murraysmith

SNOHOMISH COUNTY PUD

2021 Water System Plan

Volume 6 of 16 - Appendix 2-2

Commission Resolutions 5499-5557

December 2022

SNOHOMISH COUNTY PUD PUBLIC UTILITY DISTRICT NO. 1

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Pertinent District Resolutions

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- No. 5965 Authorizing Amendment No. 1 to Everett and JOA Participants Water Supply Contract
- No. 5983 Establishing Rates and Charges for Water Utility Service to Snohomish
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- No. 5988 Setting Hearing 2020 LUD 63
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- No. 6016 Authorizing Water Supply Contract with Everett
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RESOLUTION NO. 5499

A RESOLUTION Authorizing an Application for Funding Assistance to the U.S. Department of Interior, Bureau of Reclamation, Pursuant to the WaterSMART: Water and Energy Efficiency Grants for FY2010 Funding Opportunity Announcement

WHEREAS, Public Utility District No. 1 of Snohomish County (the "District") is planning to install a small hydroelectric project (the "Project") to capture the energy of an existing municipal water supply line owned by the City of Everett, and generate up to approximately 1,900 to 5,000 megawatt hours ("MWh") of energy annually; and

WHEREAS, the Project is intended to be a joint venture between the District and the City of Everett, although the District will be responsible for all of the costs of design, procurement and construction of the Project; and

WHEREAS, District staff have identified a potential source of funding assistance for the Project in the U.S. Department of Interior, Bureau of Reclamation's Funding Opportunity Announcement No. R10SF80157, entitled "WaterSMART: Water and Energy Efficiency Grants for FY2010" (the "Funding Opportunity"); and

WHEREAS, under the Funding Opportunity, up to 50 percent of the Project cost might be eligible for federal funding, up to $300,000 per project in one funding group, and up to $1,000,000 per project in another funding group; and

WHEREAS, the Funding Opportunity requires that, in order to submit a complete application, the District's governing body must include a formal resolution identifying the District official with authority to enter into an agreement should the funding be awarded, the governing body or appropriate official who has reviewed and supports the application submitted, the capability of the applicant to provide the amount of funding or in-kind contributions specified in the funding plan proposed as part of the application, and confirming that the applicant will work with the Bureau of Reclamation to meet established deadlines for entering into a cooperative agreement; and

WHEREAS, the Assistant General Manager for Water Resources and Generation and his staff have prepared an application for funding assistance for the Project that is on file with the Clerk of the Commission, and they recommend that the Commission support the application submitted to the Bureau of Reclamation; and

WHEREAS, the District is the second largest publicly-owned utility in the State of Washington, that owns and operates generation resources, that has substantial financial reserves, including approximately $64 million of reserves set aside for renewable energy investment projects as of December 31, 2009, and that has a substantial capital construction account that will include the proceeds of a planned sale of Generation System revenue bonds in the approximate amount of $25 million in May of 2010, all of which demonstrate the District's capability to provide the amount of funding necessary for the Project and set forth in the funding plan in the application.

NOW, THEREFORE, BE IT RESOLVED by the Board of Commissioners of Public Utility District No. 1 of Snohomish County, Washington, that the Board has reviewed the application for funding assistance from the United States Bureau of Reclamation pursuant to Funding Opportunity Announcement No. R10SF80157, on file with the Clerk of the Commission, for the small hydroelectric project designed to capture the energy of an existing municipal water supply line owned by the City of Everett, and accepts the recommendation of the Assistant General Manager for Water Resources and Generation to support the application.

BE IT FURTHER RESOLVED that in the event that the Bureau of Reclamation approves the District's application for funding, that the District will work diligently with the Bureau to meet established deadlines for entering into a cooperative agreement, and that the District's General Manager will be authorized by subsequent resolution to enter into an agreement.

BE IT FURTHER RESOLVED that the District verifies that it has the capability to provide the amount of funding set forth in the application for the project and specified in the funding plan, through its substantial financial reserves as well as through its capital construction funds for the Generation System.

PASSED AND APPROVED this 4th day of May, 2010.

