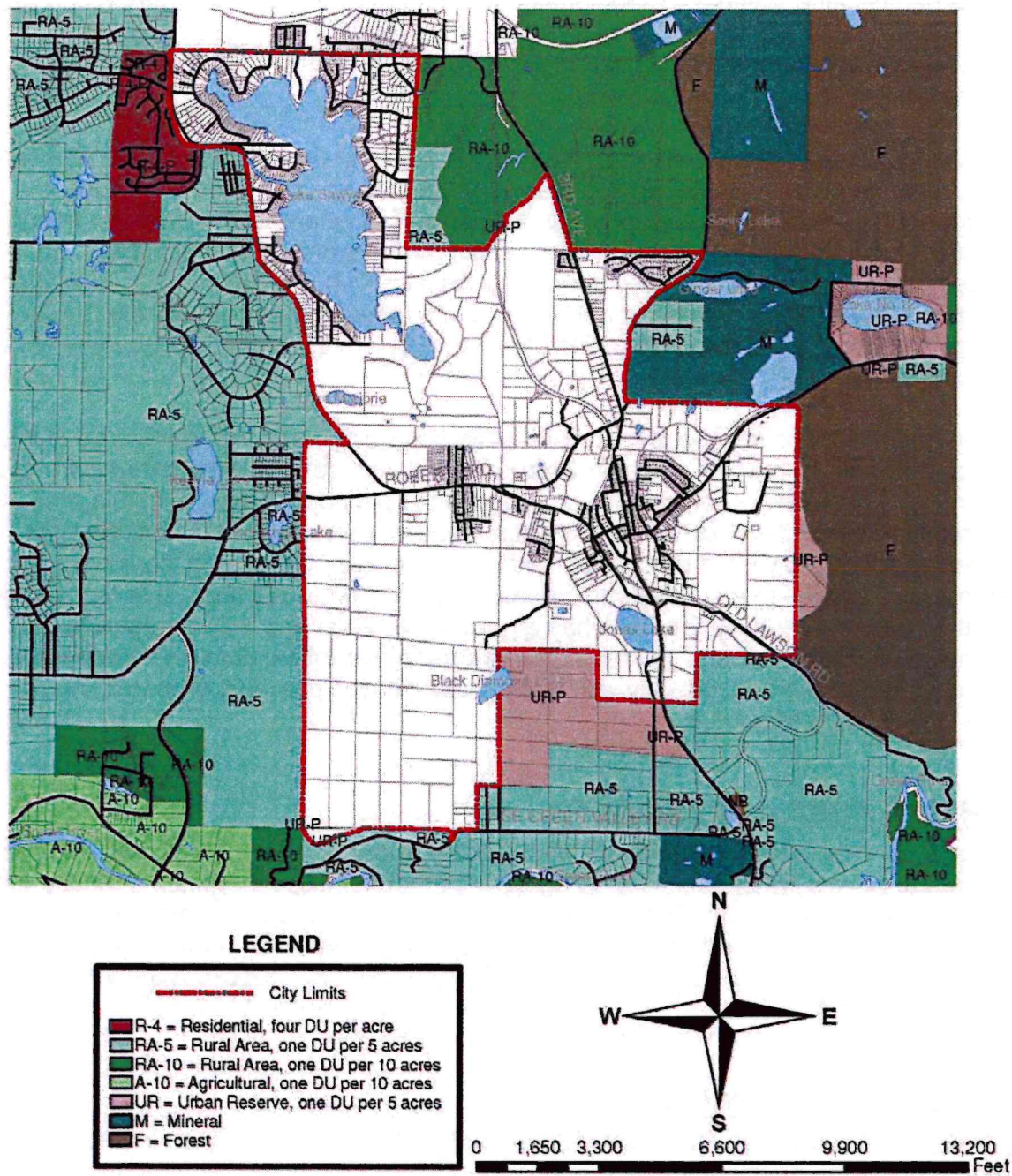


Figure 2.10, King County Zoning

the utilities that are included in the plan. A service area agreement was prepared by the South King County Water Utilities Coordinating Committee (SKCWUCC) and agreed to by the participating utilities. A copy of the “Interlocal Agreement for Establishing Water Utility Service Area Boundaries as Identified by the South King County Coordinated Water System Plan” has been included in **Appendix K – SKC-CWSP Service Area Agreement**.

The City of Black Diamond has proposed a modified boundary of their Future Service Area. This boundary is more representative of geographic conditions and more accurately reflects where development may occur. The adjustment of this boundary will not affect adjacent purveyors, with the exception of the small portion along the City’s western boundary which has been previously discussed in this plan. The City of Black Diamond is committed to working with King County on a future update of the South King County Coordinated Water System Plan to ensure that this updated boundary is reflected properly.

In general, the future service area for Black Diamond expands the service area to the east and to the south which are unincorporated, rural areas. If development were to occur, the City of Black Diamond would likely be the provider of service in this area. It is unforeseeable that development of the future service area will occur within the near future; however, the City of Black Diamond recognizes its obligation to consider extension of service to any developing parcel requiring water service. It is recognized that this rural area outside the UGA has a rural designation and may not require the extension of public facilities. However, if it is determined that water service will be extended to these areas, the City will be the water service provider, or else they will have the first right of refusal.

SERVICE AREA AGREEMENTS

All water purveyors located within a Critical Water Supply Service Area (CWSSA) are required to have a water service area agreement that identifies the external boundaries of their water service area. The City of Black Diamond has a service area agreement that was developed as part of the South King County Coordinated Water System Plan. A copy of this agreement has been included in **Appendix K – SKC-CWSP Service Area Agreement**.

SERVICE AREA POLICIES

The service area policies for the Black Diamond Water System have been developed in order to guide the development and financing of the infrastructure required to provide water service throughout the service area. **Table 2.8, Service Area Policies** summarizes the City’s policies.

Table 2.8, Service Area Policies

| POLICY NAME | |
|--|---------------------------------------|
| CITY POLICY | REFERENCE |
| WHOLESELLING WATER POLICY | |
| It is the City's policy to not allow wholeselling of water from the City of Black Diamond Water System. | Water System Plan |
| WHEELING WATER POLICY | |
| It is the City's policy to not allow wheeling of water through the City's water system. | Water System Plan |
| ANNEXATION POLICY | |
| It is the City's policy to ensure that development does not occur before it can be adequately served by public facilities, utilities, and services. Therefore, new development outside the City limits will be controlled by annexing designated expansion areas according to an identified timetable. | Comprehensive Water System Plan, 2000 |
| DIRECT CONNECTION AND SATELLITE / REMOTE SYSTEMS POLICY | |
| New development in the City limits shall be required to hook up to the municipal water system for water service. (<i>Policy CF-5</i>). | Comprehensive Plan, 1996 |
| Prohibit new private water systems within the city. Existing development with private systems must connect to municipal water. (<i>Policy CF-12</i>) | Comprehensive Plan, 1996 |
| Satellite management of other water systems is limited at this time due to current levels of staffing but could be accomplished depending on the timing and size of proposed development. The City proposes to consider requests for service on a case-by-case basis, reserving the right for either system extension or satellite management. | Comprehensive Water System Plan, 2000 |
| DESIGN AND PERFORMANCE STANDARDS POLICY | |
| The City Water Ordinance (Black Diamond Municipal Code, Chapter 13.04) specifies regulations concerning service connections, metering and billing. | City of Black Diamond Municipal Code |
| The City Water Ordinance is found in the Black Diamond Municipal Code, Chapter 13.04. The City Water Ordinance specifies regulations concerning service connections, metering and billing. In addition, the City has developed draft Development Guidelines and Public Works Standards. These standards provide requirements for developers performing work within public right-of-ways or publicly owned easements. | Comprehensive Water System Plan, 2000 |
| Upgrade existing deficiencies in water service (including fire flow). (<i>Policy CF-3</i>). | Comprehensive Plan, 1996 |
| SURCHARGE FOR OUTSIDE CUSTOMERS POLICY | |
| The minimum monthly water rates for all users outside the city limits shall be charged one hundred percent (or twice) the rate charged to users inside the city limits. In addition, in the event of a shortage of | City Municipal Code Section 13.04.280 |

| | |
|---|---------------------------------------|
| water, all water users within the city limits shall have a first priority over users outside the city limits. | |
| Requests for service to areas outside the City limits and established potential annexation areas will be considered on a case by case basis. In general, it is the goal of the City to annex those areas to which public services are to be extended. However, this may not always be practical or possible, and in some instances an annexation, or other interlocal agreement may be required in order to serve these properties as development requires. | Comprehensive Water System Plan, 2000 |
| It is recommended that the City establish a special rate structure for customers served by extensions to the system. The rate structure would intend to cover operation and maintenance costs, as well as long term replacement costs for extensions to the system. It is recommended that the rate structure be tiered based on the geographic location in relation to the core system. | |
| FORMATION OF LOCAL IMPROVEMENT DISTRICTS OUTSIDE LEGAL BOUNDARIES POLICY | |
| It is the City's policy to only allow formation of Local Improvement Districts outside of its legal boundaries to relieve health hazard conditions. | Water System Plan |
| UGA POLICY | |
| Design new development to allow for efficient and economical provision of water services, and require new development to pay its fair share of the cost of providing service. <i>(Policy CF-4)</i> | Comprehensive Plan, 1996 |
| LATE-COMER AGREEMENTS POLICY | |
| The City of Black Diamond has drafted a late-comer agreement policy for adoption by the City Council. | |
| OVERSIZING POLICY | |
| Ensure that the water service necessary to support future development will be adequate to serve development at the time the development is available for occupancy and use. | Water System Plan |
| Maintain an updated Water Plan which is coordinated with the Land Use Plan so that new development is located where sufficient system capacity exists or can be logically extended. <i>(Policy CF-6)</i> | Comprehensive Plan, 1996 |
| CROSS-CONNECTION CONTROL PROGRAM POLICY | |
| No service connection shall be allowed from the city mains to any premises supplied by water from any other source, unless special permission is given by the water superintendent, which special permission may be terminated at any time if in the judgment of the water superintendent the public interest so requires. | City Municipal Code Section 13.04.090 |
| No cross-connection shall be made or maintained between any city service connection and pipe supplying water from any other source unless the water supplied from the other source, by tests of the State | City Municipal Code Section 13.04.090 |

| | |
|---|--|
| Board of Health, is shown to conform to the United States Bacteriological Standard for drinking water. The tests must be made by a professional tester and submitted to the city at least once a month. | |
| EXTENSION POLICY | |
| Where property is located within the city's water service area and within the city limits, and where there is no existing water main laid, or where the capacity of existing water mains is not sufficient to meet the demands of new construction, the installation and cost of a water main extension to service such property previously unserved shall be the responsibility of the applicant. The applicant shall enter into a developers' extension agreement with the city prior to water system plan extension approval. | City Municipal Code, Section 13.04.040 |
| The City currently has a moratorium (Ordinance 700) on restricting the creation of new lots within the City. Although this limits the number of water connections that are expected in the short term, it is considered temporary and is not considered in the Plans projections. The moratorium is in place to give the City the opportunity to evaluate and update its development regulations. It was established in response to large scale development proposals. | Comprehensive Water System Plan, 2000 |
| It is recommended that the City establish a formal policy regarding extensions to the Water System within the future service area. This policy would cover a special rate structure for customers served by extensions to the system. The rates structure would cover operation and maintenance costs, as well as long term replacement costs for extensions to the system. It is recommended that the rate structure be tiered based on the geographic location in relation to the core system. | |
| ADDITIONAL SYSTEM POLICIES | |
| Requests for new service (individual and group) shall submit an application for water availability certificate which shall be reviewed by the City. The City shall not issue a certificate until a complete building permit application has been received and the connection fees and meter fees paid. Typically review and approval of requests for new service are completed within 30 days of application for individual services. Review and approval of group services varies depending on the size and/or complexity of the proposed development/use. | Municipal Code |
| Maintain an up-to-date record/database of the current system capacity being utilized, as well as the amount of outstanding system capacity, in order to be able to respond to requests for water availability certificates. | |
| Water Availability certificates expire at the same time that the associated building permit expires. Time extensions for water availability certificates shall be submitted to the Public Works Director for review and approval. Disputes or appeals shall be forwarded to the City Council for resolution | |
| Establish a reserve fund and pursue outside funding services to finance | Comprehensive |

DESCRIPTION OF WATER SYSTEM

PacWest Engineering, LLC

| | |
|---|---------------------------------------|
| needed improvements to the water system. (<i>Policy CF-1</i>) | Plan, 1996 |
| Ensure coordination between the City and adjacent Water Districts and municipal owned systems. (<i>Policy CF-7</i>) | Comprehensive Plan, 1996 |
| Encourage conservation efforts to address the need for adequate supply of water resources, and to protect natural resources. Efforts include, but are not limited to public education, water reuse and reclamation, use of native and/or drought resistant landscaping, low flow shower heads, conservation credits, and energy in new and existing buildings. (<i>Policy CF-9</i>) | Comprehensive Plan, 1996 |
| Reduce unaccounted for water loss. (<i>Policy CF-10</i>) | Comprehensive Plan, 1996 |
| Track the total water connections (and ERU's) to the water system, as a means to monitor available water capacity. Initiate a certificate of water availability requirement for proposed development. (<i>Policy CF-11</i>) | Comprehensive Plan, 1996 |
| Service area exchanges with neighboring purveyors may be required from time to time in order to best serve individual properties. Such exchanges will be considered on a case by case basis and interlocal service area exchange agreements will be required. | Comprehensive Water System Plan, 2000 |

CHAPTER 3

BASIC PLANNING DATA & WATER DEMANDS

CHAPTER 3 – BASIC PLANNING DATA & WATER DEMANDS

CURRENT POPULATION, SERVICE CONNECTIONS, WATER USE, AND EQUIVALENT RESIDENTIAL UNITS

CURRENT POPULATION

The 2007 population within the City of Black Diamond is 4,120 per the Washington State Office of Financial Management (OFM). Approximately 1,500 people of this total amount are located in the Lake Sawyer area and are not included in the City of Black Diamond's current water service area.

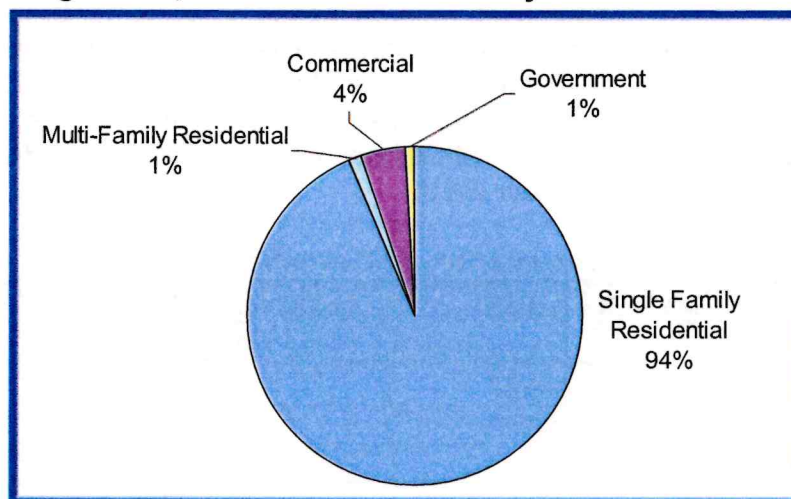
TOTAL SERVICE CONNECTIONS

As shown in **Table 3.1, Service Connections** the City of Black Diamond currently has 846 active service connections. 94% of these connections are for single family residences as shown in **Figure 3.1, Service Connections by Customer Class**.

Table 3.1, Service Connections

| CUSTOMER CLASSIFICATION | NUMBER OF SERVICE CONNECTIONS |
|---------------------------------------|-------------------------------|
| Single Family Residential | 792 |
| Multi-Family Residential ³ | 9 |
| Commercial | 37 |
| Government | 8 |
| TOTAL | 846 |

Figure 3.1, Service Connections by Customer Class



³ This includes a mobile home park with approximately 120 units

EQUIVALENT RESIDENTIAL UNITS

The demand of each customer class can be expressed in terms of equivalent residential units (ERUs) for demand forecasting and planning purposes. One ERU is equivalent to the amount of water used by a single family residence. An ERU is calculated by dividing the total volume of water utilized in the single family customer class by the total number of single family residential connections. The volume of water used by other customer classes can then be divided by this number to determine the equivalent residential units utilized by the other customer classes.

Table 3.2, Equivalent Residential Units (ERUs) provides the average daily consumption for each class, the equivalent residential units, and the average ERUs per connection for the Black Diamond Water System.

Table 3.2, Equivalent Residential Units (ERUs)

| CUSTOMER CLASS | AVERAGE DAILY WATER CONSUMPTION (GPD) | TOTAL ERUs | AVERAGE ERUs PER CONNECTION |
|---------------------------|---------------------------------------|-------------|-----------------------------|
| Single Family Residential | 153,726 | 792 | 1.0 |
| Multi-Family Residential | 52,356 | 270 | 30.0 |
| Commercial | 11,890 | 61 | 1.7 |
| Government | 1,288 | 7 | 0.8 |
| TOTAL | 219,260 | 1130 | 1.3 |

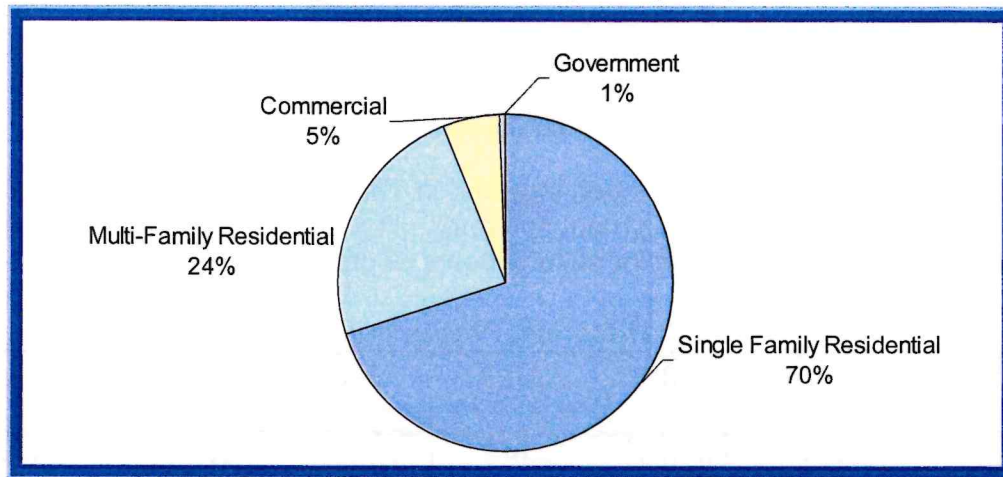
EXISTING WATER DEMANDS

Water Consumption

Water consumption is the amount of water used by all customers of the system, as measured by the customer's meters. Meter data for the City of Black Diamond is collected monthly. Recent consumption records, based on customer billing records, are included in **Table 3.3, Consumption by Customer Class (2006)**. **Figure 3.2, Consumption (2006)** indicates that roughly 70% of the consumption has been by the Single Family Residential Customer Class. Historical consumption rates are included in **Table 3.4, Historical Consumption – M-Gal per Year** and **Table 3.5, Historical Consumption - Gallons per Day per ERU**.

Table 3.3, Consumption by Customer Class (2006)

| CUSTOMER CLASS | ANNUAL CONSUMPTION (M-GAL) |
|---------------------------|----------------------------|
| Single Family Residential | 56.11 |
| Multi-Family Residential | 19.11 |
| Commercial | 4.34 |
| Government | .47 |
| TOTAL | 80.03 |

Figure 3.2, Consumption (2006)**Table 3.4, Historical Consumption – M-Gal per Year**

| 2004 | 2005 | 2006 | 2007 |
|---------|---------|---------|---------|
| 74.8124 | 77.9468 | 80.0269 | 75.8544 |

Table 3.5, Historical Consumption - Gallons per Day per ERU

| 2004 | 2005 | 2006 | 2007 | AVERAGE |
|------|------|------|------|---------|
| 181 | 189 | 194 | 184 | 187 |

Water Supply

Water supply, or production, is the total amount of water supplied to the system, as measured by the meters at each supply source. Water supply is different than water consumption in that water supply is essentially the recorded amount of water put into the system and water consumption is the recorded amount of water taken out of the system. The measured amount of water supply of any system is typically larger than the measured amount of water consumption, due to non-metered water use and water loss (i.e. unaccounted-for water).

The Black Diamond Water System has two sources of supply – the Black Diamond Spring Field and the City of Tacoma Intertie. Supply meters are monitored and read daily by City personnel.

Recent production information has been included in **Table 3.6, Production (2006)**. In comparing production records to consumption records for the same time period, it appears that consumption was greater than production. City staff is aware that there are discrepancies with their historical production meter readings. The City replaced the source meter in August of 2007. The new meter is being monitored at least twice a week and records are now showing that the City is producing more water than is being consumed.

Table 3.6, Production (2006)

| ANNUAL PRODUCTION (M-GAL) |
|--------------------------------------|
| 75.509 |

Historical production records have been included in **Table 3.7, Historical Production (M-Gal)** to demonstrate a trend in production rates. However, it should be noted that there is incomplete data available for several years of production meter readings.

Table 3.7, Historical Production (M-Gal)

| 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---------------|---------------|---------------------------|----------------------|---------------------------|---------------------------|---------------|
| 82.631 | 77.739 | 50.575⁴ | 0⁵ | 79.261⁶ | 47.263⁷ | 75.509 |

Lost and Unaccounted-for Water

The difference between the amount of water supply and water consumption is the amount of unaccounted-for water. Unaccounted-for water is simply water that is supplied to the system but not metered (accounted-for) as it is taken out of the system. There are many sources of unaccounted-for water in a typical water system, including water system leaks; inaccurate supply metering; inaccurate customer metering; fire hydrant usage; water main flushing; illegal water system connections or water use; and malfunctioning telemetry and control equipment resulting in overflowing of reservoirs. Historically the City reduced the amount of lost and unaccounted-for water in the system from 36% to 11% for the time period from 1993 to 1998. Due to recent inaccurate and incomplete production records, an updated lost and unaccounted-for water amount is not available.

PROJECTED LAND USE, FUTURE POPULATION, AND WATER DEMAND

PROJECTED POPULATION & LAND USE

Population projections for the twenty-year planning horizon were developed based on assumptions included in the City's draft Comprehensive Plan. An assumed annual growth rate was used for years 2007-2008 and years 2021 through the end of the analysis period. These growth rates were consistent with those utilized by the City in the preparation of their draft Comprehensive Plan. During the interim years (2009-2020), all background growth is assumed to be included in the planned development figures. These growth rates and assumptions are further outlined in the City's draft

⁴ Supply production meter readings are missing for the period from Aug. 17, 2002 to Dec 31, 2002

⁵ Supply production meter readings are missing for the period from Jan. 1, 2003 to Dec. 31, 2003

⁶ Supply production meter readings are missing for the period from Jan 1, 2004 to Jan 22, 2004

⁷ Supply production meter readings are missing for the period from Jan 1, 2005 to May 26, 2005

Comprehensive Plan documents which are included in **Appendix L – Population Forecast Documents**.

The City of Black Diamond is expected to experience substantial growth in the near future due to the large-scale developments that are anticipated to submit formal development applications once the moratorium is lifted. Projected land uses are based on the City of Black Diamond Land Use map as shown in the City's Draft Comprehensive Plan and has been included previously in this Water System Plan as **Figure 2.8, City of Black Diamond Draft Land Use**.

Assumptions included in this Water System Plan for these large-scale developments are based on conversations with the proposed development company and are subject to change based on the actual rate development occurs. The projections utilized in this water system analysis are the same projections utilized in the City's draft Comprehensive Plan and other planning documents. An excerpt from the draft Comprehensive Plan regarding population forecasts, as well as a technical memorandum developed during the preparation of the plan are included in **Appendix L – Population Forecast Documents**. The Lawson Hills Development is assumed to consist of 1,200 residential units at build-out. The Villages at Black Diamond development is assumed to consist of 4,800 residential units at build-out.

It should be noted that the 6,000 proposed new residential units described above are build-out figures. Based on projected growth rates, it is anticipated that 5,000 of the proposed residential units will be constructed during the 20-year planning period of this plan. These 5,000 residences are assumed to be equivalent to 5,640 ERU's based on materials provided by the developer.

The City of Black Diamond has entered into agreements with major landholders that in essence reserve capacity for a total of 7,400 ERU's. Copies of these agreements are included in **Appendix M – Water Supply and Facilities Funding Agreement**, **Appendix N – Plum Creek Land Co. Water Funding Agreement**, and **Appendix O – Palmer Coking Coal Co. Water Funding Agreement**.

As a result of the substantial population growth projected for the City of Black Diamond, the anticipated growth rates associated with the proposed development were utilized in the preparation of this Water System Plan, rather than the growth targets included in the King County Annual Growth Report. These population projections are included in **Table 3.8, Projected Populations**. Population projections utilized in the hydraulic water system modeling do not include the population of approximately 1,500 persons within the Lake Sawyer Area as this area is currently being served by the Covington Water District. Projected ERU's are included in **Table 3.9, Projected ERU's**.

Table 3.8, Projected Populations

| YEAR | BLACK DIAMOND WATER SERVICE AREA (DOES NOT INCLUDE LAKE SAWYER AREA) | BLACK DIAMOND (INCLUDES LAKE SAWYER AREA) |
|--------------|---|---|
| 2007 | 2,620 | 4,120 |
| 2008 (Yr 1) | 2,669 | 4,197 |
| 2009 (Yr 2) | 2,718 | 4,275 |
| 2010 (Yr 3) | 3,311 | 4,868 |
| 2011 (Yr 4) | 3,903 | 5,460 |
| 2012 (Yr 5) | 5,325 | 6,882 |
| 2013 (Yr 6) | 6,747 | 8,304 |
| 2015 | 8,880 | 10,437 |
| 2020 | 14,213 | 15,770 |
| 2025 | 15,341 | 16,980 |
| 2027 (Yr 20) | 15,742 | 17,424 |

Table 3.9, Projected ERU's

| 2007 (Current) | 2008 (Yr 1) | 2009 (Yr 2) | 2010 (Yr 3) | 2011 (Yr 4) | 2012 (Yr 5) | 2013 (Yr 6) | 2027 (Yr 20) |
|-------------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|
| 1130 | 1151 | 1172 | 1454 | 1736 | 2413 | 3090 | 6907 |

The Annual Growth Report prepared by King County includes growth targets for the cities located within King County. The growth targets included in the 2008 Annual Growth Report are included in **Table 3.10, King County Growth Projections**. These growth targets are the minimum populations that must be planned for. The population forecasts utilized for the City of Black Diamond in this plan are greater than these target amounts.

Table 3.10, King County Growth Projections

| 2000 HOUSEHOLDS | ADOPTED HOUSEHOLD GROWTH TARGET 2001-2002 | PAA HOUSEHOLD TARGET |
|--------------------|---|-------------------------|
| 1,456 | 1,099 | 0 |

PROJECTED WATER NEEDS

An average per capita use of 187 gpd / ERU was utilized in calculating projected water needs for all existing ERU's. This figure reflects the average per capita consumption for the period of 2004-2007 as shown in **Table 3.5, Historical Consumption - Gallons per Day per ERU**.

An average per capita use 230 gpd per ERU was utilized in calculating projected water needs for all future growth. This value consists of both residential and non-residential uses as well as unaccounted-for water. This value of 230 gpd is the documented value that has been utilized in numerous agreements between the City of Black Diamond and developers. Copies of these agreements are included in **Appendix M – Water Supply and Facilities Funding Agreement**, **Appendix N – Plum Creek Land Co. Water Funding Agreement**, and **Appendix O – Palmer Coking Coal Co. Water Funding Agreement**. These agreements also acknowledge that attempts will be made to maintain actual usage at 220 gpd or less. However, the higher value of 230 gpd has been used throughout this plan in order to provide for a more conservative evaluation of the City's water system.

A default peaking factor of 2.0 was applied to the average day demand to calculate the peak day demand due to the lack of accurate consumption data. **Table 3.11, Projected Water Demands** summarizes the projected water demands for future years.

Table 3.11, Projected Water Demands

| YEAR | PROJECTED ERU's | PROJECTED AVERAGE DAY DEMAND (GPD) | PROJECTED PEAK DAY DEMAND (GPD) | PROJECTED PEAK HOUR DEMAND (GAL PER HR) |
|--------------|-----------------|------------------------------------|---------------------------------|---|
| 2008 (Yr 1) | 1151 | 216,140 | 432,280 | 18,012 |
| 2009 (Yr 2) | 1172 | 220,970 | 441,940 | 18,414 |
| 2010 (Yr 3) | 1454 | 285,830 | 571,660 | 23,819 |
| 2011 (Yr 4) | 1736 | 350,690 | 701,380 | 29,224 |
| 2012 (Yr 5) | 2413 | 506,400 | 1,012,800 | 42,200 |
| 2013 (Yr 6) | 3090 | 662,110 | 1,324,220 | 55,176 |
| 2027 (Yr 20) | 6907 | 1,540,020 | 3,080,040 | 128,335 |

The City of Black Diamond's lack of accurate consumption and production data does not allow for a measure of the historical effects of conservation efforts on water usage. **Table 3.12, Projected Water Demands (including Conservation)** includes projected water demands assuming an annual one percent reduction in water consumption over the first six years covered within this plan, and a total reduction of ten percent by year 2027. This is consistent with the conservation goals included in the South King County Coordinated Water System Plan.

Table 3.12, Projected Water Demands (including Conservation)

| YEAR | PROJECTED ERU's | PROJECTED AVERAGE DAY DEMAND (GPD) | PROJECTED PEAK DAY DEMAND (GPD) | PROJECTED PEAK HOUR DEMAND (GAL PER HR) |
|--------------|--------------------|---|--|--|
| 2008 (Yr 1) | 1151 | 216,140 | 432,280 | 18,012 |
| 2009 (Yr 2) | 1172 | 218,760 | 437,520 | 18,230 |
| 2010 (Yr 3) | 1454 | 280,113 | 560,226 | 23,343 |
| 2011 (Yr 4) | 1736 | 340,169 | 680,338 | 28,347 |
| 2012 (Yr 5) | 2413 | 486,144 | 972,288 | 40,512 |
| 2013 (Yr 6) | 3090 | 629,005 | 1,258,010 | 52,417 |
| 2027 (Yr 20) | 6907 | 1,386,018 | 2,772,036 | 115,502 |

CHAPTER 4

SYSTEM ANALYSIS

CHAPTER 4 – SYSTEM ANALYSIS

SYSTEM DESIGN STANDARDS

Design standards were developed by the City of Black Diamond in order to assure the utility's ability to meet a minimum level of service for existing and future customers. The City of Black Diamond Development Guidelines and Public Works Standards – Water System Standards outlines the minimum system requirements. A copy of these draft standards has been included in **Appendix P – Black Diamond Public Works Standards**. Additional discussion regarding these standards has been included in **Chapter 8 – Distribution Facilities Design & Construction Standards**.

The standards included in the 'City of Black Diamond Development Guidelines and Public Works Standards' are intended to represent the minimum standards for the design and construction of water system facilities. More stringent standards may be required by the City of Black Diamond due to specific project conditions. All improvements to the existing water system shall be in compliance with the DOH requirements as outlined in the 'Washington State Department of Health Water System Design Manual', dated August 2001. Additionally, the 'South King County Coordinated Water System Plan' established uniform minimum design standards to ensure compatibility between systems. A copy of these standards has been included in **Appendix Q – SKC-CWSP Design Standards**.

Table 4.1, Minimum Design Standards

| MINIMUM DESIGN STANDARDS | |
|--|--------------------|
| DESIGN STANDARD | REFERENCE |
| AVERAGE AND MAXIMUM DAY DEMANDS | |
| Average day demand should be determined from previous actual water use. Maximum day demand is estimated at approximately two times the average day demand if metered data is not available. | DOH Design Manual. |
| MDD = 2 * ADD, where MDD = Maximum Day Demand ADD = Average Day Demand | DOH Design Manual |
| PEAK HOUR DEMAND (PHD) | |
| Distribution pipelines must be able to sufficiently deliver water to meet peak hour demands at 30 psi at every existing and proposed service connection. | DOH Design Manual |
| PHD = (MDD/1440)[(C)(N) + F] + 18 for residential demands, where PHD = Peak Hourly Demand (gpm) C = Coefficient associated with ranges of ERU's N = Number of service connections F = Factor associated with ranges of ERU's MDD = Maximum Day Demand (gpd/ERU) | DOH Design Manual |

| | |
|---|---------------------------|
| If more than one pressure zone exists, each PHD value needs to be calculated separately for each zone and analyzed appropriately. | DOH Design Manual |
| STORAGE REQUIREMENTS | |
| For a given reservoir design, each of the five storage components must be considered: 1)Operational Storage; 2)Equalizing Storage; 3)Standby Storage; 4)Fire suppression Storage; and 5)Dead Storage. | DOH Design Manual |
| FIRE FLOW RATE AND DURATION | |
| Fire flow rate and duration requirements shall be determined by the local fire control authority or the Public Water System Coordination Act for systems within the boundaries of a designated Critical Water Supply Service Area. | DOH Design Manual |
| If fire flow is to be provided, the distribution system shall be designed to provide the required fire flow at a pressure of at least 20 psi at the fire and positive pressure shall be maintained throughout the system during maximum instantaneous demand conditions. | SKC-CWSP Design Standards |
| MINIMUM SYSTEM PRESSURE | |
| The system must be capable of delivering the peak hourly demand (PHD) at the required pressure of 30 psi at every existing and proposed service connection. If fire flow is to be provided, the distribution pipelines must also be capable of delivering the maximum day demand (MDD) rate, in addition to the fire flow, at the required pressure of 20 psi throughout the distribution system. | DOH Design Manual |
| The City will require that its customers install pressure reducing valves in the water service pipe when the street main static pressure exceeds 80 psi. | BD PW Standards |
| MINIMUM PIPE SIZING | |
| Minimum water main size is 8". Larger size pipe will be required if projected to be needed in the city's current Comprehensive Water Plan or as deemed necessary based on the project demands. Verification of capacity by the developer's engineer may be required by the City. | BD PW Standards |
| Oversizing of water mains may be required to be installed per City's current Water Comprehensive Plan. | BD PW Standards |
| Pipes connecting hydrants to mains shall be at least 6 inch in diameter and not longer than 50 feet. | BD PW Standards |
| VALVE AND HYDRANT SPACING | |
| All valves larger than 12" shall be butterfly valves. All valves 12" and smaller shall be resilient seat gate valves. | BD PW Standards |
| Sufficient valving should be placed to keep a minimum number of customers out of service when water is turned off for maintenance, repair, replacement, or additions. As a general rule, valves on distribution mains of 12 inches and smaller should be located such that the water main length of not more than 1,000 feet can be isolated by valve closure. | DOH Design Manual |

| | |
|---|--|
| Fire hydrants are generally required approximately every 500 feet in residential area, and every 250 feet in commercial areas. However, fire hydrants shall be furnished and installed at all locations as specifically mandated by the local fire marshall and/or per City Building Code. | BD PW Standards |
| Fire hydrants on dead end streets and roads shall be located within approximately 300 feet from the frontage center of the farthest lot. | BD PW Standards |
| BACKUP POWER REQUIREMENTS | |
| All source and booster pumping facilities required for primary supply in an emergency shall be equipped with auxiliary power. | SKC-CWSP Design Standards |
| ADDITIONAL POLICIES | |
| Water mains shall be extended to the far property line(s) of the property being served. | BD PW Standards |
| Off-site extensions may be required to hydraulically loop existing and new systems. | BD PW Standards |
| Dead end lines are not permitted except where the Developer can demonstrate to the City's satisfaction that it would be impractical to extend the line at a future date. Water mains on platted cul-de-sacs shall extend to the plat line beyond the cul-de-sac to neighboring property for a convenient future connection, and extended off-site to create a hydraulic loop, fire hydrants will be installed at or on the termination point. | BD PW Standards |
| All new construction shall comply with the "Accepted procedure and practice in Cross Connection Control Manual" as published by the Pacific Northwest Section of the American Water Works Association", 1996, Sixth Edition, and current amendments thereto. A copy of such is available for review at the City office. | BD PW Standards |
| One water sampling station shall be provided for developments of five or more lots. The water sampling shall be furnished and installed at a location determined by the City. One additional sampling station shall be provided for each additional 50 lots or portion thereof. | BD PW Standards |
| Pressure in the distribution system should not exceed 100 psi, unless the design engineer can justify the need for the excessive pressure (reduce pumping costs, fire flow reliability, etc.), and verify that the pipe material is appropriate for this use | DOH Design Manual |
| WATER QUALITY PARAMETERS | |
| Water quality must be proved to conform to Washington State's water quality provisions contained in WAC Chapter 246-290. | WAC |
| "...Black Diamond is responsible for the provision of any additional contact time required for, and regulatory reporting of disinfection compliance under WAC 246-290-692." | Wholesale Water Agreement (Tacoma / Black Diamond) |

WATER QUALITY ANALYSIS

WATER QUALITY STANDARDS

The City of Black Diamond is required to conform to numerous Department of Health Water Quality Standards as outlined in WAC 246-290. Coliform bacteria, Disinfection Byproducts and Lead and Copper are tested throughout the distribution system. IOC, VOC, SOC, and Radioactive contaminants are tested at the source of supply.

As the demand for additional water grows, the use of the Tacoma Intertie will increase. Currently this source is only used on occasion to ensure that water is not stagnated in the line. The City may wish to conduct sampling to ensure that taste/flavor issues are not introduced into the City's water system as a result of source mixing. There may be additional issues that require investigation prior to source mixing, such as fluoridation, contact time, or precipitates.

Coliform Bacteria

"Coliform bacteria are a large group of bacteria that occur throughout the environment. They are used as an indicator organism to indicate the potential for disease-causing bacteria to be present in water. In other words, if coliform bacteria are present, it is presumed that a contamination pathway exists between the bacteria source and the water supply and disease-causing bacteria may use this pathway to enter the water supply.

Most coliform bacteria do not cause disease, but the greater their number the greater the likelihood that disease-causing bacteria may be present. Since coliform bacteria stay in water longer than most disease-causing organisms, the absence of coliform bacteria leads to the assumption that the water supply is microbiologically safe to drink. Consuming water with coliform bacteria present may cause gastrointestinal illnesses, fever, and other flu-like symptoms. Therefore, the drinking water standard requires that no coliform bacteria be present in public drinking water supplies." ⁸

Table 4.2, Microbiological Contaminants includes common microbiological contaminants that are required to be monitored for drinking water quality standards in Washington State.

Table 4.2, Microbiological Contaminants

| CONTAMINANT | MCL (mg/L) |
|-----------------------------------|---------------------------|
| Total Coliform Bacteria | 1 positive monthly sample |
| Fecal coliform and <i>E. coli</i> | 0 |
| Total organic carbon (ppm) | TT |
| Turbidity (NTU) | TT. |

⁸ Excerpted from DOH Publication #331-262, "Water Sampling: What We Test For and Why"

Disinfectants and Disinfectants Byproducts

Many water systems add chlorine or other disinfectants for treatment to destroy or inactivate microbial organisms. However, these disinfectants from disinfection byproducts (DBPs) when they react with naturally occurring organic substances in the water. Some disinfectants and DBPs cause cancer and reproductive effects in laboratory animals and may have bladder cancer and reproductive effects in laboratory animals and may have bladder cancer and reproductive effects in humans. While there is no conclusive evidence that disinfectants or DBPs are associated with cancer or other health effects, testing of the distribution system is conducted in conformance with EPA regulations. The City of Black Diamond conducts testing for Total Trihaloethanes (TTHM) and Five Haloacetic Acids (HAA5).

Table 4.3, Disinfectants & Disinfectant Byproducts Contaminants

| CONTAMINANT | MCL (mg/L) |
|-------------|------------|
| TTHM | 0.080 |
| HAA5 | 0.060 |

Lead and Copper

The presence of lead and copper is monitored throughout the City's distribution system. Unlike other contaminants, lead and copper do not occur notably in source water. Instead, they result from corrosion of building plumbing, faucets, and water fixtures. The purpose of lead and copper monitoring is to determine if water systems are distributing corrosive water. Systems with corrosive water are required to investigate and determine the best way to control corrosion. For infants and young children, elevated levels of lead can lower birth weights and slow normal physical and mental development. For adults, it can damage kidneys, slightly increase blood pressure and impair reproductive function. High levels of copper can cause nausea and diarrhea.

Table 4.4, Lead and Copper

| CONTAMINANT | Action Level (mg/L) |
|-------------|---------------------|
| Lead | 0.015 |
| Copper | 1.3 |

Inorganic Chemicals (IOC's)

Inorganic chemicals are usually substances of mineral origin. Salt, minerals, and metals are examples of typical inorganic chemicals. The inorganic contaminants listed in **Table 4.5, Inorganic Contaminants** are common inorganic contaminants in Washington and are required to be monitored. The City of Black Diamond has a compliance agreement with DOH regarding the Lead and Copper Rule. A copy of this agreement has been included in **Appendix R – Lead & Copper Bilateral Compliance Agreement**.

Table 4.5, Inorganic Contaminants

| CONTAMINANT | MCL (mg/L) |
|---------------------------|------------|
| Antimony (ppb) | .006 |
| Arsenic (ppb) | 0.010 |
| Asbestos (MFL) | 7 MFL |
| Barium (ppm) | 2 |
| Beryllium (ppb) | .004 |
| Cadmium (ppb) | .005 |
| Chromium (ppb) | .1 |
| Copper (ppm) | AL = 1.3 |
| Cyanide (ppb) | .2 |
| Fluoride (ppm) | 4 |
| Lead (ppb) | AL = .015 |
| Mercury [inorganic] (ppb) | .002 |
| Nitrate (ppm) | 10 |
| Nitrite (ppm) | 1 |
| Selenium (ppb) | .05 |
| Thallium (ppb) | .002 |

Volatile Organic Chemicals (VOC's)

"Volatile Organic Chemicals are man-made compounds that are released from water into the air. They present a health risk not only from drinking contaminated water, but also from inhaling VOC's that escape from the water as it is used during showering or other home uses. VOC's also are absorbed directly through the skin during bathing and showering.

Volatile Organic Chemicals are commonly used as solvents, fuels, paints, or degreasers. Virtually all VOC's produce an odor in water, although it may not be obvious before the drinking water standard is exceeded. Nearly all VOC's have primary drinking water standards, because they cause cancer or damage to the liver, kidneys, nervous system, or circulatory system."⁹

Table 4.6, Volatile Organic Contaminants includes common volatile organic contaminants that are required to be monitored for drinking water quality standards in Washington State.

⁹ Excerpted from DOH Publication #331-262, "Water Sampling: What We Test For and Why"

Table 4.6, Volatile Organic Contaminants

| CONTAMINANT | MCL (mg/L) |
|-------------------------------------|------------|
| Benzene (ppb) | .005 |
| Bromate (ppb) | .010 |
| Carbon tetrachloride (ppb) | .005 |
| Chloramines (ppm) | MRDL = 4 |
| Chlorine (ppm) | MRDL = 4 |
| Chlorite (ppm) | 1 |
| Chlorine dioxide (ppb) | MRDL = .8 |
| Chlorobenzene (ppb) | .1 |
| o-Dichlorobenzene (ppb) | .6 |
| p-Dichlorobenzene (ppb) | .075 |
| 1,2-Dichloroethane (ppb) | .005 |
| 1,1-Dichloroethylene (ppb) | .007 |
| cis-1,2-Dichloroethylene (ppb) | .07 |
| trans-1,2-Dichloroethylene (ppb) | .1 |
| Dichloromethane (ppb) | .005 |
| 1,2-Dichloropropane (ppb) | .005 |
| Ethylbenzene (ppb) | .7 |
| Haloacetic Acids (HAA) (ppb) | .060 |
| Styrene (ppb) | .1 |
| Tetrachloroethylene (ppb) | .005 |
| 1,2,4-Trichlorobenzene (ppb) | .07 |
| 1,1,1-Trichloroethane (ppb) | .2 |
| 1,1,2-Trichloroethane (ppb) | .005 |
| Trichloroethylene (ppb) | .005 |
| TTHMs [Total trihalomethanes] (ppb) | 0.10/.080 |
| Toluene (ppm) | 1 |
| Vinyl Chloride (ppb) | .002 |
| Xylenes (ppm) | 10 |

Synthetic Organic Chemicals (SOC's)

"Nonvolatile organic chemicals are also known as Synthetic Organic Chemicals or SOC's. Nearly all SOC's are pesticides, with a few notable exceptions (PCB's and dioxin). They differ from VOC's because they do not escape readily into the air from water." ¹⁰

Common synthetic organic contaminants that are required to be monitored for drinking water quality standards in Washington State are outlined in **Table 4.7, Synthetic Organic Contaminants**.