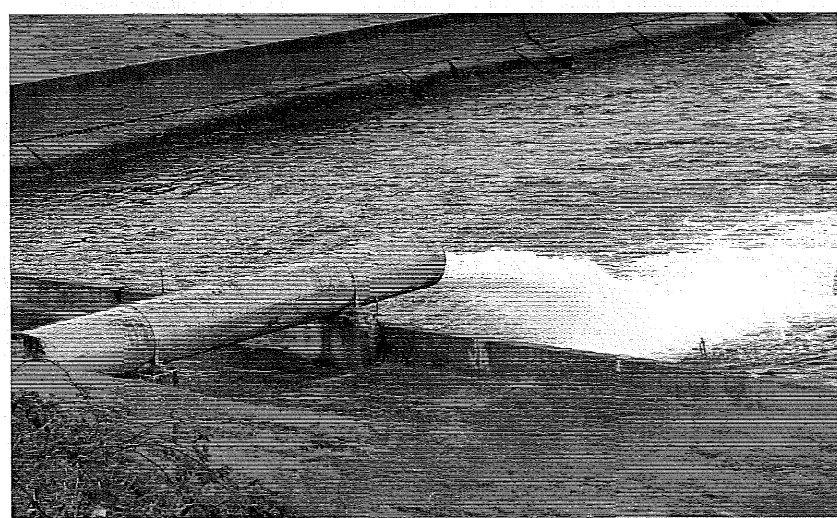
President

Vice-President

Secretary

Resolution No. 5499

Installation of Small Hydroelectric Project on Existing Water Supply Pipeline in Everett, Washington "Rucker Hill Hydroelectric Project"



Applicant:
Public Utility District No. 1 of Snohomish County
2320 California Street
PO Box 1107
Everett, WA 98206-1107

Project Manager:
Mr. Scott Spahr, P.E.
2320 California Street
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Technical Proposal

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1. Executive Summary

May 4, 2010. Public Utility District No. 1 of Snohomish County; Everett; Snohomish County; Washington.

The "Rucker Hill Hydroelectric Project" adds piping, control improvements, a turbine and a generator to improve energy efficiency by capturing the energy of an existing municipal water supply pipeline. The existing water pipeline continuously flows at 41 cubic-feet per second (cfs) and currently dissipates over 75 feet of head by dropping that water into two reservoirs. This Project will recover this currently wasted energy resulting in the generation of 1,900 to 5,000 megawatt hours (MWh) of energy annually via improvement of existing hydraulics and installation of a turbine and generator. This renewable generation source will offset other energy production facilities which have greater impact on ESA species, while the improved controls and piping will both enhance water tracking and result in fewer losses from leaks or overflows.

A grant for $300,000 is requested for this Rucker Hill Hydroelectric Project.

Item	Amount
Average annual acre-feet of water supply	29,682 acre-feet
Estimated amount of water saved from Project	unknown acre-feet[1]
Estimated amount of water better managed	29,682 acre-feet
Estimated/current amount of water marketed	29,682 acre-feet

The Project is anticipated to take 24 months to complete from the time of award. If the grant is awarded in late June 2010 with an agreement awarded by September 2010, the Project is estimated to be completed by September 2012.

2. Background Data

The Rucker Hill Project is a joint venture between the City of Everett (City) and Public Utility District No. 1 of Snohomish County (Snohomish PUD), utilizing each public agency's expertise while allowing each to focus on their area of public service – for the City: water supply; for Snohomish PUD: electricity. See Appendix A.

a. Water Resource

The City, in the last century, has grown from a simple localized system for the residents of Everett to a vital regional water provider. The City's water system (Figure 1) now supplies water to the majority of Snohomish County (80 percent; more than 550,000 residents) through a network of local water providers. Major facilities and characteristics of the Everett water system include the following:

- Spada Reservoir – 50 billion gallon capacity
- Chaplain Reservoir – 4.5 billion gallon capacity
- Drinking Water Treatment Plant at Chaplain Reservoir – 132 million gallons per day (MGD) Department of Health approved flow rate

[1] A small unquantified amount of water leaks at the Panther Creek Screenhouse.

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- Four main transmission lines – ranging from 48 to 51 inches in diameter
- Four pump stations
- 18 pressure zones
- 15 storage facilities – ranging from 0.1 to 24 million gallons in capacity
- 370 miles of distribution pipeline