¹⁰ Excerpted from DOH Publication #331-262, "Water Sampling: What We Test For and Why"

Table 4.7, Synthetic Organic Contaminants

| CONTAMINANT | MCL (mg/L) |
|--|------------|
| 2,4-D (ppb) | .07 |
| 2,4,5-TP [Silvex](ppb) | .05 |
| Acrylamide | TT |
| Alachlor (ppb) | .002 |
| Atrazine (ppb) | .003 |
| Benzo(a)pyrene [PAH] (nanograms/l) | .0002 |
| Carbofuran (ppb) | .04 |
| Chlordane (ppb) | .002 |
| Dalapon (ppb) | .2 |
| Di(2-ethylhexyl) adipate (ppb) | .4 |
| Di(2-ethylhexyl) phthalate (ppb) | .006 |
| Dibromochloropropane (ppt) | .0002 |
| Dinoseb (ppb) | .007 |
| Diquat (ppb) | .02 |
| Dioxin [2,3,7,8-TCDD] (ppq) | .00000003 |
| Endothall (ppb) | .1 |
| Endrin (ppb) | .002 |
| Epichlorohydrin | TT |
| Ethylene dibromide (ppt) | .00005 |
| Glyphosate (ppb) | .7 |
| Heptachlor (ppt) | .0004 |
| Heptachlor epoxide (ppt) | .0002 |
| Hexachlorobenzene (ppb) | .001 |
| Hexachlorocyclo-pentadiene (ppb) | .05 |
| Lindane (ppt) | .0002 |
| Methoxychlor (ppb) | .04 |
| Oxamyl [Vydate] (ppb) | .2 |
| PCBs [Polychlorinated biphenyls] (ppt) | .0005 |
| Pentachlorophenol (ppb) | .001 |
| Picloram (ppb) | .5 |
| Simazine (ppb) | .004 |
| Toxaphene (ppb) | .003 |

Radioactive Contaminants

"Radioactivity usually occurs in water from radium, uranium, or radon. These materials emit radioactivity as alpha, beta, or gamma radiation. Each form of radiation affects the human body differently, yet all can lead to cancer." ¹¹

¹¹ Excerpted from DOH Publication #331-262, "Water Sampling: What We Test For and Why"

Table 4.8, Radioactive Contaminants

| CONTAMINANT | MCL (mg/L) |
|--------------------------------|--------------|
| Beta/photon emitters (mrem/yr) | 4 mrem/yr |
| Alpha emitters (pCi/l) | 15 pCi/l |
| Combined radium (pCi/l) | 5 pCi/l |
| Uranium (pCi/l) | 30 micro g/l |

HISTORICAL REVIEW OF TRENDS

The City of Black Diamond conducts routine testing of the quality of the water supplied to customers in the Black Diamond Water System. The City annually prepares a 'Drinking Water Quality Report' that is distributed to consumers. A copy of the most recent report has been included in **Appendix S – Drinking Water Quality Report**.

Additionally, the City has adopted a Cross Connection Control policy in order to prevent contamination of the City's water supply. A copy of the City's Cross Connection Control Program has been included in **Appendix T – Cross Connection Control Program**.

Coliform Bacteria

The City of Black Diamond conducts testing for the presence of coliform bacteria twice each month. All samples have been within acceptable contaminant levels with the exception of Sample Number 24291 on February 13, 2007. A copy of the City's Coliform Monitoring Plan has been included in **Appendix U – Coliform Monitoring Plan**.

The City currently tests for coliform bacteria at three testing sites. If a sample site contains unsatisfactory results, a repeat sample should include the unsatisfactory site as well as one upstream and one downstream. The results of the coliform monitoring are available for public review and are included in the City's Annual Drinking Water Quality Report.

Disinfectants and Disinfectant Byproducts

The City of Black Diamond completes regular TTHM and HAA5 sampling. Recent testing results can be found in **Appendix V – Water Quality Testing**.

Lead and Copper

The City of Black Diamond completes ten lead and copper samples yearly throughout the distribution system to keep in compliance with DOH. Recent testing results can be found in **Appendix V – Water Quality Testing**.

Inorganic Chemicals (IOC's)

The City of Black Diamond is required to conduct testing for inorganic contaminants every three years. Testing was most recently completed in 2005 and no chemicals exceeded MCL's (maximum contaminant levels). Additionally, testing is completed for

the presence of nitrate once each year. Copies of these test results can be found in **Appendix V – Water Quality Testing**.

Volatile Organic Chemicals (VOC's)

The City of Black Diamond conducts testing for volatile organics once every three years. Testing was most recently completed in 2006 and all levels were within allowable DOH standards. Copies of these test results can be found in **Appendix V – Water Quality Testing**.

Synthetic Organic Chemicals (SOC's)

The City of Black Diamond is required to test for synthetic organic chemicals every three years. Testing was most recently completed in 2006 and there were no exceedances of maximum contaminant levels.. Copies of these test results can be found in **Appendix V – Water Quality Testing**.

SOURCE CAPACITY ANALYSIS

As previously mentioned, the City of Black Diamond has two sources of supply for its municipal water system – the Black Diamond Spring Field and a wholesale water agreement with the City of Tacoma. Details regarding the capacity and allowable withdrawal rates have been included in **Chapter 2 – Description of Water System**.

An engineering analysis was completed in 2003 of the Black Diamond Spring Field and the findings were documented in the “City of Black Diamond Springs – Vulnerability and Feasibility Study”. This study has been included in **Appendix W – Springs Vulnerability and Feasibility Study**. An additional study, “City of Black Diamond Spring Source Feasibility Analysis”, was completed in 2004 and presented a preliminary analysis of design alternatives for development of the springs.

Prior to the Tacoma Intertie, the springs were the only source of drinking water for the area since the early 1900's. It is anticipated that the springs will continue to serve the City for at least the twenty year planning period covered by this Water System Plan.

The intertie to the City of Tacoma was completed in 2006 and is expected to remain in service for at least the twenty year planning period covered by this Water System Plan. At this time, the City of Black Diamond has only used a minimal amount of water from this source – mostly only to flush the line to ensure the water remains fresh in case it is needed. This intertie was completed in order to plan ahead for the substantial population growth that the City is anticipating.

The City of Black Diamond has sufficient capacity from the Spring Field and from the Tacoma Intertie to accommodate current water demands, as well as projected water demands for the six-year and twenty-year periods. The existing transmission lines however are undersized and are constructed of Asbestos Cement so this will need to be upgraded within the system.

Detailed information regarding the City's Water Rights has been presented in **Chapter 2 – Description of Water System**. **Chapter 3 – Basic Planning Data & Water Demands** includes calculations of projected water needs over the planning period. The City of Black Diamond has sufficient water rights to serve the projected growth that the City of Black Diamond is anticipated to experience over the next twenty years. This is outlined below in **Table 4.9, Black Diamond Annual Water Supply Needs**.

Table 4.9, Black Diamond Annual Water Supply Needs

| | MAXIMUM ANNUAL SUPPLY / DEMAND |
|--------------------|-----------------------------------|
| Supply | 986,924,855 gal/yr |
| Demand (Year 2027) | 562,107,300 gal/yr |

There are concerns with the vulnerability of the springs, in particular, collection area vulnerability and transmission main vulnerability.

SOURCE COLLECTION VULNERABILITY

Potential problems with the source collection areas are primarily associated with the risks of damage due to erosion/landslides and contamination or damage to the springs by human and/or animal vandalism. In particular, Spring Number One has been experiencing erosion to the bank downstream of the spring. Additionally, Spring Field Number Three has experienced surface water runoff crossing over the top and center of the collection area and needs to be reconstructed to ensure the spring water is not contaminated.

SOURCE TRANSMISSION VULNERABILITY

On the south bank of the Green River, the spring transmission lines are considered vulnerable due to erosion, landslides, or flooding due to age and location on a very steep slope. The spring transmission main is exposed and cabled in some locations which increases the chances of localized landslides. Additionally, tree uprooting, leaking, or natural ground erosion are concerns with this transmission line.

The transmission lines are attached to a foot-bridge, suspension bridge crossing of the Green River. This portion of the transmission lines are vulnerable to wash-out due to possible flooding of the river.

The Black Diamond Spring Field is located almost two miles southeast of the City's distribution system. Water is supplied via an existing 8" AC transmission line that reduces to a 6" AC line prior to reaching the 4.3 MG Reservoir. These lines are recommended to be upsized to accommodate future growth as well as to be constructed of ductile iron materials.

WATER TREATMENT CAPACITY ANALYSIS

A 25% sodium hydroxide solution (caustic soda) is used to provide corrosion treatment for the Black Diamond Water Supply is provided at the 4.3 MG reservoir site.

Chlorination treatment for the Black Diamond Water Supply is provided at the North Bank pump station. The City produces sodium hypochlorite through the use of a 2-pound brine generating system. This system was constructed in 1995 and has the capacity to serve the existing system. However the system, along with replacement parts, are no longer manufactured. It is recommended that the City explore alternate methods of chlorination in order to assure that the City's drinking water supply from the Black Diamond Spring Field is not compromised due to a mechanical issue.

STORAGE CAPACITY ANALYSIS

The City of Black Diamond currently has two reservoirs for storage within the system. Details regarding these reservoirs have been provided in **Chapter 2 – Description of Water System**. The .5 MG Reservoir was constructed in 1986 and is built of steel. The 4.3 MG Reservoir, also constructed of steel, was built in 2006. Both of these reservoirs are considered to have sufficient remaining life over the twenty year planning period of this report.

Water from the Springs and Intertie are directed to the 4.3 MG Reservoir. This reservoir then supplies the .5 MG Reservoir as needed. The .5 MG Reservoir provides distribution to the 965 pressure zone. The 4.3 MG Reservoir provides distribution to the 850 and 750 pressure zones.

It is anticipated that two additional reservoirs will be required during the twenty-year planning period. The need for this additional storage capacity will be to serve the projected growth that the City is anticipating. Preliminary sizing of the future reservoirs has been provided by developers. It is anticipated that an additional 3 MG reservoir and pump station will be constructed to serve the proposed "Lawson Hills Development" in order to provide water at a sufficient pressure in the higher elevations of the eastern portion of the Service Area. It is anticipated that this proposed reservoir will serve a future 1175 pressure zone. Additionally, a 1.2 MG reservoir is proposed to be constructed in the southern portion of the water service area to serve the higher elevations of the "Villages at Black Diamond" planned development. This reservoir will serve the 850 pressure zone.

ANALYSIS CRITERIA

The existing and proposed storage facilities have been analyzed to assure that there is sufficient capacity to meeting the existing and future storage requirements of the system. Storage needs have been analyzed based on the projected distribution of ERU's throughout the system. **Table 4.10, ERU Distribution by Pressure Zone** includes the assumed distribution of ERU's throughout the pressure zones as included in the computerized hydraulic model of the City's water system.

Table 4.10, ERU Distribution by Pressure Zone

| PRESSURE ZONE | 2007 (EXISTING) | 2013 (YR 6) | 2027 (YR 20) |
|--|--------------------|----------------|-----------------|
| 750 Pressure Zone (served by 4.3 MG reservoir) | 400 | 2,208 | 4,076 |
| 850 Pressure Zone (served by 4.3 MG reservoir and future 1.2 MG reservoir) | 627 | 779 | 1,511 |
| 965 Pressure Zone (served by .5 MG reservoir) | 103 | 103 | 475 |
| 1175 Pressure Zone (served by future 3 MG reservoir) | 0 | 0 | 845 |
| Total | 1,130 | 3,090 | 6,907 |

Basic physical data for the existing storage tanks has been included below in **Table 4.11, Storage Facility Data**.

Table 4.11, Storage Facility Data

| DATA | .5 MG TANK | 4.3 MG TANK | FUTURE 1.2 MG TANK | FUTURE 3 MG TANK |
|---------------------|---------------|----------------|---------------------------------|---------------------|
| Base Elevation (Ft) | 930 | 780 | 710 | |
| Diameter (Ft) | 50 | 102 | 60 (assumed) | 80 (assumed) |
| Height (Ft) | 35 | 71 | 60 (assumed) (Elevated tank) | 80 (assumed) |
| Volume (MGal) | .5 | 4.3 | | |

Storage capacity has been analyzed for the following components: 1) Operational Storage; 2) Equalizing Storage; 3) Standby Storage; 4) Fire Suppression Storage; and 5) Dead Storage.

Operational Storage

Operational storage is the volume of the reservoirs used to supply the water system under normal conditions when the Springs and/or Intertie are not delivering water to the system. This volume is associated with the elevation difference required for the pump level sensors which is an operational distance of three feet for each of the reservoirs.

Equalizing Storage

Equalizing Storage is the volume of water used to supply the system (at a minimum pressure of 30 psi at all service connections) under peak demand conditions when the system demand exceeds the total rate of supply by the Springs and/or Intertie. The formula used for reservoirs with electronic level controls is:

$$ES = (PHD - Q_s) * (150 \text{ min}), \text{ but in no case less than zero}$$

where, ES = Equalizing storage (Gal)
PHD = Peak Hourly Demand (GPM)

Q_s = Sum of all installed and active source of supply capacities, except emergency sources of supply (GPM)

Standby Storage

Standby Storage is the volume of water used to supply the water system under emergency conditions when supply facilities are out of service due to equipment failures, loss of supply, transmission main breaks, power outages, and any other situation that disrupts the supply source.

For water systems with a single source (2007 conditions):

$$SB = (2 \text{ days}) * (ADD) * (N)$$

For water systems with multiple sources (2013 & 2027 conditions):

$$SB = (2 \text{ days}) * (ADD) * (N) - (t) * (Q_s - Q_l)$$

Where, SB = Standby Storage (Gal)

ADD = Average day demand (gpd/ERU) = (230 gal/ERU)

N = Number of ERU's

Q_s = Sum of all installed and continuously available source of supply capacities, except emergency sources (GPM)

Q_l = largest capacity source available to the system (GPM)

t = Time that remaining sources are pumped on the day when the largest source is not available (min.). Unless restricted otherwise, this is generally assumed to be 1,440 minutes.

Fire Suppression Storage

Fire Suppression Storage is the volume of the water tank used to supply water to the system at the maximum rate and duration required to extinguish a building with the highest fire flow requirement. Maximum fire flow requirements served by each of the reservoirs are outlined below in **Table 4.12, Maximum Fire Flows by Reservoir**.

$$FSS = (FF) * (t)$$

Where,

FSS = Fire Suppression Storage

FF = Required Fire Flow rate (gpm)

T = Duration of FF rate (min.)

Table 4.12, Maximum Fire Flows by Reservoir

| RESERVOIR | MAX. FIRE FLOW (GPM) | DURATION (MIN) |
|----------------------|----------------------|----------------|
| Existing .5 MG Tank | 2,500 | 120 |
| Existing 4.3 MG Tank | 3,500 | 120 |
| Future 1.2 MG Tank | 3,500 | 120 |
| Future 3 MG Tank | 3,500 | 120 |

Dead Storage

Dead Storage is the volume of water in the reservoir that cannot be used because it is stored at an elevation that does not provide system pressures that meet the minimum pressure requirements established by DOH without pumping. The City of Black Diamond does not have any dead storage requirements for the storage facilities due to the elevations within the system.

STORAGE REQUIREMENTS

An analysis of the afore mentioned storage components has been completed and indicate that there is sufficient storage capacity within the system for existing conditions as summarized in **Table 4.13, Existing Storage Evaluation**; for 2013 (6 Yr) conditions as summarized in **Table 4.14, 2013 (Yr 6) Storage Evaluation**; and for 2027 (20 Yr) conditions as summarized in **Table 4.15, 2027 (Yr 20) Storage Evaluation**.

Table 4.13, Existing Storage Evaluation

| STORAGE COMPONENT | EXISTING .5 MG TANK | EXISTING 4.3 MG TANK | TOTAL |
|--------------------------------|---------------------------|----------------------------|------------------|
| Operational Storage (Gal) | 44,000 | 183,000 | 227,000 |
| Equalizing Storage (Gal) | 0 | 0 | 0 |
| Standby Storage (Gal) | 47,000 | 472,000 | 519,000 |
| Fire Suppression Storage (Gal) | 300,000 | 420,000 | 720,000 |
| TOTAL STORAGE (Gal) | 391,000 | 1,075,000 | 1,466,000 |

Table 4.14, 2013 (Yr 6) Storage Evaluation

| STORAGE COMPONENT | EXISTING .5 MG TANK | EXISTING 4.3 MG TANK | FUTURE 1.2 MG TANK | TOTAL |
|--------------------------------|---------------------------|----------------------------|--------------------------|------------------|
| Operational Storage (Gal) | 44,000 | 183,000 | 63,000 | 290,000 |
| Equalizing Storage (Gal) | 0 | 0 | 0 | 0 |
| Standby Storage (Gal) | 47,000 | 883,000 | 0 | 930,000 |
| Fire Suppression Storage (Gal) | 300,000 | 420,000 | 420,000 | 1,140,000 |
| TOTAL STORAGE (Gal) | 391,000 | 1,486,000 | 483,000 | 2,360,000 |

Table 4.15, 2027 (Yr 20) Storage Evaluation

| STORAGE COMPONENT | EXISTING .5 MG TANK | EXISTING 4.3 MG TANK | FUTURE 1.2 MG TANK | FUTURE 3 MG TANK | TOTAL |
|--------------------------------|---------------------------|----------------------------|--------------------------|------------------------|------------------|
| Operational Storage (Gal) | 44,000 | 183,000 | 63,000 | 113,000 | 403,000 |
| Equalizing Storage (Gal) | 0 | 32,000 | 0 | 0 | 32,000 |
| Standby Storage (Gal) | 129,000 | 1,770,000 | 309,000 | 478,000 | 2,686,000 |
| Fire Suppression Storage (Gal) | 300,000 | 420,000 | 420,000 | 420,000 | 1,560,000 |
| TOTAL STORAGE (Gal) | 473,000 | 2,405,000 | 792,000 | 1,011,000 | 4,681,000 |

DISTRIBUTION SYSTEM HYDRAULIC CAPACITY ANALYSIS

The City of Black Diamond transmission and distribution system consists of over 108,000 lineal feet of pipe providing water to three pressure zones within the City. Specifics regarding pipe sizes and materials, as well as the pressure zones, have been previously documented in **Chapter 2 – Description of Water System**. Large portions of the system are considered in need of replacement as over 25% of the pipes are constructed of Asbestos Cement materials and there are numerous waterlines that are undersized and unable to provide sufficient flow to meet minimum fire flow requirements. It is recommended that these pipes be removed and replaced with ductile iron materials. These projects have been included in the recommended projects listed in **Chapter 9 – Improvement Program**.

A hydraulic analysis of the Black Diamond Water System was completed utilizing the computerized water modeling software program, H2ONet Water as developed by MWH Soft. In order to create a realistic representation of the City's water system, the model was created using a previously-completed water system map, as-built construction plans, and information obtained through discussions with City staff.

The hydraulic model included various system elements such as pipes, hydrants, reservoirs, pumps, and valves. Details regarding these elements were inputted into the H2ONet model such as pipe length, diameter, system elevations, water demands, pipe status (open or closed), as well as pump and tank characteristics and operations. Modeling inputs and results, as well as a node map have been included in **Appendix X – H2ONet Hydraulic Analysis**. The following scenarios were included in the hydraulic analysis: 2007 (Existing); 2008 (Yr 1); 2009 (Yr 2); 2010 (Yr 3); 2011 (Yr 4); 2012 (Yr 5); 2013 (Yr 6); and 2027 (20 Yr). Build-out of all future development for which ERU's have been contractually obligated were also considered in order to size all proposed water system facilities.

WATER DEMANDS

Existing system demands were determined for the City service area from existing consumption/water billing records. System demands were distributed throughout the system spatially based on customer billing address.

The demands for future modeling scenarios are based on existing demands and the anticipated population growth projections as found in **Chapter 3 – Basic Planning Data & Water Demands**. Geographic distribution of future ERU's were based on information provided by the potential developer.

MODEL CALIBRATION

Field pressure readings and tank levels were collected in support of calibration of the hydraulic model at various locations throughout the City's water system. **Table 4.16, Calibration Results – System Pressures** describes the location of the H2ONet nodes used for model calibration and identifies the system pressures and the percentage difference between the field collected and modeled data. An acceptable difference between field collected data and the simulated model was a 5% tolerance range.

Table 4.16, Calibration Results – System Pressures

| LOCATION | NODE | AM PRESSURE (PSI) | | % DIFF | PM PRESSURE (PSI) | | % DIFF |
|--|------------|-------------------------|-------|-----------|-------------------------|-------|-----------|
| | | FIELD | MODEL | | FIELD | MODEL | |
| 750 Pressure Zone | | | | | | | |
| 32812 Railroad Ave | J5056 | 61 | 59.0 | -3.3% | 60 | 59.0 | -1.7% |
| Roberts Drive at Bruckners Intersection | J-24 | 97 | 96.4 | -.6% | 98 | 96.5 | -1.5% |
| 24712 Roberts Drive | J5224 | 77 | 76.2 | -1.0% | 78 | 76.3 | -2.2% |
| 850 Pressure Zone | | | | | | | |
| Cumberland Way & Cumberland Dr | J- 1280 | 48 | 48.8 | 1.7% | 48 | 49.0 | 2.1% |
| Summit & Kummer Intersection | J-860 | 69 | 69.7 | .9% | 68 | 69.8 | 2.7% |
| End of Old Lawson Rd | J5078 | 101 | 104.2 | 3.2% | 106 | 104.1 | -1.8% |
| 965 Pressure Zone | | | | | | | |
| Newcastle & McKay Lane Intersection | J-590 | 97 | 100.6 | 3.7% | 98 | 101.3 | 3.4% |
| 25708 Lawson, 250' east of 6 th St | J5226 | 101 | 104.4 | 3.4% | 102 | 105.2 | 3.1% |

Table 4.17, Calibration Results – Tank Levels describes the reservoir water levels for both field collected data as well as the modeled values. Again, an acceptable tolerance range of 5% was utilized in calibrating the model.

Table 4.17, Calibration Results – Tank Levels

| LOCATION | AM LEVEL (FT) | | % DIFF | PM LEVEL (FT) | | % DIFF |
|------------------|------------------|-------|-----------|------------------|-------|-----------|
| | FIELD | MODEL | | FIELD | MODEL | |
| 4.3 MG Reservoir | 45.9 | 48.1 | 4.8% | 47.3 | 48.6 | 2.7% |
| .5 MG Reservoir | 33.6 | 32.4 | -3.5% | 33.6 | 33.8 | .7% |

PEAK HOUR DEMANDS

According to DOH requirements, a water system must maintain a minimum pressure of 30 psi in the distribution system under peak hour demand conditions. In all modeling scenarios, all pressures throughout the distribution system exceeded the minimum system pressure of 30 psi. Additionally DOH requires a maximum velocity of 8 feet per second (not including fire flow). In all modeling scenarios, all pipe velocities throughout the distribution system are less than 8 feet per second.

FIRE FLOW ANALYSIS

A detailed fire flow analysis was completed for all hydrants within the City of Black Diamond Water System. The analysis was conducted in conformance with DOH requirements that state a water system must provide adequate fire flow under peak day demand conditions, while maintaining a minimum system pressure of 20 psi. **Table 4.18, Minimum Fire Flow Design Requirements** provides the minimum fire flow requirements. They have been developed based on the zoning classifications that are included in the City's Draft Comprehensive Plan. These are the minimum fire flows to be considered in the design of system improvements. Actual fire flow requirements for proposed new structures will be as determined by the Fire Marshall.

Table 4.18, Minimum Fire Flow Design Requirements

| FIRE FLOW REQUIREMENT (GPM) | CLASSIFICATION |
|-----------------------------------|---|
| 1,000 gpm | Urban Reserve; Residential (Low Density) |
| 2,500 gpm | Residential (Medium Density); Mixed Use; Neighborhood Commercial; Town Center; Community Commercial; Master Planned Development Overlay |
| 3,000 gpm | Business Park & Light Industrial |
| 3,500 gpm | Industrial; School |

The City currently does not meet fire flow requirements in several areas of the City. Detailed results of the fire flow analysis for all modeled scenarios has been included in **Appendix X – H20Net Hydraulic Analysis**. There are 81 fire hydrants that are failing under current conditions. The proposed system improvements, as detailed in **Chapter 9 – Improvement Program**, which are scheduled to be implemented over the twenty-

year planning period will improve the ability of the system to meet minimum fire flow requirements. In the modeling scenario for the 20th year, no hydrants are failing.

Table 4.19, Fire Flow Analysis Results

| MODEL SCENARIO | # OF HYDRANTS THAT DO NOT MEET MINIMUM FIRE FLOW REQUIREMENTS |
|-----------------------|--|
| 2007 (EXIST) | 81 |
| 2008 (YR 1) | 81 |
| 2009 (YR 2) | 56 |
| 2010 (YR 3) | 48 |
| 2011 (YR 4) | 46 |
| 2012 (YR 5) | 36 |
| 2013 (YR 6) | 25 |
| 2027 (YR 20) | 0 |

DISTRIBUTION & TRANSMISSION SYSTEM DEFICIENCIES

A summary of the primary system deficiencies is outlined below. **Chapter 9 – Improvement Program** provides specifics on proposed improvement projects.

The existing transmission waterlines from the Black Diamond Springs to the .5 MG reservoir are deficient for the system due to pipe age and material, pipe size, and the location of pipelines on or adjacent to very steep slopes.

In its existing condition, the water system will be unable to serve the projected growth that the City is anticipating. A large number of the proposed improvement projects outlined in **Chapter 9 – Improvement Program** are development related projects that will be required based on the actual rate at which development occurs. Additionally, there are a substantial number of growth-related projects that are upsizing and improvements to existing waterlines that will be required to accommodate the future growth.

There are also existing deficiencies to the system such as the inability to meet fire flow requirements. These deficiencies are eliminated through the upsizing of water lines or looping of the water system.

Other deficiencies to the distribution system include undersized lines in the system (4-inches and smaller), as well as waterlines constructed of Asbestos Cement (AC).

SELECTION AND JUSTIFICATION OF PROPOSED IMPROVEMENTS

Projects were selected for inclusion in the program based on the following criteria:

- 1) **Growth Related Projects (New development)** – The City of Black Diamond is anticipating significant development to occur within the next several years.

The proposed Capital Improvement Program includes growth related projects to serve these proposed new developments.

- 2) **Growth Related Projects (Existing System)** – These are proposed projects to upsize and improve portions of the existing system that will not be able to adequately serve the system with the anticipated growth.
- 3) **System Improvements** – These projects are included in order to address existing system deficiencies such as inability to meet minimum fire flow requirements. These projects include upsized lines and system looping improvements.
- 4) **Small Line Replacements** – Projects have been included to replace all waterlines that are 4-inches and smaller.
- 5) **AC Line Replacements** – Projects have been included to remove all Asbestos Cement (AC) lines and replace them with ductile iron materials.

CHAPTER 5

CONSERVATION PROGRAM, WATER RIGHT ANALYSIS, SYSTEM RELIABILITY & INTERTIES

CHAPTER 5 – CONSERVATION PROGRAM, WATER RIGHT ANALYSIS, SYSTEM RELIABILITY & INTERTIES

CONSERVATION PROGRAM DEVELOPMENT & IMPLEMENTATION

The City of Black Diamond's Conservation Program is intended to reduce per capita water use. A Water Conservation Program is a required element of a Water System Plan, as required by the Water Use Efficiency Act of 1989. The City of Black Diamond has less than 1,000 service connections and is thus held accountable to the requirements for a "small system" as outlined in the "Conservation Planning Requirements", as published by the Washington DOH & DOE in 1994.

WATER USE DATA COLLECTION REQUIREMENTS

The City of Black Diamond is required to collect data regarding the system's water use as outlined in **Table 5.1, Water Use Data Collection Requirements**. The City is currently complying with all collection requirements as further shown in the table.

Table 5.1, Water Use Data Collection Requirements

| TYPE OF DATA | UNITS OF MEASURE | COLLECTION REQUIREMENT | CITY COLLECTION |
|---|--|-------------------------------|------------------------|
| Source of Supply Meter Readings | Cubic feet | Monthly and Annual | Daily |
| Wholesale – Amount Purchased | Cubic feet | Monthly Total | Available |
| Peak Day / Peak Month | Cubic feet pumped from the supply sources | Each year's peak month totals | Available |
| Unaccounted for Water | Cubic feet | Annual Total | Available |
| Accounted for Water | Cubic feet | Annual Total | Available |
| Service Meter Readings – Single Family | Total cubic feet used by this customer class | Monthly | Monthly |
| Service Meter Readings – Multi-Family | Total cubic feet used by this customer class | Monthly | Monthly |
| Service Meter Readings – Commercial / Government / Industrial | Total cubic feet used by this customer class | Monthly | Monthly |
| Population Served | Estimate the number of customers and connections served in the residential classes and the number of connections served in the commercial, government, and industrial classes. | Annual | Available |

| | | | |
|-------------------|---|----------------------|-----------|
| Economic data | Existing Water rates for each customer class | Existing Water Rates | Available |
| Conservation Data | Report the type of measure, the level of implementation the duration of the measure, and the date at which they were begun. | Once per year | Available |

CONSERVATION PROGRAM

The objective of the City of Black Diamond's Conservation Program is to reduce per capita water use. This savings goal is reflected in the water demand forecasts included in **Chapter 3 – Basic Planning Data & Water Demands**.

Table 5.2, Conservation Program outlines the recommended components of the Conservation Program for a "small system" (less than 1000 connections), as included in the "Conservation Planning Requirements" published by DOH and DOE. Additionally, the City of Black Diamond's current level of implementation is listed, along with any recommendations. The City of Black Diamond has become more aggressive in their pursuit of conservation as identified by such items as their recent adoption of a new tiered rate structure.

Table 5.2, Conservation Program

| RECOMMENDED CONSERVATION PLAN ELEMENTS | DEFINITION | CURRENT CITY STATUS AND RECOMMENDATIONS |
|--|--|---|
| PUBLIC EDUCATION - Program Promotion | Publicize the need for water conservation through television and radio public service announcements, news articles, public water systems bill inserts, or other means. This includes promoting efficient indoor and outdoor water usage, distribution of Ecology / Health conservation brochures or other printed material, informing customers, builders and contractors of new plumbing code regulations requiring efficient plumbing fixtures, and other efforts. | The City of Black Diamond currently provides water conservation tips to consumers in the annual Drinking Water Quality Report. It is recommended that the City continue this practice, and also promote public education through the use of billing inserts with regular monthly water billings and education brochures to be available at City Hall. |

| | | |
|---|---|--|
| SYSTEM MEASURES - Source Meters | Install master source meters for all sources. Maintain periodic meter testing and repair programs. | The City has installed source meters throughout the system. Source production totals are now being recorded and available. |
| SYSTEM MEASURES - Service Meters | Install individual service meters for all water users. Maintain periodic meter testing and repair program. | The City requires individual water service meters for all water uses. |
| INCENTIVES / OTHER MEASURES - Land Management / Playfields - Xeriscaping | Promote low water demand landscaping in all retail customer classes (private, public, commercial, industrial, etc.). Work with local nurseries to ensure the availability of plants that achieve this objective | It is recommended that the City consider requiring the use of low water demand landscaping in City Code. |

WATER USE EFFICIENCY

The Municipal Water Law was passed by the Washington State Legislature in 2003 and included language that all municipal water suppliers must use water more efficiently in exchange for water right certainty and flexibility to help them meet future demands. The City of Black Diamond is required to develop and monitor a Water Use Efficiency (WUE) program and to include it within the city's water planning documents.

WATER USE EFFICIENCY GOALS

The City of Black Diamond recognizes the need to establish measureable goals regarding water use efficiency. The City has established the following goals to be monitored and evaluated. These goals have been adopted through a public process in conjunction with the adoption of this Water System Plan

Goal #1: Reduce per capita consumption by one percent annually over the first six years of this plan.

Goal #2: Correct system metering problems within two years to support accurate data collection of supply and demand system requirements in order to accurately measure any lost or unaccounted for water.

WATER USE EFFICIENCY MEASURES

The City of Black Diamond is required to establish a minimum of four water use efficiency measures, in addition to required measures, based on the current number of system connections. The City of Black Diamond has established the following measures:

- Measure #1:** Install production (source) meters (Required Measure)
- Measure #2:** Install consumption (service) meters (Required Measure)
- Measure #3:** Perform meter calibration (Required Measure)
- Measure #4:** Implement a water loss control action plan to control leakage (Required Measure)
- Measure #5:** Educate customers about water use efficiency practices (Required Measure)
- Measure #6:** Implement rates that encourage water demand efficiency for single-family residential customers
- Measure #7:** Implement rates that encourage water demand efficiency for multi-family residential customers
- Measure #8:** Implement rates that encourage water demand efficiency for commercial customers
- Measure #9:** Provide advertising to educate customers on the need for efficient water use.

It is anticipated that all of the measures listed above will provide a cost-effective benefit to the City of Black Diamond Water System.

CUSTOMER EDUCATION

The City of Black Diamond currently provides water use efficiency tips to consumers in the annual Drinking Water Quality Report. The City plans to continue this practice, and is also considering the promotion of public education through the use of billing inserts with regular monthly water billings and education brochures to be available at City Hall.

PROJECTED WATER SAVINGS

Projected water savings based on demands reduced by efficient water use have been included in **Chapter 3 – Basic Planning Data & Water Demands** of this plan.

WATER USE EFFICIENCY EFFECTIVENESS

The City of Black Diamond will evaluate the effectiveness of the Water Use Efficiency program on an annual basis in conjunction with the annual reporting requirements.

DISTRIBUTION SYSTEM LEAKAGE EVALUATION

A detailed discussion regarding lost and unaccounted for water has been included in **Chapter 3 – Basic Planning Data & Water Demands** of this plan. Historically the City reduced the amount of lost and unaccounted-for water in the system from 36% to 11% for the time period from 1993 to 1998. Due to recent inaccurate and incomplete production records, an updated lost and unaccounted-for water amount is not available.

RATE STRUCTURE EVALUATION

The City of Black Diamond recently adopted updated water rates that were effective January 2009. The new rate structure is in the form of inclining block rates in order to promote conservation.

SUPPLY & WATER RIGHTS EVALUATION

Detailed information regarding the City's Water Rights has been presented in **Chapter 2 – Description of Water System**. The City of Black Diamond has sufficient water rights to serve the projected growth that the City of Black Diamond is anticipated to experience over the next twenty years. This is outlined below in **Table 5.3, Black Diamond Annual Water Supply**.

Table 5.3, Black Diamond Annual Water Supply

| SOURCE OF SUPPLY | MAXIMUM ANNUAL SUPPLY |
|----------------------------|--|
| Black Diamond Spring Field | 179,544,855 gal / yr (551 acre-ft / yr) |
| City of Tacoma Intertie | 807,380,000 gal / yr |
| TOTAL | 986,924,855 gal / yr |

As discussed in **Chapter 3 – Basic Planning Data & Water Demands**, the estimated annual water demand in year 2027 is 562.1 M-gallons. Thus, there is sufficient capacity to serve the City's projected growth by utilizing the City's existing water rights.

The City is encouraged to explore alternative methods to reduce the demand from their current sources of supply. Suggested areas to explore include enhanced conservation methods such as the use of reclaimed water. The City is actively looking in to the use of reclaimed water. Preliminary discussions have taken place between the City of Black Diamond and King County regarding the possibility of construction of a reclaimed water plant within the City of Black Diamond.

SYSTEM RELIABILITY

SOURCE RELIABILITY

The City of Black Diamond has made great progress in addressing the reliability of their source production. Within recent years, the City of Black Diamond has negotiated a wholesale water purchase from the City of Tacoma through an intertie. This additional source allows for reliability in supplying the Black Diamond Water System. If the Black Diamond Spring Field source was compromised in some manner, there is sufficient supply from the Intertie to accommodate system demands.

FACILITY RELIABILITY

As previously discussed, there are extensive portions of the City's current water system that are unable to provide adequate fire flow. Additionally, there are numerous locations where pipes are undersized and/or constructed of Asbestos Cement materials. Major expansions to the existing system will be required to accommodate the forecasted growth as described in **Chapter 3– Basic Planning Data & Water Demands**.

DESCRIPTION OF EXISTING & PROPOSED INTERTIES

EXISTING INTERTIES

The City of Black Diamond currently has an existing intertie to the City of Tacoma Second Supply Pipeline. Details regarding this intertie have been provided in **Chapter 2 – Description of Water System**. The intertie was first put into use in 2006. No additional interties are being proposed at this time. An intertie with Covington Water has been proposed in the past, however the need for this intertie has been addressed through the intertie with the City of Tacoma.

CHAPTER 6

SOURCE WATER PROTECTION

CHAPTER 6 – SOURCE WATER PROTECTION

WELLHEAD PROTECTION PROGRAM

OVERVIEW

This Wellhead Protection Program has been prepared as a component of the City of Black Diamond's Water System Plan in order to meet requirements of the Department of Health (DOH) and the Environmental Protection Agency (EPA)¹². The Black Diamond Spring Field is located on a 58-acre parcel that is owned by the City. The Black Diamond Spring Field is fed from the Cumberland aquifer which is located southeast of the Green River. However, the recharge area to the southeast of the springs is not within the City's jurisdiction.

There are recent large lot developments created in the spring recharge area that have been created by Palmer Coking Coal Company in the Hyde Lake Area. The City of Black Diamond shall notify King County and the Department of Health of the close proximity of these new developments to our source recharge area.

SUSCEPTIBILITY ASSESSMENT

A susceptibility assessment for the Black Diamond Spring Field was previously completed and submitted to the Department of Health.

WELLHEAD PROTECTION AREA INFORMATION

The City of Black Diamond's Wellhead protection areas are shown in **Figure 6.1, Wellhead Protection Zones**. The protection zones, also known as "zones of contribution", are the areas that are most likely to contribute pollutants to the groundwater. It is important that land use is managed within zones of contribution in order to protect the City's spring source. The delineation of zones of contribution and the hydrogeological methods used to develop the zones are the Fixed Radius Method, the Analytical Method, and the Numeric Method.

Fixed Radius Method

The simplest method of modeling groundwater is the Fixed Radius Method. In this method, concentric areas around the wells delineate the zones of contribution by a set distance. Alternatively, the Calculated Fixed Radius Method delineates the zones of contribution based on known or assumed aquifer characteristics and pumping data.

¹² The analysis of the City of Black Diamond's Wellhead Protection Areas was completed in conjunction with the 2000 Water System Plan update.

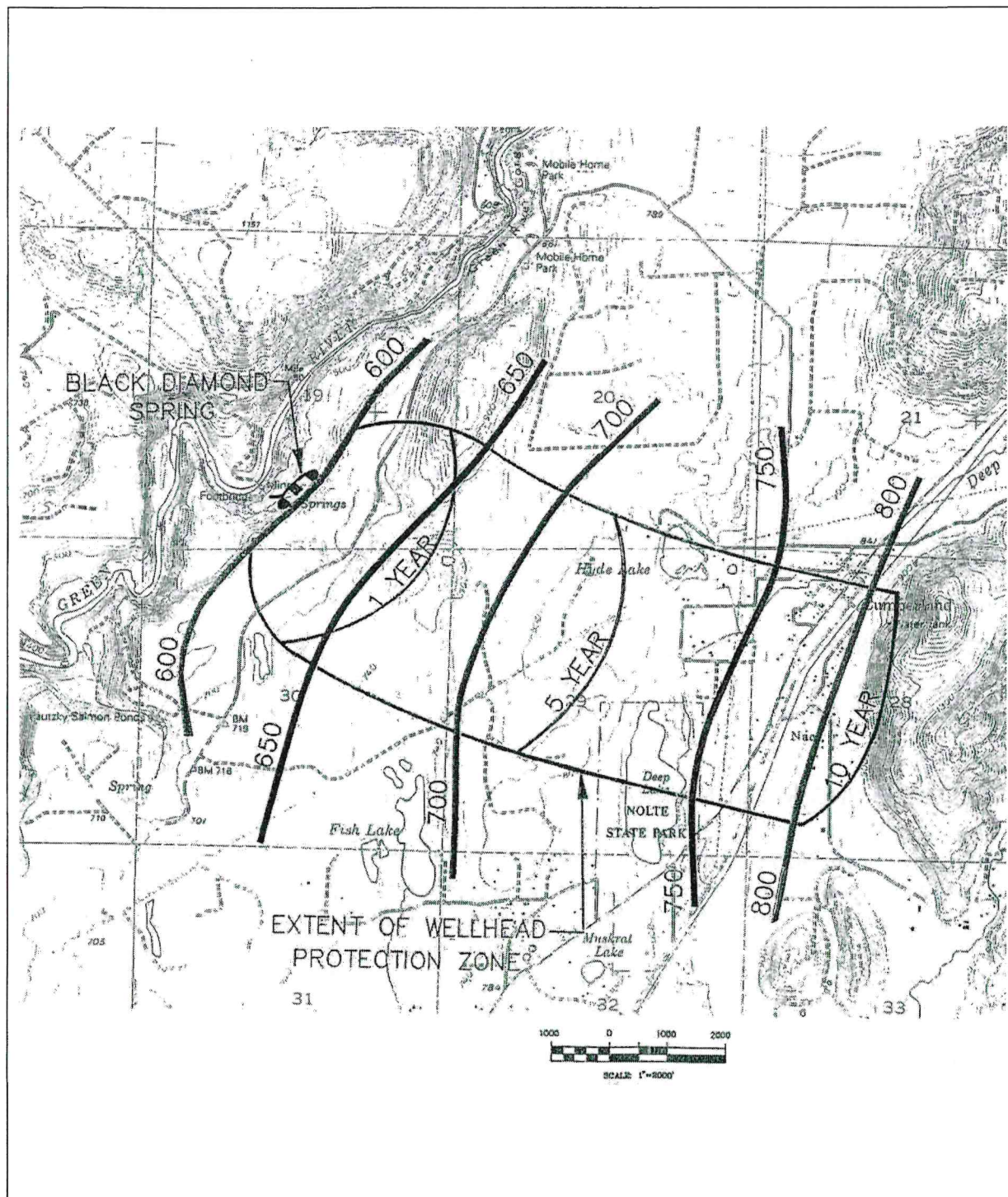


Figure 6.1, Wellhead Protection Zones

Analytical Method

The analytical method utilizes basic physical characteristics of the aquifer such as aquifer thickness and direction of groundwater flow. The analytical method makes assumptions and simplifies the hydrogeologic processes. However, by utilizing information regarding the physical characteristics of the aquifer, the analytical method is a more realistic representation of groundwater flow than the Fixed Radius Method.

Numeric Method

The numeric method is an even more complex and costlier delineation method than the analytical method. The numeric method models groundwater by superimposing a grid over the study area. Each of the squares in the grid is identified by its' physical characteristics which are collected from a variety of sources. These sources may include geologic and hydrogeologic maps, geophysical data, well logs, groundwater elevation data, meteorological data, and stream flow discharge. The numeric method results in a more accurate representation of groundwater flow than the Analytical or Fixed Radius Methods.

Black Diamond Wellhead

The Black Diamond wellhead protection areas were delineated through the use of a computerized analytical model from the Wellhead Protection Area (WHPA) that was developed by EPA. It was determined that the Fixed Radius method was inappropriate for the Black Diamond Spring Field as water does not flow to the discharge point from a 360-degree radius due to geographic constraints along the Green River embankment.

Table 6.1, Wellhead Delineation Factors includes data from a previously completed report that was inputted into the model in order to determine the one, five, and ten year zones of contribution.

Table 6.1, Wellhead Delineation Factors

| DESCRIPTION | VALUE |
|--|--|
| Direction of groundwater flow within the Cumberland Aquifer | Generally to the northwest |
| Constant Discharge Rate from three spring field collection areas | 20 CFS (6.67 per spring field collection area) |
| Porosity | 0.22 |
| Hydraulic Gradient | 0.02 ft/ft |
| Aquifer thickness | 100 feet |

CONTAMINANT SOURCE INVENTORY

An inventory of all potential contaminants is necessary in order to identify past, present, and future activities which may potentially be a source of contamination to the City's spring field. The majority of the identified spring recharge area is undeveloped, forest

lands. However, the town of Cumberland is within the ten-year zone of contribution, as well as recent large-lot developments in the Hyde Lake Area.

In order to maintain an effective full inventory, all known and potential sources must be identified and mapped. There are many activities that may be a potential source of contamination, such as: landfills; underground storage tanks; septic tanks; land use and zoning practices; commercial and industrial operations; dry wells and catch basins; and known sites of contamination.

CONTINGENCY PLAN

Contingency planning plays an important role in the development of a wellhead protection program. Contingency planning addresses the long-term replacement of the City of Black Diamond's spring source. A contingency plan allows for the City of Black Diamond to be prepared to respond to emergency situations. For the City, a worst case scenario would be if the Black Diamond Spring Field experienced groundwater contamination. Contamination could occur due to illegal discharges, leaks, or spills in and around the Spring Protection area.

Previously, the Black Diamond Spring Field was the City's only source of supply. Within recent years, the City has negotiated with the City of Tacoma and an intertie has been completed between the City of Black Diamond's water system and the City of Tacoma's Second Supply Pipeline. This intertie connection has resulted in an alternate source of supply for the City in the event of contamination of the Black Diamond Spring Field.

RECOMMENDATIONS AND NOTIFICATION OF FINDINGS

The City of Black Diamond will take the following actions in order to minimize the risk of contamination to the Black Diamond Spring Field. The City will notify commercial businesses, hazardous waste generators, and septic system owners of their presence within the City's wellhead protection area. The City will also assertively notify King County of the potential impact that developments approved by their jurisdiction may have on the water quality of the City of Black Diamond. The City will utilize management strategies provided by the King County Groundwater Protection Program.

CHAPTER 7

OPERATION & MAINTENANCE PROGRAM

CHAPTER 7 – OPERATION & MAINTENANCE PROGRAM

WATER SYSTEM MANAGEMENT & PERSONNEL

The City of Black Diamond operates with a Mayor-Council form of government with the Mayor acting as the chief administrative official and the City Council as the legislative function. The Mayor is assisted in the administrative oversight by a City Administrator who performs the day to day management function of the organization. The Public Works Department operates the City's water system and is lead by a Public Works Director that supervises the Utilities Superintendent who is assisted as needed by two maintenance staff.

The Public Works Superintendent is charged with the day to day operational responsibilities of the water utility. Those responsibilities include preventive maintenance, field installation and repair judgments, water quality monitoring and management of the City's cross-connection control program.

The Public Works Director is the initiator of the department's budget proposals which are reviewed, modified as needed and approved through the City's administrative review and Council adoption process. He/she would also be the person who would most often respond to complaints.

On issues requiring more formal notification or responses to the public or press, the Public Works Superintendent would serve as technical advisor to the Public Works Director &/or City administration in formulating the appropriate responses/notifications to the public/press.

Utility billing for the system is accomplished through the field meter reading managed by the Public Works Superintendent and the administrative function of creating bills and collecting payments which is provided through the City Clerk's office.

OPERATOR CERTIFICATION

The City of Black Diamond has a responsibility to comply with regulations established by the State of Washington Department of Health (WDOH) WAC 246-292. This requires the City of Black Diamond to employ the services of a Water Distribution Manager (WDM) who is in responsible charge of the daily operational activities of the system. This position is required to maintain their currency in the field by obtaining not less than three continuing education units (CEUs) within a specified three year time frame. Common sources of that training include seminars put on by the American Water Works Association (AWWA) or Washington Education and Training Resources Center (WETRC).

The City of Black Diamond meets these requirements through the Superintendent Position currently held by Mr. Dal Santo. Mr. Dal Santo is certified as a WDM-2 and is supported by the City's training budget to meet his department's ongoing training and education requirements.

It is important that anyone who assists the Public Works Superintendent be trained as well. At a minimum, the water maintenance staff should be trained in: Confined space; Trenching and shoring; Cross-Connection Control; Asbestos cement pipe safety; and Traffic flagging.

SYSTEM OPERATION AND CONTROL

MAJOR SYSTEM COMPONENTS

The Water System Map, included in **Appendix G –Water System Map**, provides the location of the City's major water system components. Each major component is listed below with a description of their normal operation procedures.

Black Diamond Spring Field

The City of Black Diamond currently collects water from a hydraulically interconnected field of springs known as the Black Diamond Spring Field. The springs have two points of collection currently in use. This currently serves as the City's primary source of water. See the description provided in **Chapter 2 – Description of Water System** for a more detailed discussion of this facility and the Water system map included in **Appendix G –Water System Map** for its location relative to other features of the water system. In the event that the availability of water from the springs was interrupted due to maintenance or repair activities, the City would utilize the City of Tacoma intertie as it's primary source of supply until the springs were back in service.

City of Tacoma Intertie

The City of Black Diamond also has a secondary source of water supplied by agreement from the City of Tacoma by an intertie connection with Tacoma's Second Supply Pipeline (SSPL). This will become a primary source as the City's growth outstrips the ability of the Spring Field to meet the demands. Currently this source is accessed only to ensure reliability.

Storage Reservoirs

The City currently operates with two storage reservoirs. The first reservoir provides 0.5 million gallons and provides service to the 965 Pressure Zone. The City's SCADA system controls the pumping system and records the volume of water pumped to this reservoir. The second reservoir provides 4.3 million gallons and provides service to the 850 and 750 Pressure zones. It also serves as the source of supply to the 0.5 MG reservoir.

Pumping Facilities

The City has three pumping facilities for moving water from its sources of supply to its reservoirs. One is the hydro-turbine located south of the Green River and used to pump water from the Black Diamond Spring Field. This is currently not in use, but has historically been used during lower demand periods in the winter months.

The second is the electrical pumping facility located on the north bank of the Green River. It is fed by gravity from the springs, treated with chlorine, and then pumped to the 4.3 MG reservoir. This pumping facility is equipped with emergency power generation capability.

The third pumping facility is located at the 4.3 MG Reservoir site. It is used to pump water from the 4.3 MG Reservoir to the 0.5 MG Reservoir. This pumping facility is equipped with emergency power generation capability.

Water Treatment Systems

The City currently has two water treatment facilities. The first is a chlorination system located at the North Bank Pump Station. The City produces sodium hypochlorite through the use of a 2-pound brine generating system. The second treatment facility is a corrosion treatment system located at the 4.3 MG reservoir site. Corrosion treatment is provided through the use of a 25% sodium hydroxide solution (caustic soda).

Valves

The Black Diamond Water System currently operates with three pressure zones. These pressure zones are defined through the utilization of four Pressure Reducing Valves (PRV's) throughout the system, as well as through the use of closed valves.

Additionally, there are numerous valves throughout the system in order to be able to isolate segments of waterline in the event of repair or replacement. There are also numerous hydrant valves throughout the system to control flow to fire hydrants.

ROUTINE SYSTEM OPERATION & MAINTENANCE

Routine maintenance activities help to preserve the value of the water system and to ensure that the utility can continue to operate in an efficient manner. In a water system, maintenance is essential to ensure that the system can fulfill the safety and health requirements of the customers.

The City of Black Diamond conforms to all recommended maintenance tasks as published by equipment suppliers as a minimum standard for maintenance activities. Regular operational tasks for the Black Diamond Water System are outlined in **Table 7.1, Black Diamond Routine Operations & Preventative Maintenance**. Sample forms to be used in documenting and recording maintenance activities have been provided in **Appendix Y – Operations & Maintenance Forms**.

Table 7.1, Black Diamond Routine Operations & Preventative Maintenance

| FACILITY | ACTIVITY | FREQUENCY |
|----------------------------------|---|--|
| Customers | Respond to customer complaints and water emergencies. | As needed |
| Black Diamond Spring Field | Clean screens. Inspect for leaks and proper operation. Inspect for animal intrusion. | 2-3 times per week |
| | Maintaining Access Roads | As Needed |
| | Clearing Brush from area of springs | As Needed |
| City of Tacoma Intertie | Inspect for proper operation to ensure intertie is readily available as needed | Monthly |
| | Monitor contact time requirements in conformance with WAC 246-290-692. | Daily |
| Reservoirs | Inspect exterior components of the reservoirs. Inspect for vandalism. Record levels. | Daily |
| | Daily check of 4.3 MG reservoir and pump station, along with recording flows and water temperature. | Daily |
| | Monitor chlorine residual at a minimum chlorine residual of 0.2 milligrams per Liter (mg/L) prior to the first customer and a trace at all other points in the distribution system. | Daily |
| | Monitor pH level between 7.6 and 7.8 mg/L | Daily |
| | Inspect screens, vents, and hatch seals. Repair or replace screens and seals as needed | Monthly |
| | Operate reservoir drain and run reservoir to overflow. Inspect tank interior. Clean and/or repaint interior and exterior as needed. | Annually |
| | | |
| Pumping Facilities | Inspect hydro-pump station (when in use) | Weekly |
| | Inspect electric pump stations | Bi-weekly |
| | Inspect condition of impellers. Replace pump oil. Inspect pump station buildings and piping. Repaint and repair as needed. | Annually |
| Pressure Reducing Valves (PRV's) | Inspect for proper operation | Quarterly, or additionally as system pressures require |
| Distribution System Valves | Inspect valves for proper operation | Semi-Annually |
| Distribution System Pipes | Flushing of dead-end water mains | Bi-Annually |
| Distribution System Testing | Coliform Sampling | Bi-Monthly |
| | Lead and copper sampling, asbestos sampling, TTHM and HAA5 sampling | Annually |

| | | |
|-----------------------------|---|----------------------------------|
| Source Testing | Nitrate Testing | Annually |
| | SOC, VOC, and IOC testing | Every 3 years |
| | Compliance with GWI testing and radionuclide testing | As needed |
| Fire Hydrants | Inspect hydrants, exercise valves, and conduct flow testing | Annually (by Fire Department) |
| | Flush fire hydrants | Bi-Annually |
| Blowoff Assemblies | Flush lines to remove stagnant water and debris | Bi-Annually |
| Meters | Read meters | Monthly |
| | Test and calibrate source meters | Every two years |
| | Replace worn or defective meters | As needed |
| Telemetry & Control Systems | Backup program and data | Daily |
| | Visually inspect cabinets and panels for damage, dust and debris. Test alarm indicator units. Clean and flush all pressure sensitive devices. | Semi-Annually |

EQUIPMENT, SUPPLIES, AND CHEMICAL LISTING

The City of Black Diamond utilizes the equipment included in **Table 7.2, Operation and Maintenance Equipment** to perform routine operation and maintenance of the water system. Additionally, **Table 7.3, Chemical** lists chemicals that are maintained on hand in order to operate the system.

Table 7.2, Operation and Maintenance Equipment

| EQUIPMENT |
|--------------------------------------|
| 2005 Dodge 4x4 Quad Cab Pickup Truck |
| 2001 Ford F350 Pickup Truck |
| 2000 Chevy CK3500 Pickup Truck |
| 1990 GMC 1 T Flat Bed Truck |
| 1991 Portland Trailer |
| 1998 John Deere Backhoe |
| John Deere Grader |
| Miscellaneous Tools, Etc. |

Table 7.3, Chemical Supplies

| CHEMICAL | AMOUNT |
|-------------------------|---------------|
| .8% Sodium Hypochlorite | 44 Gallons |
| Sodium Hydroxide 25% | 1,200 Gallons |

COMPREHENSIVE MONITORING PLAN

The City of Black Diamond conducts regular water quality testing in order to ensure that a safe product is being distributed to its customers in conformance with DOH regulations. A copy of the City's Monitoring Plan has been included in **Appendix U – Coliform Monitoring Plan**. Additionally, copies of recent water quality test results have been included in **Appendix V – Water Quality Testing**. Further details regarding water quality monitoring requirements has been included in **Chapter 4 – System Analysis**.

EMERGENCY RESPONSE PROGRAM¹³

Utility Emergency Planning can be defined as the activities which prepare a utility to respond to an emergency situation. Emergencies can be small or large with respect to their effects on utility operations and service.

Many utilities cope with smaller scale or "routine emergency" situations frequently, perhaps weekly or daily. Larger scale or "disaster emergency" situations occur far less frequently, but many aspects or effects of a disaster manifest themselves in the same way as the routine emergencies. In many respects, a disaster can be thought of as the simultaneous occurrence of many smaller scale emergencies. If a utility is well prepared to handle the routine emergencies, then they will also be better prepared to handle the more serious ones as well.

PRIORITY SERVICES LIST

In certain instances, particularly during an emergency, it is not possible to provide advanced notice of a water shutdown. However, there are certain water customers that must be notified in the event of a disruption of service. Critical among these in the City of Black Diamond are kidney dialysis patients. A current list of customers with dialysis machines requiring an uninterrupted supply of water must be maintained. The list must be updated regularly by the City. Customers on the priority list are notified prior to emergency shutdown of water service.

AFTER HOURS EMERGENCY CALLOUT

System operators are notified at home of an emergency condition after hours by either City staff directly or a page on the Public Works Utility Emergency pager. The situation is assessed by the operations staff person responding to the emergency, and the repairs completed. As was previously indicated, there are sufficient materials available on-site to make the necessary repairs. An emergency call list has been provided in **Table 7.4, Emergency Call List**.

¹³ This section on the Emergency Response Program is an excerpt from City of Black Diamond, Final Comprehensive Water System Plan, 2000 with minor edits for content updates and formatting.

Table 7.4, Emergency Call List

| CONTACT | PHONE NUMBER |
|---|---------------------|
| Emergency Service | 911 |
| Public Works – Utility Emergency Pager | (253) 333-5555 |
| City Shop | (360) 886-2523 |
| King County Office of Emergency Management | (206) 296-3830 |
| Power: Puget Sound Energy | |
| Business & Power Outages | (800) 321-4123 |
| Chemical Supplies | |
| All Pure Chemical | (360) 673-5215 |
| Van Waters and Rogers | (800) 562-4860 |
| Pipe / Fitting Suppliers | |
| H.D. Fowler | (800) 927-5699 |
| H.D. Supply | (206) 722-4800 |
| Testing Lab (Coliform) | |
| Washington State Dept. of Health | (206) 361-2800 |
| Telephone: Qwest Communications | |
| Business | (800) 603-6000 |
| Repair | (800) 954-1211 |

In the event of a major disaster:

- 1) All staff should report to City Hall upon learning of the disaster.
- 2) During the ensuing survey of the system's facilities for damage, use of the radio should be kept to a minimum and limited to the transmitting of important information.
- 3) Upon a request to clear the air, all operators should stand by for emergency instructions.
- 4) All contact with the media should be through the Mayor only. This is critical as it will minimize the amount of misinformation that typically accompanies such events.
- 5) It is important to stick to the task at hand until the damage to the system has been evaluated and the City staff have declared that the water system emergency status has been terminated. The damage to the water system must be evaluated to prevent, where possible, loss of life, bodily injury, property damage and contamination as a result of the damage to water system facilities. All City and County forces will be overburdened at such times, but, it is not the role of the city personnel to assist Police, Fire or other

personnel unless directed to do so or until released from the emergency work associated with water system facilities.

EMERGENCY RESPONSE PLAN

Emergency responses for the springs, reservoirs, and the distribution system have been identified for the following emergencies: Power failure; Severe Earthquake; Severe Snowstorm; and Contamination of Water Supply or Spring Washout.

Power Failure

Various types of weather can cause loss of power, i.e., wind, lightning, freezing rain, freezing snowstorm. Power is provided by Puget Sound Energy and City staff report approximately one power outage per year.

Table 7.5, Power Failure Emergency Response

| SYSTEM COMPONENT | ACTION |
|---|---|
| Pumps: Electric pump will shut off and system will automatically switch to backup power | Verify backup power is working |
| Reservoir: Water level may fall if system demand exceeds supply | Check reservoir level and notify customers to curtail water use if reservoir level continues to drop – increase pumping |
| Distribution System: Pressure will drop if reservoir level drops | Continuously monitor reservoir level, implement water restrictions if needed. |

Severe Earthquake

Although severe earthquakes are rare, the City may be vulnerable if facilities are damaged. The City should be prepared to obtain the ability to procure trucked-in water.

Table 7.6, Severe Earthquake Emergency Response

| SYSTEM COMPONENT | ACTION |
|--|--|
| Springs: Structural damage may have occurred and/or mechanical damage to pumps or piping may have occurred | Check pumps and mechanical piping. |
| Reservoir : Reservoir may be leaking or be structurally damaged | Check reservoir for structural damage and drain if necessary. Check reservoir for cracks and leaks and seal or drain as required. Bypass reservoir and run system from pumps only. |
| Distribution System: Distribution and transmission mains may be broken | Isolate broken sections and repair. |

Severe Snowstorm

Heavy snowfall will bring motor vehicle traffic to a standstill. Employees will not be able to reach the problem area. Power outages may occur. Water supply should not be interrupted.

Table 7.7, Severe Snowstorm Emergency Response

| SYSTEM COMPONENT | ACTION |
|-------------------------|---|
| Pumps and Springs | No immediate effect – snow may prevent access. Clear snow from access roads. |
| Reservoir | No immediate effect – snow may prevent access. Clear snow from access roads. |
| Distribution System | Crew transportation to monitor system and to effect repairs will be limited, City crews will plow important streets – contact State Highway Department to expedite plowing to any problem area under their jurisdiction, Have chains or other snow gear in readiness for maintenance equipment, Valve location maps should be made available for maintenance personnel and should be kept current, Clear snow from fire hydrants. |

Contamination of Water Supply

Contamination of the water supply might occur due to main breaks or pollution from an isolated source. Redundant source capacity and the ability to isolate the reservoirs help to reduce the City's vulnerability.

Table 7.8, Contamination of Water Supply Emergency Response

| SYSTEM COMPONENT | ACTION |
|---|---|
| Springs – Isolate source of contamination | Close valves as required and isolate source of contamination. Repair and/or otherwise remove source of pollution. Flush previously contaminated section and test until free of contamination prior to resumption of use. |
| Reservoir – Chlorinate | Isolate contaminated reservoir from system and decide method of disinfection. Inspect vent screens, hatches and piping to try to identify the source of contamination. If reservoir water is considered unsuitable for consumption due to stagnation, etc., consider draining, cleaning and disinfecting reservoir. If water surface needs skimming, consider overflow reservoir and then disinfect contents. Disinfect reservoir with chlorine as required by AWWA standards – take bacteriological samples and return reservoir to service when results are satisfactory. |

| | |
|---|---|
| Distribution System – Isolate source of contamination | Close valves as required to isolate source of contamination. Repair and/or otherwise remove source of pollution. Flush previously contaminated section and test until free of contamination prior to resumption of use. |
|---|---|

SAFETY PROCEDURES

Safety is the highest concern and responsibility of all water operations and maintenance staff. First aid kits are available at all Public Works buildings and in each maintenance vehicle. **Table 7.9, Safety Procedures** identifies safety procedures to be followed for operations and maintenance tasks that are associated with the City's water system.

Table 7.9, Safety Procedures

| HAZARDOUS CONDITION | SAFETY PROCEDURE |
|---------------------------------------|--|
| Use of Chlorine / Chlorine Products | Handle with care, provide adequate ventilation, and wear safety glasses and rubber gloves. Detailed handling procedures are found in the respective Material Safety Data Sheets (MSDS). |
| Use of Sodium Hydroxide | Handle with care, provide adequate ventilation, wear safety goggles, apron, and rubber gloves. Keep container tightly closed, store in a dry, corrosion-proof area. Protect from unintentional contact with water. Never return contaminated material to its original container. Immediately contact the chemical supplier / manufacturer for handling instructions if drums of caustic appear to be swollen. Detailed handling procedures are found in the respective Material Safety Data Sheets (MSDS). |
| Working in Confined Spaces | Follow state requirements for confined space entry. |
| Working around Heavy Equipment | Obtain proper training and follow all safety procedures. Use noise protection equipment. |
| Working in Traffic Areas | Wear proper clothing and provide adequate signage and flagging for work area. Refer to the Manual of Uniform Traffic Control Devices (MUTCD) for current requirements. |
| Working on or Around Water Reservoirs | Follow proper safety harness procedures for working on tall structures. |
| Working in or around Pump Stations | Obtain proper training and follow all safety procedures for working on pumps and electrical equipment. Use noise protection equipment. |

| | |
|---|--|
| Working on Asbestos Cement (AC) Water Main | Obtain proper training and follow all safety procedures for working with asbestos materials. |
|---|--|

CROSS-CONNECTION CONTROL PROGRAM

The City has developed a Cross Connection Control policy in order to prevent contamination of the City's water supply. A copy of the City's Cross Connection Control Program has been included in **Appendix T – Cross Connection Control Program**.

CUSTOMER COMPLAINT RESPONSE PROGRAM

The City of Black Diamond has received few written complaints, and periodically receives telephone calls from customers with questions or concerns. Any comments or concerns are recorded by the utility clerk and written on a work order form for the utility department to address on a daily basis. The calls are typically infrequent and involve low-impact issues. There does not appear to be a trend or pattern to the calls that have been received to date.

RECORDKEEPING AND REPORTING

The City of Black Diamond maintains thorough records for water system related data such as customer billing records, source meter readings, and water quality testing. All records are annually stored onto electronic media (i.e. discs or CD's) which are kept in the Public Works office at City Hall. All test results are kept and filed in the PW Utility File Cabinet at City Hall.

O&M IMPROVEMENTS

The City of Black Diamond is interested in converting existing water meters to radio-read meters with a fixed base. This would involve retro-fitting existing meters and purchasing and installing software. This capital purchase has been listed under the proposed projects in **Chapter 9 – Improvement Program**.

Additional staff will be required to accommodate operation and maintenance of the water system as the City experiences the anticipated significant growth. This additional staffing need is reflected in **Chapter 10 - – Financial Program**.

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CHAPTER 8

DISTRIBUTION FACILITIES DESIGN & CONSTRUCTION STANDARDS

CHAPTER 8 – DISTRIBUTION FACILITIES DESIGN & CONSTRUCTION STANDARDS

PROJECT REVIEW PROCEDURES

The process by which the City of Black Diamond will review all project documents related to the City water system has been clearly outlined in the Water Standards for the City of Black Diamond. Specific emphasis has been placed on distribution projects which will not need to be reviewed and approved by DOH. A copy of the draft standards have been included in **Appendix P – Black Diamond Public Works Standards**. The City of Black Diamond is hereby requesting approval of these draft standards by the Department of Health in conjunction with approval of this Water System Plan.

POLICIES AND REQUIREMENTS FOR OUTSIDE PARTIES

Policies and requirements for outside parties, such as developers, including right-of-way and pipe looping requirements have been addressed by the Water Standards, as well as the City's Developer Extension Agreement and checklist which has been included in **Appendix Z – Developer Extension Checklist and Agreement**. Various sections of these standards cover the requirements of a development project that will include City water system components.

The City Water Standards cover the general design requirements for additions to the Black Diamond Water System. The Developer Extension Agreement covers the administrative and contractual requirements of outside parties constructing water projects to be included in the City Water System. These documents generally address the necessary applications, provisions for special circumstances, design standards, developer charges, and performance bonding for outside parties.

The City of Black Diamond currently provides Water Investigation Certificates to developers inquiring about water availability. This practice is pursuant to the Growth Management Act (GMA) level of service standards for potable water. In 1990, the Legislature passed the Growth Management Act which has been codified primarily in RCW 36.70A. The legislative intent of the GMA is to coordinate and plan growth so as to balance environmental, economic development, health, safety, and quality concerns in the use of the lands within the state.

The specific provision of the GMA regarding water availability has been codified in RCW 19.27.097(1), of the State Building Code Act. It provides as follows:

Each applicant for a building permit of a building necessitating potable water shall provide evidence of an adequate water supply for the intended

use of the building. Evidence may be in the form of a water right permit from the department of ecology, a letter from an approved water purveyor stating the ability to provide water, or another form sufficient to verify the existence of an adequate water supply. In addition to other authorities, the county or city may impose conditions on building permits requiring connection to an existing public water system where the existing system is willing and able to provide safe and reliable potable water to the applicant with reasonable economy and efficiency. An application for a water right shall not be sufficient proof of an adequate water supply.

The City of Black Diamond utilizes a Water Investigation Certificate format to provide information to the public as to the availability of potable water. The certificates include language regarding the guarantee of that availability as it is reliant on the ability of the applicant to obtain a building permit. This letter should also include reference to an expiration date of 1 year from the date of issuance.

The Water Investigation Certificate format supports a documentation program for the availability of its water supply. This program includes an up-to-date tracking of water system capacity and current water usage throughout the system. This data can then be weighed against those requests for future water service to project system capacity in support of development. This can also be used to assist in assessment of future capital facilities needs for the City Water System.

DESIGN STANDARDS

Design standards and sizing criteria for City water improvements are outlined in the draft Water Standards in **Appendix P – Black Diamond Public Works Standards**. All proposed water mains shall be sized by a professional engineer qualified to do so and licensed in the State of Washington. Minimum pipe size will be as specified in the Water Standards and this WSP. Specific requirements regarding pipe sizing and performance are included in **Chapter 2 – Description of Water System** and **Chapter 4 – System Analysis**.

For improvements located within unincorporated King County, improvements shall be designed in conformance with the “King County 2007 Road Design and Construction Standards.” These standards are available on the King County website at <http://www.metrokc.gov/kcdot/roads/eng/roadstandards/index.cfm>.

CONSTRUCTION STANDARDS

Construction materials and methods for the Black Diamond Water System have been addressed in detail in the City’s draft Water Standards. The Water Standards include specific references to individual standards of pipe class, manufacturers, and construction specifications. A copy of this draft document has been included in **Appendix P – Black Diamond Public Works Standards**.

For improvements located within unincorporated King County, improvements shall be constructed in conformance with the "King County 2007 Road Design and Construction Standards." These standards are available on the King County website at <http://www.metrokc.gov/kcdot/roads/eng/roadstandards/index.cfm>. A right-of-way permit will also be required for improvements constructed within unincorporated King County.

CONSTRUCTION CERTIFICATION AND FOLLOW-UP PROCEDURES

The City of Black Diamond is committed to ensuring that City water projects are constructed in accordance with the City's Water Standards. Specific design, approval, inspection, testing, acceptance, and contractor warranty requirements are all included in the Water Standards. All of these elements of the standards and procedures undertaken by the City, work to ensure that Water System facilities are installed to the standards set forth by the City of Black Diamond, DOH, and Washington State Law.

Construction inspection procedures, including pressure testing, disinfection, and water quality sampling procedures are outlined in the City's Water Standards. Specific instruction and direction are provided to the Contractor and City Inspector on the standards of testing required for construction certification by the City.

Procedures for final certification by the City also require the preparation and submittal of construction record drawings. DOH also requires the project to be documented through the submittal of a Construction Completion Report following WAC 246-290-120(5) which states the following:

(5) Purveyors shall submit a construction completion report (departmental form) to the department within sixty days of completion and before use of distribution-related projects in accordance with WAC 246-290-125 (3)(f), or other project approved for construction by the department. Exceptions to this requirement are projects listed in WAC 246-290-125(1). The form shall:

- (a) Bear the seal, date, and signature of a professional engineer licensed in the state of Washington;
- (b) State the project is constructed and is completed in accordance with department regulations and principles of standard engineering practice, including physical testing procedures, water quality tests, and disinfection practices; and
- (c) Document system physical capacity to serve consumers if the project results in a change (increase or decrease) in physical capacity.

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CHAPTER 9

IMPROVEMENT PROGRAM

CHAPTER 9 – IMPROVEMENT PROGRAM

IDENTIFICATION AND PRIORITIZING OF IMPROVEMENTS

This Chapter presents the proposed projects and schedule for the City of Black Diamond's six-year Capital Improvement Plan (CIP) in accordance with the requirements of WAC 246-290-100. The projects were selected to address existing deficiencies and expected growth within the water system customer base. In identifying projects the plan looked at the supply system, storage requirements and the transmission and distribution needs. The projects were evaluated considering, but not limited to, health standards, land use, supply requirements, system reliability, capital investment requirements, consistency with regional plans and environmental impacts.

FUNDING SOURCES

Three funding sources have been identified for funding the proposed improvement projects – “Development”, “Connection Charges”, and “Rates”. “Development” has been identified as a funding source for projects that are to be funded outright by development as extensions to the system. “Connection Charges” has been identified as a funding source for projects that improve the existing system to address growth-related deficiencies. “Rates” has been identified as a funding source for projects that address existing system deficiencies.

Additional discussion regarding the funding program is included in **Chapter 10 – Financial Program**.

PROPOSED IMPROVEMENTS

The proposed improvement projects are classified according to the project types included in **Table 9.1, Improvement Project Types**. Project descriptions and costs are presented in **Table 9.2, Proposed Improvement Projects**. The project locations are displayed on **Figure 9.1, Proposed Improvement Projects**. A large size copy of this map has also been included in **Appendix AA – Proposed Improvement Project Map**.

DISTRIBUTION SYSTEM IMPROVEMENTS

The distribution system faces several challenges, the most important of which is to ensure adequate water supplies reach the areas of expected growth. The plan provides for 12-inch lines to deliver water to the emergent areas which is sufficient to meet domestic and fire flow needs. The exception to this is a 16-inch line in the proposed future industrial area along Pipeline Road.

Projects were also identified to provide for looping of the system where possible. Additionally, undersized lines were identified and projects planned to eliminate lines less than 8-inches in diameter where possible.

Lastly, in anticipation of possible future issues with asbestos cement water lines, replacement of existing asbestos cement lines are identified for replacement. Presently, the City conducts regular water quality testing of the system due to the high percentage of Asbestos Cement lines and is in compliance with all required standards. It is expected that the AC replacement projects are of lower priority and should be considered for replacement in advance of major improvement to the street surfaces in which they lie. Since a new street surface may have a 20-40 year life this would be an opportune time to eliminate any risk with asbestos cement lines.

Table 9.1, Improvement Project Types outlines the various improvement project types. The improvement projects are then listed in **Table 9.2, Proposed Improvement Projects**. The projects are listed and include the relevant information needed to understand the origin of the project and manage the implementation of the program.

Table 9.1, Improvement Project Types

| PROJECT TYPES | |
|---------------|-----------------------------|
| D/T | Distribution / Transmission |
| So | Source |
| WQ | Water Quality |
| St | Storage |
| PZ | Pressure Zone |
| O/M | Operations / Maintenance |

Table 9.2, Proposed Improvement Projects

| NO. | PROJECT | PROJ. TYPE | ESTIMATED COST & FUNDING SOURCE |
|-----|--|------------|---------------------------------|
| 1 | RAILROAD AVE W/L REPLACEMENT, PHASE 1: Replacement of 930 lineal feet of 4-inch AC waterline with 12-inch DI waterline from Baker Street to south of the intersection with Merino Street. This project upsizes the waterline to improve fire flow and replaces AC waterline. | D/T | \$186,000 Rates |
| 2 | MERINO ST W/L REPLACEMENT, PHASE 1: Replacement of 230 lineal feet of 4-inch AC and 2-inch AC waterlines with 8-inch DI waterline from Railroad Avenue to Merino Drive. This project upsizes the waterline to improve fire flow and replaces AC waterline. | D/T | \$30,000 Rates |

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| 3 | SPRINGS STUDY: A study to analyze how to protect the Black Diamond Spring Field and how to best continue to provide the City with optimal water quality. This study will include an investigation of relocating water rights to the north side of the Green River. | So, WQ | \$50,000 Rates |
| 4 | WATER METER UPGRADES: Upgrade of water meters to radio-read meters with a fixed base. Includes purchase and installation of software and equipment to read meters. Includes retrofitting of existing meters. | O/M | \$200,000 Rates |
| 5 | ROBERTS DR W/L REPLACEMENT: Replacement of 2,200 lineal feet of 6-inch PVC, 6-inch AC, and 8-inch DI with 12-inch DI along Roberts Drive from Morgan Drive, east to the tie-in with the 12-inch DI waterline on Roberts Drive. This project will provide for a 12-inch waterline to the west end of the 750 pressure zone to serve the North and South Annexation Area Improvements. This project will include transferring services from three existing small lines that are 2-inch or smaller and are serving multiple lots. | D/T | \$440,000 Development |
| 6 | THE VILLAGES, PHASE 1: Extension to serve "The Villages at Black Diamond" anticipated development. The improvements will extend a 16-inch DI waterline from the Roberts Dr/3 rd Ave intersection in a westerly direction along Pipeline Road. The improvements will transition to a 12-inch DI waterline and run to serve the area west of Morganville. The backbone transmission line will serve the 850 pressure zone. PRV's will be installed to serve areas of development within the 750 pressure zone and to provide system looping to the 750 pressure zone. This project also provides a 12-inch DI connection to the current western end of the waterline in Roberts Drive. The location shown is illustrative only and is based on information provided by the potential developer. The project includes approximately 8,000 lineal feet of 16-inch and 18,000 lineal feet of 12-inch waterlines. | D/T, PZ | \$3,780,000 Development |
| 7 | 3RD AVE W/L REPLACEMENT, PHASE 1: Replacement of 1,250 lineal feet of 8-inch AC with 12-inch DI along 3 rd Avenue from the intersection with Roberts Drive to 1,250 north along 3 rd Avenue. This project upsizes the waterline to a 12-inch to serve the 850 and 750 Pressure Zones. This project also replaces AC waterline. | D/T | \$250,000 Connection Charges |

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| 8 | SPRINGS TRANSMISSION MAIN REPLACEMENT, PHASE 1 & SPRING COLLECTION UPGRADES: Improvement to springs and the points of collection. Replacement of transmission mains from springs to the River Crossing. Replacement of 1,300 lineal feet of 6-inch AC with 12-inch DI crossing the Green River, and the transmission piping from the Green River to the North Bank Pump Station. The crossing across the Green River has been previously studied and horizontal directional drilling (HDD) has been recommended in order to reduce vulnerability of the otherwise exposed pipes. Further analysis to see about the relocation of water rights to the North Bank of the Green River may also be appropriate. | D/T, So | \$1,000,000 Development |
| 9 | SPRINGS TRANSMISSION MAIN REPLACEMENT, PHASE 2: Replacement of 9,100 lineal feet of 8-inch AC with 12-inch DI from the North Bank Pump Station to tie-in to the existing 12" Spring Supply Main. In conjunction with this project, the 6-inch AC line from the end of this project to the .5 MG Reservoir will be abandoned. This project upsizes the transmission waterline to a 12-inch line to serve all Pressure Zones. This project also replaces AC waterline. | D/T | \$1,274,000 Development |
| 10 | SPRINGFIELD NO. 3 COLLECTION UPGRADE: Upgrade of the spring collection system to ensure that all surface water is routed away from the collection area. | So, WQ | \$100,000 Rates |
| 11 | 3RD AVE W/L REPLACEMENT, PHASE 2: Replacement of 1,000 lineal feet of 8-inch AC with 12-inch DI on 3 rd Avenue from the current north end of the water system to 1,000 south along 3 rd Avenue. | D/T | \$200,000 Connection Charges |
| 12 | THE VILLAGES, PHASE 2: Extension to serve "The Villages at Black Diamond" anticipated development. The improvements will extend a 12-inch DI waterline from the south end of "The Villages, Phase 1" to the south to a new proposed 1.2 MG reservoir. This project includes the construction of this new reservoir located to serve the 850 pressure zone. The backbone transmission line will serve the 850 pressure zone. PRV's will be installed to serve development within the 750 pressure zone. The waterline locations, reservoir location, and preliminary reservoir sizing are illustrative only and are based on information provided by the potential developer. This project includes approximately 33,000 lineal feet of 12-inch DI waterline. | D/T, St, PZ | \$5,790,000 Development |

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| 13 | 2ND AVE W/L REPLACEMENT: Replacement of 950 lineal feet of 8-inch DI with 12-inch DI on 2 nd Ave from approximately 150-feet south of the intersection with Lawson Street to approximately 260-feet north of the intersection with Baker Street. This project also includes approximately 100-feet of waterline on Baker Street, easterly from the intersection with 2 nd Ave. This project upsizes the waterline to improve fire flow. | D/T | \$190,000 Rates |
| 14 | MORGAN ST W/L REPLACEMENT: Replacement of 3,150 lineal feet of 6-inch AC with 8-inch DI and 12-inch DI along Morgan Street from Roberts Drive to Baker Street. The 12-inch DI is proposed for the commercial area (per draft land use map) towards Baker Street. This project upsizes the waterline to improve fire flow and replaces AC waterline. | D/T | \$416,000 Rates |
| 15 | 965 PRESSURE ZONE TRANSMISSION REPLACEMENT: Replacement of 2,300 lineal feet of 8-inch AC with 12-inch DI from the .5 MG reservoir to the intersection of Lawson Street & Newcastle Drive. This project upsizes the transmission line to a 12-inch to serve the 965 Pressure Zone and also replaces AC waterline. | D/T | \$300,000 Connection Charges |
| 16 | THE VILLAGES, PHASE 3: Extension to serve "The Villages at Black Diamond" anticipated development. The improvements extend a 12-inch DI waterline from the north end of the existing 12-inch waterline in 3 rd Ave to the northwest and then to the south to tie in to "The Villages, Phase 1". The backbone transmission line will serve the 850 pressure zone. PRV's will be installed to serve development within the 750 pressure zone. The location shown is illustrative only and is based on information provided by the potential developer. The project includes approx. 14,000 lineal feet of 12-inch DI waterline. | D/T, PZ | \$1,820,000 Development |
| 17 | THE VILLAGES, PHASE 4: Extension to serve "The Villages at Black Diamond" anticipated development. The improvements will extend a 12-inch DI waterline from the southern end of "The Villages, Phase 1" waterline and then to the south where a PRV will be installed at the tie in to the transmission backbone line (850 pressure zone). These improvements will serve areas of development within the 750 pressure zone. The location shown is illustrative only and is based on information provided by the potential developer. This project includes approximately 5,300 lineal feet of 12-inch DI waterline. | D/T, PZ | \$689,000 Development |

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| 18 | 3RD AVE W/L REPLACEMENT, PHASE 3: Replacement of 2,150 lineal feet of 8-inch AC with approximately 1,600 lineal feet of 12-inch DI waterline from Roberts Dr to James St and approximately 550 lineal feet of 8-inch DI waterline from James St to Park St. This project upsizes the waterline to improve fire flow and replaces AC waterline. | D/T | \$398,000 Development |
| 19 | BAKER ST W/L REPLACEMENT, PHASE 1: Replacement of 570 lineal feet of 4-inch AC and 6-inch AC with 8-inch DI waterline from Railroad Avenue to 2 nd Avenue. This project upsizes the waterline to improve fire flow and replaces AC waterline. This project is part of the "Downtown AC & Small Line Replacement Program". | D/T | \$100,000 Rates |
| 20 | LAWSON ST W/L REPLACEMENT, PHASE 1: Replacement of 750 lineal feet of 8-inch AC waterline with 12-inch DI waterline from 5 th Ave to 2 nd Ave. This project upsizes the waterline to improve fire flow and replaces AC waterline. | D/T | \$150,000 Rates |
| 21 | 5TH AVE W/L REPLACEMENT & EXTENSION: Replacement and extension of 750 lineal feet of 12-inch DI waterline to replace 8-inch AC waterline. This project replaces existing waterline from Lawson St to the end of 5 th Ave and also extends the waterline from the end of 5 th Ave to the end of the waterline in Pacific Place. This project upsizes the waterline to improve fire flow, provides system looping, and replaces AC waterline. The location shown for the extension is illustrative only. This project is part of the "5 th Ave/Pacific AC & Small Line Replacement Program". | D/T | \$208,000 Rates |
| 22 | PACIFIC PL W/L REPLACEMENT: Replacement of 550 lineal feet of 6-inch AC waterline with 8-inch DI waterline. This project replaces existing waterline from Pacific St to the end of Pacific Pl. This project upsizes the waterline to improve fire flow and replaces AC waterline. This project is part of the "5 th Ave/Pacific AC & Small Line Replacement Program". | D/T | \$72,000 Rates |

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| 23 | PACIFIC ST W/L REPLACEMENT & EXTENSION: Replacement and extension of 1,750 lineal feet of 8-inch DI waterline to replace 6-inch AC waterline. This project replaces the existing waterline from 5 th Ave to Pacific Pl and also extends the waterline from Pacific Pl, to the end of Pacific St, and then to a new tie-in location on Old Lawson Rd. This project upsizes the waterline to improve fire flow, provides system looping, and replaces AC waterline. The location shown for the extension is illustrative only. This project is part of the "5 th Ave/Pacific AC & Small Line Replacement Program". | D/T | \$228,000 Rates |
| 24 | 3RD AVE W/L REPLACEMENT, PHASE 4: Replacement of 2,200 lineal feet of 8-inch AC with 12-inch DI along 3 rd Avenue from Lawson Street to Old Lawson Road. This project upsizes the existing system in order to provide a 12-inch supply to the south end of the 750 pressure zone. This project also replaces AC waterline. | D/T | \$440,000 Connection Charges |
| 25 | 5TH AVE W/L REPLACEMENT: Replacement of 2,200 lineal feet of 8-inch DI with 12-inch DI along 5 th Avenue between Newcastle Dr and Lawson St. This project upsizes the existing system in order to provide improved fire flows and to provide a 12" connection to the 750 pressure zone. This project also includes a physical disconnection between Baker Street and 5 th Avenue where the system currently operates with a closed valve in order to maintain separation between pressure zones. | D/T, PZ | \$440,000 Connection Charges |
| 26 | MORGAN DR W/L REPLACEMENT: Replacement of 2,100 lineal feet of 4-inch AC and 6-inch AC with 8-inch DI from the north end of Morgan Drive to Buena Vista Drive. This project upsizes the waterline to improve fire flow and replaces AC waterline. This project is part of the "Morganville AC & Small Line Replacement Program". | D/T | \$273,000 Rates |
| 27 | DAIL DR / UNION DR W/L REPLACEMENT: Replacement of 600 lineal feet of 4-inch AC waterline with 8-inch DI waterline along Dail Dr between Morgan Dr and Union Dr and from Dail Dr to 400 ft south along Union Dr. This project upsizes the waterline to improve fire flow and replaces AC waterline. This project is part of the "Morganville AC & Small Line Replacement Program". | D/T | \$78,000 Rates |

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| 28 | BAKER ST W/L REPLACEMENT, PHASE 2: Replacement of 300 lineal feet of 4-inch AC with 8-inch DI waterline between 3 rd Ave and 5 th Ave. This project upsizes the waterline to improve fire flow and replaces AC waterline. This project is part of the "Downtown AC & Small Line Replacement Program". | D/T | \$39,000 Rates |
| 29 | UNION DR / HIGHLAND DR W/L REPLACEMENT & LOOPING: Replacement and extension of existing 2-inch PVC and GI waterline with 8-inch DI waterline. This project is located on Union Dr from Roberts Dr, then south to the end of Union Dr; on Highland Dr from Buena Vista Dr, then south to the end of Highland Dr; and a new line between the end of Union Dr and the end of Highland Dr. This project upsizes existing waterlines to improve fire flows and provides system looping. This project involves the construction of 2,300 lineal feet of 8-inch DI waterline. This project is part of the "Morganville AC & Small Line Replacement Program". | D/T | \$299,000 Rates |
| 30 | MINER AVE W/L REPLACEMENT & LOOPING: Replacement of 2-inch PVC with 8-inch DI. Extension of 8-inch DI waterline. This 530 lineal foot project from Morgan Street to Railroad Avenue upsizes the waterline and provides system looping to improve fire flow. This project is part of the "Downtown AC & Small Line Replacement Program". | D/T | \$69,000 Rates |
| 31 | TERRACE PLACE W/L REPLACEMENT: Replacement of 340 lineal feet of 6-inch AC with 8-inch DI waterline from Morgan Street to the end of Terrace Place. This project upsizes the water line to improve fire flow. This project is part of the "Morganville AC & Small Line Replacement Program". | D/T | \$44,000 Rates |
| 32 | RAILROAD AVE W/L LOOPING & REPLACEMENT: Replacement of 2-inch PVC with 12-inch DI. Extension of 12-inch DI waterline. This 1,150 lineal foot project from Morgan St to 1 st Avenue upsizes the waterline and provides system looping to improve fire flow. This project is part of the "Downtown AC & Small Line Replacement Program". | D/T | \$150,000 Rates |

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| 33 | COMMISSION AVE W/L LOOPING & REPLACEMENT: Replacement of 2-inch GI with 12-inch DI. Extension of 12-inch DI waterline. This 800 lineal foot project from Morgan Street to Railroad Avenue upsizes the waterline and provides system looping to improve fire flow. This project is part of the "Downtown AC & Small Line Replacement Program". | D/T | \$160,000 Rates |
| 34 | MERINO ST W/L REPLACEMENT, PHASE 2 & LOOPING TO COMMISSION AVE: Replacement of 2-inch GI with 8-inch DI and extension of 8-inch DI waterline. This 850 lineal foot project is located on Merino St between Merino Dr and the end of Merino St, and also on Favro St between Merino St and Commission Ave. This project upsizes the system to provide improved fire flow and also provides system looping. This project is part of the "Downtown AC & Small Line Replacement Program". | D/T | \$111,000 Rates |
| 35 | JAMES ST / 4TH AVE W/L REPLACEMENT: Replacement of 820 lineal feet of 6-inch AC with 8-inch DI waterline from the intersection of James Street and Third Avenue to the intersection of 4 th Avenue and Park Street. This project upsizes the waterline to improve fire flow. This project is part of the "Downtown AC & Small Line Replacement Program". | D/T | \$107,000 Rates |
| 36 | RAILROAD AVE W/L REPLACEMENT, PHASE 2: Replacement of 2-inch and 8-inch waterline with 12-inch DI waterline and extension of new 12-inch DI waterline from the intersection with Merino St, south along Railroad Ave and then tie-in to the end of the existing 8-inch waterline at the intersection of 1 st Ave and SR-169. This 1,300 lineal foot project upsizes the waterline to improve fire flow; replaces AC waterline; and provides system looping. This project is part of the "Downtown AC & Small Line Replacement Program". | D/T | \$239,000 Rates |
| 37 | 1ST AVE / BAKER ST INTERCONNECTION: Extension of 200 lineal feet of 8-inch DI waterline from the end of the existing waterline on 1 st Avenue to Baker Street in order to provide system looping and improve fire flows. | D/T | \$26,000 Rates |

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| 38 | BAKER ST / NEWCASTLE INTERCONNECTION: Extension of 460 lineal feet of 8-inch DI waterline from the end of the existing waterline on Baker Street to Newcastle Drive in order to provide system looping. The location shown is illustrative only. | D/T | \$60,000 Rates |
| 39 | BLACK DIAMOND RAVENSDALE RD W/L LOOPING: Extension of 4,000 lineal feet of 12-inch DI along Black Diamond Ravensdale Road from 3 rd Avenue to Kanasket Drive. This project provides system looping in order to improve fire flow. | D/T | \$800,000 Rates |
| 40 | DIAMOND VILLAGE W/L REPLACEMENT: Replacement of 590 lineal feet of 8-inch DI waterline with 12-inch DI waterline throughout the Diamond Village Condominiums property to a tie-in location on Roberts Dr. This project upsizes system waterlines in order to improve fire flows. | D/T | \$118,000 Rates |
| 41 | LAWSON ST W/L REPLACEMENT, PHASE 2: Replacement of 1,300 lineal feet of 8-inch AC to 8-inch DI from 5 th Avenue to the tie in to the 12" transmission main. This project replaces AC waterline. This project also involves a physical disconnection of the waterline at the intersection of 6 th Avenue where the system currently operates with a closed valve to maintain separation between pressure zones. | D/T, PZ | \$169,000 Rates |
| 42 | LAWSON ST W/L REPLACEMENT, PHASE 3: Replacement of 1,500 lineal feet of 8-inch AC with 8-inch DI along Lawson Street from Newcastle Drive northeasterly to the end of the existing system. This project replaces AC waterline. | D/T | \$195,000 Rates |
| 43 | MASON-BUENA VISTA, W/L IMPROVEMENTS: Extension of 1,600 lineal feet of 8-inch DI waterline from the west end of Mason Street to the east end of Buena Vista Drive in order to provide system looping and improve fire flows. The location shown is illustrative only. | D/T | \$208,000 Rates |
| 44 | OLD LAWSON RD W/L REPLACEMENT: Replacement of 1,500 lineal feet of 6-inch AC and 8-inch AC with 8-inch DI from Enumclaw-Black Diamond Road to the east end of the AC waterline on Old Lawson Road. This project upsizes the line to improve fire flow and replaces AC waterline. | D/T | \$195,000 Rates |

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|----|---|-----|----------------------------|
| 45 | PALMER / 3RD W/L REPLACEMENT: Replacement of 230 lineal feet of 4-inch AC with 12-inch DI in order to provide sufficient fire flow to the waterlines at the Palmer Coking Coal site located on 3 rd Avenue, north of Roberts Drive. This project also replaces AC waterline. | D/T | \$46,000 Rates |
| 46 | PALMER COKING COAL W/L REPLACEMENT: Replacement of 6-inch AC with 12-inch DI. Extension of 12-inch DI to tie-in with 3 rd Street. This 1,000 lineal foot project provides system looping and sufficient fire flow to the waterlines near the Palmer Coking Coal site located on 3 rd Avenue, north of Roberts Drive. This project also replaces AC waterline. | D/T | \$220,000 Rates |
| 47 | CEDARBROOK W/L REPLACEMENT: Replacement of 8-inch DI with 12-inch DI from SR-169 and then throughout the Cedarbrook Mobile Home Park. This 1,650 lineal foot project upsizes waterlines in order to provide sufficient fire flow. | D/T | \$328,000 Rates |
| 48 | TREATMENT PLANT W/L REPLACEMENT: Replacement of 2,700 lineal feet of 6-inch PVC with 8-inch DI waterline from the intersection of Railroad Avenue and Merino St to the abandoned wastewater treatment plant. This project upsizes the waterline in order to provide improved fire flow. | D/T | \$378,000 Rates |
| 49 | CHLORINATION TREATMENT UPGRADE: Upgrade of chlorination system at the North Bank Pump Station to provide a reliable method of disinfection for the Black Diamond Water System. | WQ | \$200,000 Rates |
| 50 | THE VILLAGES, PHASE 5: Extension to serve "The Villages at Black Diamond" anticipated development. The improvements will provide a 12-inch DI waterline from the 1.2 MG reservoir included in "The Villages, Phase 2" to serve proposed areas of development within the 850 pressure zone. This project also extends a 12-inch DI waterline connection between this proposed development area and the existing waterline in Enumclaw-Black Diamond Road (SR-169) to provide system looping. The location shown is illustrative only and is based on information provided by the potential developer. This project includes approximately 16,000 lineal feet of 12-inch DI waterline. | D/T | \$2,325,000 Development |

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| 51 | LAWSON HILLS IMPROVEMENTS: Extension to serve anticipated Lawson Hills development within the East Annexation Area and within existing City Limits. The improvements will extend to the east from the .5 MG reservoir site. These improvements will include a new pump station and 3 MG storage reservoir in order to provide service to a new, higher, 1175 pressure zone. The location shown is illustrative only. | D/T, St, PZ | \$4,000,000 Development |
| 52 | ABRAMS EXTENSION: Extension of 3,000 lineal feet of 12-inch DI waterline from the current south end of Abrams Dr and then south to tie into "The Villages, Phase 5". This project may serve as a potential alternative to looping from "The Villages, Phase 5" over to SR-169. This project provides system looping. The location shown is illustrative only. | D/T | \$ To Be Determined Development |

PROPOSED IMPROVEMENT PROJECTS

2008-2013 PROJECTS

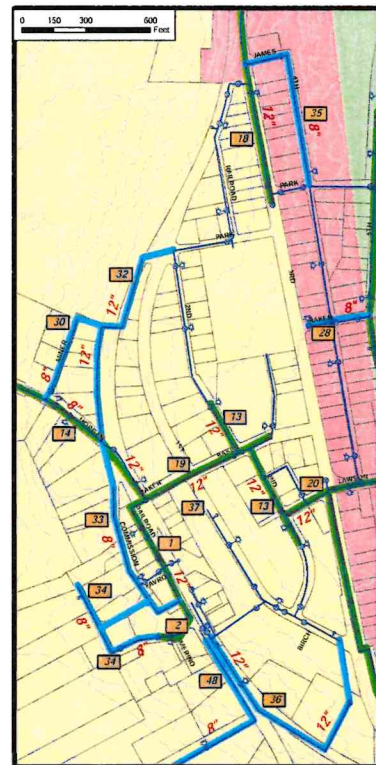
| NO. | PROJECT NAME |
|-----|---|
| 1 | RAILROAD AVE W/L REPLACEMENT, PHASE 1 |
| 2 | MERINO ST W/L REPLACEMENT, PHASE 1 |
| 3 | SPRINGS STUDY (*) |
| 4 | WATER METER UPGRADES (*) |
| 5 | ROBERTS DR W/L REPLACEMENT |
| 6 | THE VILLAGES, PHASE 1 |
| 7 | 3RD AVE W/L REPLACEMENT, PHASE 1 |
| 8 | SPRINGS TRANSMISSION MAIN REPLACEMENT, PHASE 1 & SPRING COLLECTION UPGRADES |
| 9 | SPRINGS TRANSMISSION MAIN REPLACEMENT, PHASE 2 |
| 10 | SPRINGFIELD NO. 3 COLLECTION UPGRADE (*) |
| 11 | 3RD AVE W/L REPLACEMENT, PHASE 2 |
| 12 | THE VILLAGES, PHASE 2 |
| 13 | 2ND AVE W/L REPLACEMENT |
| 14 | MORGAN ST W/L REPLACEMENT |
| 15 | 965 PRESSURE ZONE TRANSMISSION REPLACEMENT |
| 16 | THE VILLAGES, PHASE 3 |
| 17 | THE VILLAGES, PHASE 4 |
| 18 | 3RD AVE W/L REPLACEMENT, PHASE 3 |
| 19 | BAKER ST W/L REPLACEMENT, PHASE 1 (**) |
| 20 | LAWSON ST W/L REPLACEMENT, PHASE 1 |
| 21 | 5TH AVE W/L REPLACEMENT & EXTENSION (***) |
| 22 | PACIFIC PL W/L REPLACEMENT (***) |
| 23 | PACIFIC ST W/L REPLACEMENT (***) |
| 24 | 3RD AVE W/L REPLACEMENT, PHASE 4 |
| 25 | 5TH AVE W/L REPLACEMENT |

2014-2027 PROJECTS

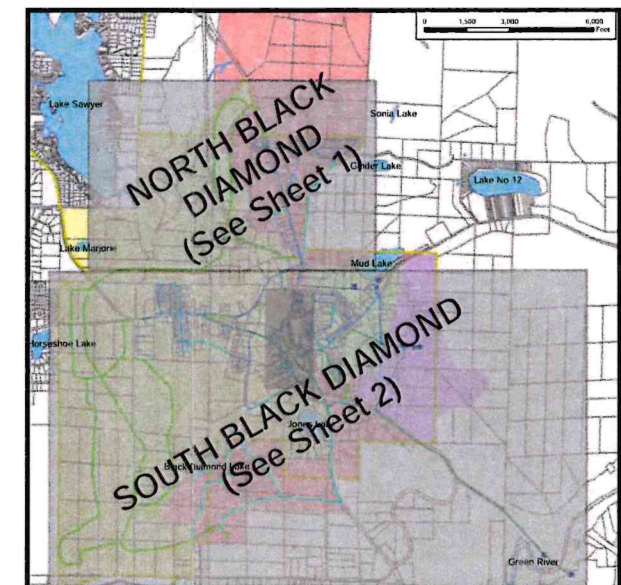
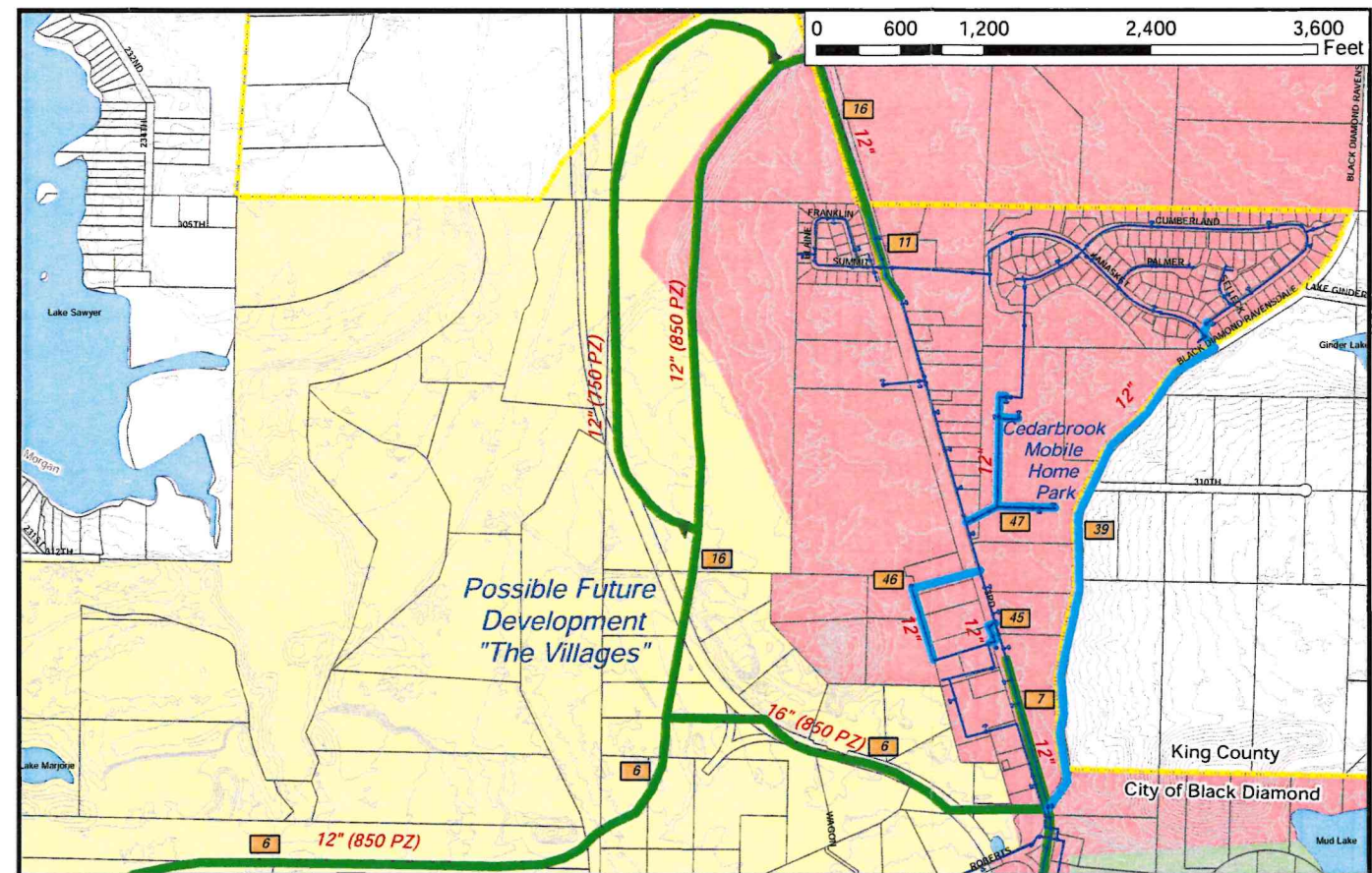
| NO. | PROJECT NAME |
|-----|---|
| 26 | MORGAN DR W/L REPLACEMENT (****) |
| 27 | DAIL DR / UNION DR W/L REPLACEMENT (****) |
| 28 | BAKER ST W/L REPLACEMENT, PHASE 2 (**) |
| 29 | UNION DR / HIGHLAND DR W/L REPLACEMENT & LOOPING (****) |
| 30 | MINER AVE W/L REPLACEMENT & LOOPING (**) |
| 31 | TERRACE PLACE W/L REPLACEMENT (****) |
| 32 | RAILROAD AVE W/L LOOPING & REPLACEMENT |
| 33 | COMMISSION AVE W/L LOOPING & REPLACEMENT (**) |
| 34 | MERINO ST W/L REPLACEMENT, PHASE 2 & LOOPING TO COMMISSION AVE (**) |
| 35 | JAMES ST / 4TH AVE W/L REPLACEMENT (**) |
| 36 | RAILROAD AVE W/L REPLACEMENT, PHASE 2 (**) |
| 37 | 1ST AVE / BAKER ST INTERCONNECTION |
| 38 | BAKER ST / NEWCASTLE INTERCONNECTION |
| 39 | BLACK DIAMOND RAVENSDALE RD W/L LOOPING |
| 40 | DIAMOND VILLAGE W/L REPLACEMENT |
| 41 | LAWSON ST W/L REPLACEMENT, PHASE 2 |
| 42 | LAWSON ST W/L REPLACEMENT, PHASE 3 |
| 43 | MASON-BUENA VISTA W/L IMPROVEMENTS |
| 44 | OLD LAWSON RD W/L REPLACEMENT |
| 45 | PALMER / 3RD W/L REPLACEMENT |
| 46 | PALMER COKING COAL W/L REPLACEMENT |
| 47 | CEDARBROOK W/L REPLACEMENT |
| 48 | TREATMENT PLANT W/L REPLACEMENT |
| 49 | CHLORINATION TREATMENT UPGRADE (*) |
| 50 | THE VILLAGES, PHASE 5 |
| 51 | LAWSON HILLS IMPROVEMENTS |
| 52 | ABRAMS EXTENSION (Potential alternative to looping from Villages, Phase 5 to SR-169. May also require upsizing of existing lines up to Abrahms Avenue which is not shown on this map) |

* NOT SHOWN ON MAP
 ** DOWNTOWN AC & SMALL LINE REPLACEMENT PROGRAM
 *** 5TH AVE / PACIFIC AC & SMALL LINE REPLACEMENT PROGRAM
 **** MORGANVILLE AC & SMALL LINE REPLACEMENT PROGRAM

DOWNTOWN



NORTH BLACK DIAMOND



Sheet 1



PacWest Engineering, LLC
 5009 Pacific Highway East, Unit 9-0
 Fife, WA 98424
 Phone (253) 926-3400
 Fax (253) 926-3402

FIGURE 9.1a
CITY OF BLACK DIAMOND
PROPOSED WATER
SYSTEM IMPROVEMENTS

| | |
|--|--------------------|
| | Hydrant |
| | Tank |
| | Pump Station |
| | 750 Pressure Zone |
| | 850 Pressure Zone |
| | 965 Pressure Zone |
| | 1175 Pressure Zone |

| LEGEND | |
|--------|---|
| | City Limits |
| | Existing Waterlines |
| | Proposed Improvement Projects (2008-2013) |
| | Proposed Improvement Projects (2014-2027) |

SOUTH BLACK DIAMOND

Matchline "NORTH BLACK DIAMOND" (See Sheet 1)

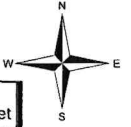
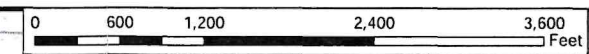
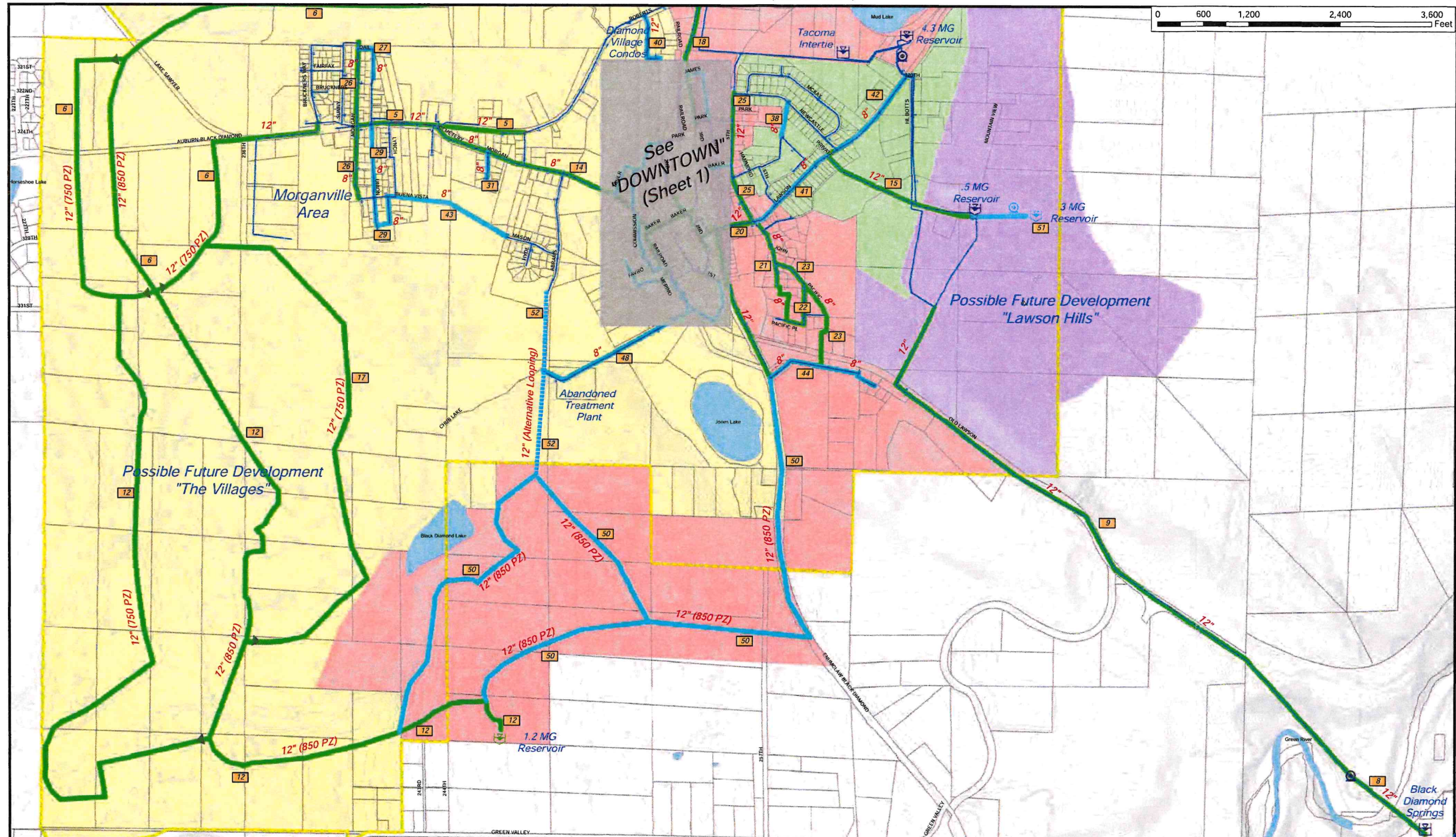


FIGURE 9.1b
CITY OF BLACK DIAMOND
 PROPOSED WATER
 SYSTEM IMPROVEMENTS

- Hydrant
- Tank
- Pump Station
- 750 Pressure Zone
- 850 Pressure Zone
- 965 Pressure Zone
- 1175 Pressure Zone

LEGEND

- City Limits
- Existing Waterlines
- Proposed Improvement Projects (2008-2013)
- Proposed Improvement Projects (2014-2027)



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IMPROVEMENT SCHEDULE

The six-year schedule of proposed improvements is included in **Table 9.3, Six-Year Capital Improvement Program**. **Table 9.4, Annual Totals by Funding Source** summarizes the annual financial impact of the proposed Capital Improvement Program broken out by the various funding sources.

Table 9.3, Six-Year Capital Improvement Program

| PROJECT NAME | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|------|-------------|-------------|-------------|-----------|------|
| 1 Railroad Ave W/L Repl., Ph 1 <i>Rates</i> | | \$186,000 | | | | |
| 2 Merino St W/L Repl., Ph 1 <i>Rates</i> | | \$30,000 | | | | |
| 3 Springs Study <i>Rates</i> | | \$50,000 | | | | |
| 4 Water Meter Upgrades <i>Rates</i> | | \$70,000 | \$70,000 | \$60,000 | | |
| 5 Roberts Dr W/L Repl. <i>Development</i> | | \$440,000 | | | | |
| 6 The Villages, Ph 1 <i>Development</i> | | \$3,780,000 | | | | |
| 7 3 rd Ave W/L Repl., Ph 1 <i>Connect. Charges</i> | | | \$250,000 | | | |
| 8 Springs Transm. Main Repl., Ph 1 & Spring Collection Upgrades <i>Development</i> | | | \$1,000,000 | | | |
| 9 Springs Trans. Main Repl., Ph 2 <i>Development</i> | | | \$1,274,000 | | | |
| 10 Springfield No. 3 Collection Upgrade <i>Rates</i> | | | | \$100,000 | | |
| 11 3 rd Ave W/L Repl., Ph 2 <i>Connect. Charges</i> | | | | \$200,000 | | |
| 12 The Villages, Ph 2 <i>Development</i> | | | | \$5,790,000 | | |
| 13 2 nd Ave W/L Repl. <i>Rates</i> | | | | | \$190,000 | |

| PROJECT NAME | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 14 Morgan St W/L Repl. <i>Rates</i> | | | | | \$416,000 | |
| 15 965 Pressure Zone Trans. Repl. <i>Connect. Charges</i> | | | | | \$300,000 | |
| 16 The Villages, Ph 3 <i>Development</i> | | | | | \$1,820,000 | |
| 17 The Villages, Ph 4 <i>Development</i> | | | | | \$689,000 | |
| 18 3 rd Ave W/L Repl., Ph 3 <i>Development</i> | | | | | \$398,000 | |
| 19 Baker St W/L Repl., Ph 1 <i>Rates</i> | | | | | | \$100,000 |
| 20 Lawson St W/L Repl., Ph 1 <i>Rates</i> | | | | | | \$150,000 |
| 21 5 th Ave W/L Repl. & Extension <i>Rates</i> | | | | | | \$208,000 |
| 22 Pacific PI W/L Replacement <i>Rates</i> | | | | | | \$72,000 |
| 23 Pacific St W/L Repl. & Extension <i>Rates</i> | | | | | | \$228,000 |
| 24 3 rd Ave W/L Repl., Ph 4 <i>Connect. Charges</i> | | | | | | \$440,000 |
| 25 5 th Ave W/L Repl. <i>Connect. Charges</i> | | | | | | \$440,000 |
| TOTAL | \$0 | \$4,556,000 | \$2,594,000 | \$6,150,000 | \$3,813,000 | \$1,638,000 |

Table 9.4, Annual Totals by Funding Source

| FUNDING SOURCE | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 6 Yr TOTAL 2008-2013 |
|--------------------|------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------------------|
| Develop-ment | \$0 | \$4,220,000 | \$2,274,000 | \$5,790,000 | \$2,907,000 | \$0 | \$15,191,000 |
| Connection Charges | \$0 | \$0 | \$250,000 | \$200,000 | \$300,000 | \$880,000 | \$1,630,000 |
| Rates | \$0 | \$336,000 | \$70,000 | \$160,000 | \$606,000 | \$758,000 | \$1,930,000 |
| TOTAL | \$0 | \$4,556,000 | \$2,594,000 | \$6,150,000 | \$3,813,000 | \$1,638,000 | \$18,751,000 |

In addition to the annual list of projects planned for each of the first six years, additional projects were identified as needed over the twenty year planning period. Since the City anticipates a rapid rate of growth controlled largely by a single developer, the plan has been prepared with the expectation that events may create the need to adjust priority of projects depending on the location within the City in which growth focuses. Sufficient project identification is included in the plan to permit a flexible response to a wide variety of challenges and still remain with the guiding principles of the plan.

It should be noted that a number of the projects included in the plan are proposed in order to directly respond to potential development proposals. If these developments should not move forward or if the timing is different that what has been originally proposed, there is sufficient flexibility to adjust the timing and priority of projects included in this plan as needed.

It is expected that other projects may be identified in response to conditions not now known which may require adjustment to the project list and its priorities. The City Council retains the ability to re-schedule projects, adjust the scope of projects or initiate the process for a plan amendment should conditions so dictate. As each project is considered for implementation it should be re-evaluated to ensure it is consistent with up-to-date planning requirements for the community.

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CHAPTER 10

FINANCIAL PROGRAM

CHAPTER 10 – FINANCIAL PROGRAM

INTRODUCTION

Washington Administrative Code (WAC 246-290-100) requires a demonstration of financial viability as part of the water system comprehensive plan. This chapter includes a summary of the past income and expense for the past six years. Also included is the current budget and the current status of outstanding debt for past improvement projects.

One of the City's most important objectives is to ensure that the investment required to support the expected high rate of growth is captured appropriately from the new customer base. This will include direct funding of required capital improvements and payment of the City's general facility charge. The increase of the customer base is expected to also allow the City to improve its current ability to operate and maintain the utility.

The City of Black Diamond has entered into several agreements with large developers which outline specific water system improvement projects and funding participation details. Copies of these agreements are included in ***Appendix M – Water Supply and Facilities Funding Agreement***, ***Appendix N – Plum Creek Land Co. Water Funding Agreement***, and ***Appendix O – Palmer Coking Coal Co. Water Funding Agreement***.

PAST FINANCIAL STATUS

Table 10.1, Historical Revenues lists the revenue by year and by source for the past six years. As evidenced by the figures, major sources of revenue for the City in recent years has been Developer funding, as well as Public Works Trust Fund loan. These two sources have comprised almost 60% of the funding over the previous six year period.

Table 10.2, Historical Expenses provides information on expenses by year and by major category of expenditure. As evidenced by this information, the City of Black Diamond has constructed several large-scale capital projects in recent years, while maintaining relatively low operating expenses.

Table 10.1, Historical Revenues

| REVENUES | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 ¹⁴ |
|------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| OPERATING SOURCES | | | | | | |
| Water Sales | \$319,086 | \$321,395 | \$323,827 | \$303,614 | \$324,463 | \$296,375 |
| Water Parts | \$4 | \$1,575 | \$1,228 | \$341 | \$2,151 | \$20,750 |
| Reimbursement | \$0 | \$0 | \$0 | \$0 | \$0 | \$605 |
| Water Repairs | | | | | | |
| Water Hydrant Rental | \$0 | \$0 | \$0 | \$0 | \$0 | \$426 |
| Water Surcharge | \$26,877 | \$26,853 | \$27,070 | \$26,727 | \$26,456 | \$25,655 |
| Staff Review Fees | \$800 | \$700 | \$1,100 | \$700 | \$1,100 | \$2,700 |
| Late Fees / Name Changes | \$9,055 | \$10,233 | \$10,031 | \$10,606 | \$10,559 | \$9,017 |
| NON-OPERATING SOURCES | | | | | | |
| Water Connections | -\$47,811 | \$11,953 | \$11,953 | \$29,882 | \$27 | \$200,209 |
| Transfer from Equip. Reserve | \$5,000 | \$7,500 | \$0 | \$11,250 | \$0 | \$0 |
| Recovered Assets | \$0 | \$0 | \$35,122 | \$0 | \$0 | \$0 |
| Interest Income | \$19,789 | \$13,160 | \$22,116 | \$86,987 | \$89,794 | \$91,862 |
| OTHER SOURCES | | | | | | |
| Transfer | \$0 | \$0 | \$0 | \$29,882 | \$67,260 | \$0 |
| Developer Debt Service | \$0 | \$0 | \$599,791 | \$242,907 | \$902,915 | \$910,850 |
| Developer / Private Funding | \$24,290 | \$6,023,204 | \$330,371 | \$4,109,595 | \$262,817 | \$0 |
| Public Works Trust Loan | \$0 | \$0 | \$0 | \$2,451,519 | \$3,176,301 | \$0 |
| Cash / Invest. on Hand | \$1,201,407 | \$1,281,247 | \$1,448,260 | \$1,372,842 | \$4,842,941 | \$4,309,153 |
| TOTAL REVENUES | \$1,558,497 | \$7,697,820 | \$2,810,869 | \$8,676,852 | \$9,706,784 | \$5,867,602 |

¹⁴ Historical revenues for 2007 are for the period from January 2007 through November 2007

Table 10.2, Historical Expenses

| EXPENSES | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 ¹⁵ |
|--------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| OPERATING USES | | | | | | |
| Salaries & Benefits | \$126,706 | \$144,314 | \$154,732 | \$161,571 | \$187,078 | \$175,600 |
| Supplies, Services, Charges | \$113,121 | \$199,628 | \$137,983 | \$90,989 | \$139,280 | \$174,759 |
| NON-OPERATING USES | | | | | | |
| Refund of Revenues | \$0 | \$25,183 | \$0 | \$0 | \$0 | \$0 |
| Capital / Equipment/ Property | \$5,000 | \$20,980 | \$0 | \$20,969 | \$2,551 | \$0 |
| Transfer to equipment /Water Reserve | \$5,000 | \$7,500 | \$0 | \$29,882 | \$67,260 | \$38,750 |
| OTHER USES | | | | | | |
| Principal | \$14,842 | \$14,842 | \$581,874 | \$581,874 | \$707,599 | \$886,118 |
| Interest Payments | \$12,581 | \$11,504 | \$123,632 | \$196,074 | \$256,596 | \$275,583 |
| Capital Projects | \$0 | \$5,825,609 | \$439,806 | \$2,752,552 | \$4,037,267 | \$2,919,411 |
| Ending Cash / Invest. | \$1,281,247 | \$1,448,260 | \$1,372,842 | \$4,842,941 | \$4,309,153 | \$1,397,381 |
| TOTAL EXPENSES | \$1,558,497 | \$7,697,820 | \$2,810,869 | \$8,676,852 | \$9,706,784 | \$5,867,602 |

A copy of the City's current budget has been included as **Appendix BB – City of Black Diamond Budget**.

IMPROVEMENT PROGRAM FINANCING

Project funding sources have been identified in **Table 10.3, Proposed Capital Project Funding Sources**.

Water rate revenue is the primary source of funding the system management and maintenance activities. Water rate revenue also is the source for funding non growth related system improvements. This source may be augmented through seeking state

¹⁵ Historical expenditures for 2007 are for the period from January 2007 through November 2007

and/or federal grants or low interests loans. Non growth related system improvements may also be funded by city general obligation or revenue bonds. This permits more immediate corrections of existing deficiencies which can be repaid of an extended period of time.

Growth related capital improvements are categorized in two ways. One is extensions to the water system based on private development projects which are expected to be funded privately as a condition of approval. Secondly, growth related projects which are improvements to the existing system such as replacing existing lines with larger lines to provide increased flow capacity to the new growth areas. These projects may or may not be sufficiently associated with a particular development proposal. It is anticipated that these projects may be also funded from general facility connection charge revenue.

Table 10.3, Proposed Capital Project Funding Sources

| | PROJECT | FUNDING SOURCE |
|----|---|--------------------|
| 1 | Railroad Ave W/L Replacement, Phase 1 | Rates |
| 2 | Merino St W/L Replacement, Phase 1 | Rates |
| 3 | Springs Study | Rates |
| 4 | Water Meter Upgrades | Rates |
| 5 | Roberts Dr W/L Replacement | Development |
| 6 | The Villages, Phase 1 | Development |
| 7 | 3 rd Ave W/L Replacement, Phase 1 | Connection Charges |
| 8 | Springs Transmission Main Replacement, Phase 1 & Spring Collection Upgrades | Development |
| 9 | Springs Transmission Main Replacement, Phase 2 | Development |
| 10 | Springfield No. 3 Collection Upgrade | Rates |
| 11 | 3 rd Ave W/L Replacement, Phase 2 | Connection Charges |
| 12 | The Villages, Phase 2 | Development |
| 13 | 2 nd Ave W/L Replacement | Rates |
| 14 | Morgan St W/L Replacement | Rates |
| 15 | 965 Pressure Zone Transmission Replacement | Connection Charges |
| 16 | The Villages, Phase 3 | Development |
| 17 | The Villages, Phase 4 | Development |
| 18 | 3 rd Ave W/L Replacement, Phase 3 | Development |
| 19 | Baker St W/L Replacement, Phase 1 | Rates |
| 20 | Lawson St W/L Replacement, Phase 1 | Rates |
| 21 | 5 th Ave W/L Replacement & Extension | Rates |
| 22 | Pacific Pl W/L Replacement | Rates |
| 23 | Pacific St W/L Replacement & Extension | Rates |
| 24 | 3 rd Ave W/L Replacement, Phase 4 | Connection Charges |
| 25 | 5 th Ave W/L Replacement | Connection Charges |
| 26 | Morgan Dr W/L Replacement | Rates |
| 27 | Dail Dr / Union Dr W/L Replacement | Rates |
| 28 | Baker St W/L Replacement, Phase 2 | Rates |
| 29 | Union Dr / Highland Dr W/L Replacement & Looping | Rates |

| | | |
|----|--|-------------|
| 30 | Miner Ave W/L Replacement & Looping | Rates |
| 31 | Terrace Place W/L Replacement | Rates |
| 32 | Railroad Ave W/L Looping & Replacement | Rates |
| 33 | Commission Ave W/L Looping & Replacement | Rates |
| 34 | Merino St W/L Replacement, Phase 2 & Looping to Commission Ave | Rates |
| 35 | James St / 4 th Ave W/L Replacement | Rates |
| 36 | Railroad Ave W/L Replacement, Phase 2 | Rates |
| 37 | 1 st Ave / Baker St Interconnection | Rates |
| 38 | Baker St / Newcastle Interconnection | Rates |
| 39 | Black Diamond Ravensdale Rd W/L Looping | Rates |
| 40 | Diamond Village W/L Replacement | Rates |
| 41 | Lawson St W/L Replacement, Phase 2 | Rates |
| 42 | Lawson St W/L Replacement, Phase 3 | Rates |
| 43 | Mason – Buena Vista W/L Improvements | Rates |
| 44 | Old Lawson Rd W/L Replacement | Rates |
| 45 | Palmer / 3 rd W/L Replacement | Rates |
| 46 | Palmer Coking Coal W/L Replacement | Rates |
| 47 | Cedarbrook W/L Replacement | Rates |
| 48 | Treatment Plant W/L Replacement | Rates |
| 49 | Chlorination Treatment Upgrade | Rates |
| 50 | The Villages, Phase 5 | Development |
| 51 | Lawson Hills Improvements | Development |
| 52 | Abrams Extension | Development |

AVAILABLE FUNDING SOURCES

Locally generated revenues have been most heavily relied upon for purposes of financial planning for the implementation of this plan. However, alternative funding sources have been identified below which should be pursued as available, and as appropriate to the improvement project.

GRANTS

Grant programs are becoming more and more competitive, and typically less funding is available than historically was available.

Community Development Block Grant (CDBG)

There are several grant programs available through the Community Development Block Grant Program, including: general purpose grants; planning only grants; imminent threat grants; and community investment fund grants. Grants are awarded annually through a competitive process. The Washington State CDBG Program is funded by the U.S. Department of Housing and Urban Development (HUD). The purpose of the state CDBG Program is to improve and maintain the economic and physical environment of

eligible, non-entitlement cities and counties in order to enhance the quality of life for low- and moderate-income residents and, as a result, benefit the entire community.

King County Department of Community Development

King County annually receives Community Development Block Grant (CDBG) funding from the US Department of Housing and Urban Development (HUD). The primary objective of the CDBG program is “the development of viable urban communities, by providing decent housing and a suitable living environment and expanding economic opportunities, principally for persons of low and moderate income.” Water infrastructure improvements may be eligible for grant funding and should be evaluated as a possible alternate funding source to augment local funds.

USDA Rural Development Water & Waste Disposal Grants

Black Diamond may be competitive in applying for a grant from the USDA. Cities with a population less than 10,000 are eligible, with priority given to communities with a population of less than 5,500. Grants can be used to construct, extend, enlarge, or otherwise improve water facilities. Engineering and right-of-way acquisition are also eligible activities.

Community Economic Revitalization Board Grants (CERB)

The City of Black Diamond may wish to consider submitting for grant funding from the CERB. Typically grants through CERB are for improvement projects that support economic development in the community, and specifically support industrial sector business growth and job creation or retention.

Water System Acquisition and Rehabilitation Program (WSARP)

If the City of Black Diamond chooses to pursue taking over the portion of the Covington Water District that encompasses the Lake Sawyer Area within the City of Black Diamond, the City should investigate eligibility for grants from the Water System Acquisition and Rehabilitation Program. The Washington Department of Health, the Public Works Board, and the Department of Community, Trade, and Economic Development (CTED) jointly administer the WSARP program. Municipal Group A water systems with projects that will acquire other public water systems that have water quality problems or deteriorated drinking water infrastructure may be eligible for WSARP grants.

LOANS

There are several loan programs that the City may wish to consider in evaluating funding options for its capital improvement program. Loan programs are becoming more common with the reduction in available grant funding.

Drinking Water State Revolving Loan Fund (DWSRF)

The City of Black Diamond may wish to pursue a low-interest loan through the Drinking Water State Revolving Loan Fund. These loans are designed to fund projects that increase public health protection through improvements to the City’s drinking water

system. This loan program is sponsored by the Department of Health, the Public Works Board, and the Department of Community, Trade, and Economic Development. Low interest rates (typically 0 to 1.5%) are an advantage of this program, along with no required local financial match.

Public Works Trust Fund (PWTF)

The City of Black Diamond may be competitive in applying for a long-term, low-interest loan from the Public Works Trust Fund. Eligible projects include repair, replacement, rehabilitation, reconstruction, or improvement of public works systems, including water systems, to meet current standards for existing customers. Typically, a lower interest rate can be obtained by providing an increased local financial match.

USDA Rural Development Water & Waste Disposal Loans

Black Diamond may be competitive in applying for a loan from the USDA. Cities with a population less than 10,000 are eligible, with priority given to communities with a population of less than 5,500. Loans can be used to construct, extend, enlarge, or otherwise improve water facilities. Engineering and right-of-way acquisition are also eligible activities.

Community Economic Revitalization Board Loans (CERB)

The City of Black Diamond may wish to consider submitting for a low-interest loan from the CERB. Typically loans through CERB are for improvement projects that support economic development in the community, and specifically support industrial sector business growth and job creation or retention.

BONDS

There are two standard types of bond financing that the City may wish to consider in order to augment local funding sources -- general obligation bonds or revenue bonds.

Revenue Bonds

Revenue bonds are a common source of funding for major utility construction projects. Revenue bonds are issued by the City and are typically repaid from rate revenues. In order to qualify to sell revenue bonds, the City must demonstrate that its net water utility operating income is equal to or greater than a coverage factor, multiplied by the annual revenue bonded debt.

General Obligation Bonds

Voters may elect to issue general obligation bonds to finance projects of benefit to the City. The bonds are typically paid through assessments levied against all privately-owned properties within the City. The City may also wish to consider repayment from user rates. General obligation bonds usually have a low interest rate, however obtaining voter approval may be a time consuming process. Additionally, the City of Black Diamond should be aware of any limits imposed on the City as to its total allowable amount of general obligation debt. Financing large capital improvements through general obligation bonds reduces the ability to issue future debt.

FINANCIAL VIABILITY TEST

Water systems with less than 1,000 connections are required to conduct a “Financial Viability Test”. This process has been completed for the City of Black Diamond and the results are summarized in **Appendix CC – Financial Viability Tests**. The Financial Viability Test consists of a series of four tests. The first three individual tests examine the adequacy of the system’s operating budget, operating cash reserve, and emergency reserve. The fourth test, the household income index analysis, allows the system and DOH to evaluate the water rate impact on system users of existing and additional operating procedures and/or capital improvements.

Test #1 – Six Year Operating Budget

The purpose of Test #1 is to ensure that the water system has an operating budget that demonstrates sufficient revenue to meet all of its incurred expenses. As evidenced on the test results included in **Appendix CC – Financial Viability Tests**, the City of Black Diamond passes Test #1. It should be noted that the six-year operating budget includes the addition of one new staff member in year 3 and an additional staff member in year 4.

Test #2 – Six Year Operating Cash Reserve

The purpose of Test #2 is to ensure that the water system has an ability to withstand cashflow fluctuations. The Department of Health recommends that an Operating Cash Reserve be established that is equal to or greater than 1/8 of its annual operating budget (Operations & Maintenance expenses, as well as General & Administrative expenses). The City of Black Diamond passes Test #2.

Test #3 – Six Year Emergency Reserve

The purpose of Test #3 is to ensure that the water system has the ability to cover the costs of an emergency or failure of its most vulnerable system component. For purposes of this test, the insured value of the transmission line from the Black Diamond Springfield to the Reservoir has been utilized. The City of Black Diamond passes Test #3. The Emergency Reserve fund is being funded primarily through connection charges in excess of what is required for the proposed capital improvements during the six year period.

Test #4 – Household Income Index

The purpose of Test #4 is to measure the rate impact of increased operating and facility expenses on system customers. This is done by calculating the estimated annual rate for a average residential user. This is then compared to one and a half percent of King County’s average annual median household income. This test ensures that the rates are affordable to the users. The City of Black Diamond passes Test #4.

RATE STRUCTURE ANALYSIS

Table 10.4, Monthly Water Consumption Rates lists the current rate structure for the City of Black Diamond's water utility. These rates were adopted by the Black Diamond City Council in December 2008 and became effective in January 2009.

The monthly consumption rates included in **Table 10.4, Monthly Water Consumption Rates** were developed as a recommendation of a utility rate study that was recently completed. Based on the results of this study, the Black Diamond City Council established a rate structure which supports conservation of water.

The utility rate study also recommended a ramping to the rates with a proposed rate increase in 2010 and 2011. This Water System Plan financial analysis assumes that the current rates are not changed over the six years of the plan. This is a conservative approach to ensure that the City can adequately fund the needs of the water system during challenging economic times which may not support subsequent rate increases.

Table 10.4, Monthly Water Consumption Rates

| METER SIZE | METER RATE ** | COMMODITY CHARGE PER 100 CF (0-600 CF) | COMMODITY CHARGE PER 100 CF (601-1200 CF) | COMMODITY CHARGE PER 100 CF (1201+ CF) |
|---|---------------|--|---|--|
| 5/8" or 3/4" Meter | \$17.88 | \$1.82 | \$2.09 | \$2.40 |
| 1" Meter | \$22.50 | \$1.82 | \$2.09 | \$2.40 |
| 1-1/2" Meter | \$24.38 | \$1.82 | \$2.09 | \$2.40 |
| 2" Meter | \$42.55 | \$1.82 | \$2.09 | \$2.40 |
| 3" Meter | \$51.61 | \$1.82 | \$2.09 | \$2.40 |
| 4" Meter | \$96.95 | \$1.82 | \$2.09 | \$2.40 |
| 6" Meter | \$250.70 | \$1.82 | \$2.09 | \$2.40 |
| ** Each additional dwelling/business served from the above meter shall be charged \$14.95 for each additional unit inside the City limits and \$29.90 for each additional unit outside the City limits. | | | | |

Table 10.5, Water Capital Facility Connection Rates lists the current capital facility connection rates for the City of Black Diamond's water utility.

Table 10.5, Water Capital Facility Connection Rates

| METER SIZE | RATE |
|---------------|------------------|
| Single Family | \$5,976.39 |
| Duplex | \$11,952.78 |
| Multi-Family | \$5,976.39 / ERU |
| Trailer Park | \$5,976.39 / ERU |
| Other | \$5,976.39 / ERU |

Table 10.6, Other Water System Fees lists other fees associated with the water system.

Table 10.6, Other Water System Fees

| DESCRIPTION | FEE |
|----------------------------------|---------------------------|
| Meter Testing Charge | Cost + 20% |
| Unauthorized Connection | \$1,200.00 |
| 5/8" Meter Drop | \$500.00 |
| 3/4" Meter Drop | \$500.00 |
| 1" Meter Drop | \$600.00 |
| 1-1/2" Meter thru 6" Meter | Cost + 20% |
| Irrigation 5/8" Meter | \$500.00 |
| Installation of Water Service | \$1,000.00 deposit + cost |
| Installation Re-inspection Fee | Hourly Rate |
| Hydrant Meter Rental Deposit | \$1,000.00 |
| Hydrant Meter Rental per Day | \$25.00 / day |
| Hydrant Meter Rental per Week | \$100.00 / week |
| Hydrant Meter Rental per Month | \$250.00 / month |
| Hydrant Meter Water Usage | Double basic rate |
| Water Investigation Residential | \$100.00 |
| Water Investigation Multi-Family | \$200.00 |
| Water Investigation Industrial | \$200.00 |
| Water Hydraulic Model Deposit | \$500.00 |