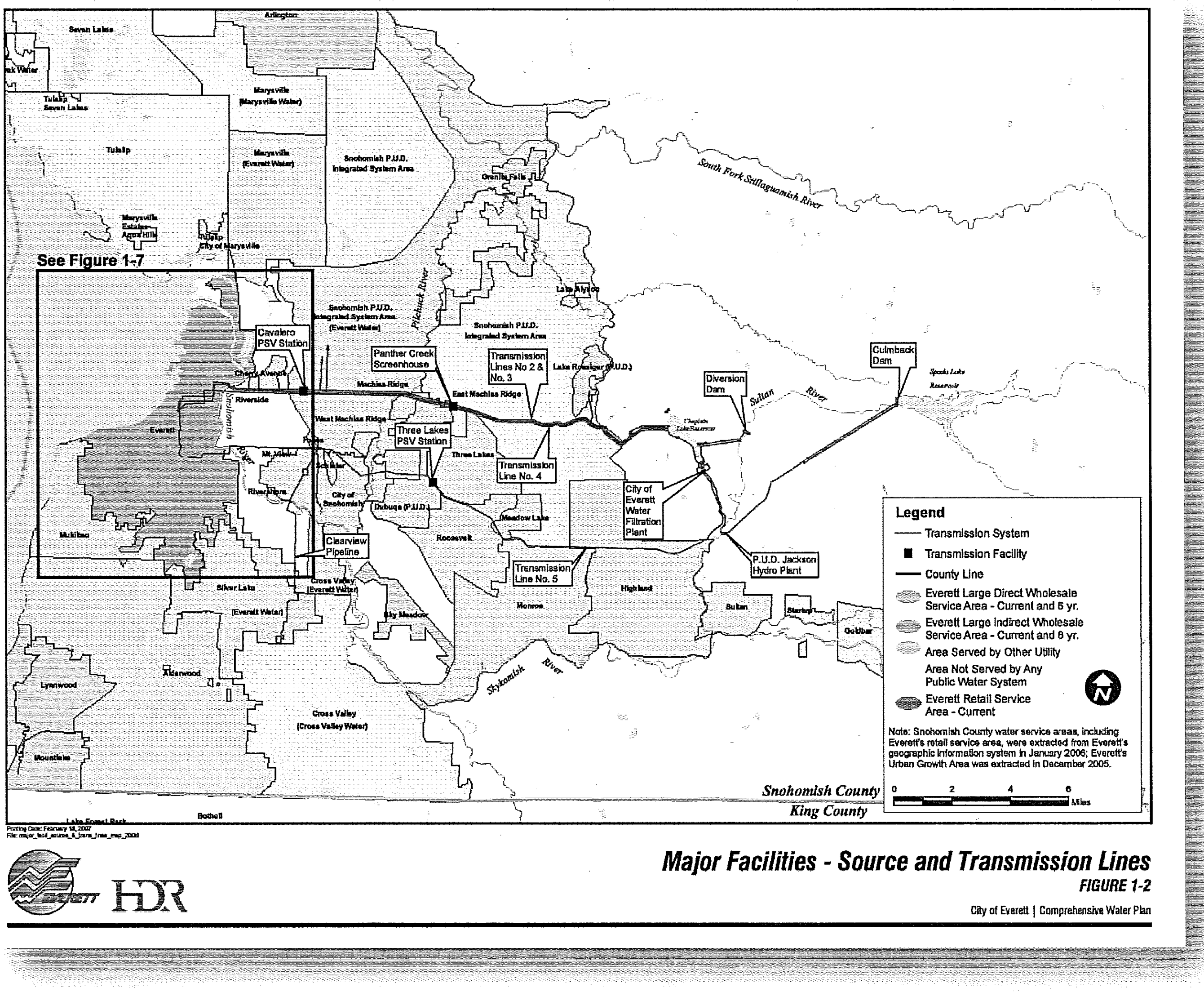

Figure 1: City of Everett Water Supply System

The source of the City's drinking water supply is the Sultan River, located approximately 30 miles east of Everett. In the Sultan Basin watershed, rain and snowmelt flow down from the Cascade Mountains into creeks and streams. These drain into the upper Sultan River, which flows into the Spada Lake Reservoir. The Spada Lake Reservoir holds an average of 50 billion gallons of water.

Today, the City has water rights for 255 million gallons of water per day (MGD) from the Sultan

River system and a pending water right application for an additional 129 MGD.[2] Of these existing water rights, several are joint rights with the Snohomish PUD for storage and generation purposes. Snohomish PUD holds a water right authorizing diversion of 556 cfs and 250,200 acre-feet per year from the Sultan River for power generation (Certificate No. S1-00732C, priority date May 3, 1946); and Snohomish PUD and the City jointly hold a second water right authorizing diversion of 1,500 cfs and 506,800 acre-feet per year of water from the Sultan River for power generation and municipal water supply purposes (Certificate No. S1-23398C, priority date June 15, 1979). Snohomish PUD and the City also jointly hold two water rights authorizing the storage of water in Spada Lake for generation and municipal water supply purposes (Certificate R1-00733, priority date May 3, 1946, for 133,700 acre-feet per year; and Certificate R1-23397, priority date June 15, 1979, for 153,260 acre-feet per year for power generation only).[3]

Water demand was 84 MGD in 2008, with an expected increase to 144 MGD over the next 25 years (Figure 2).[4]

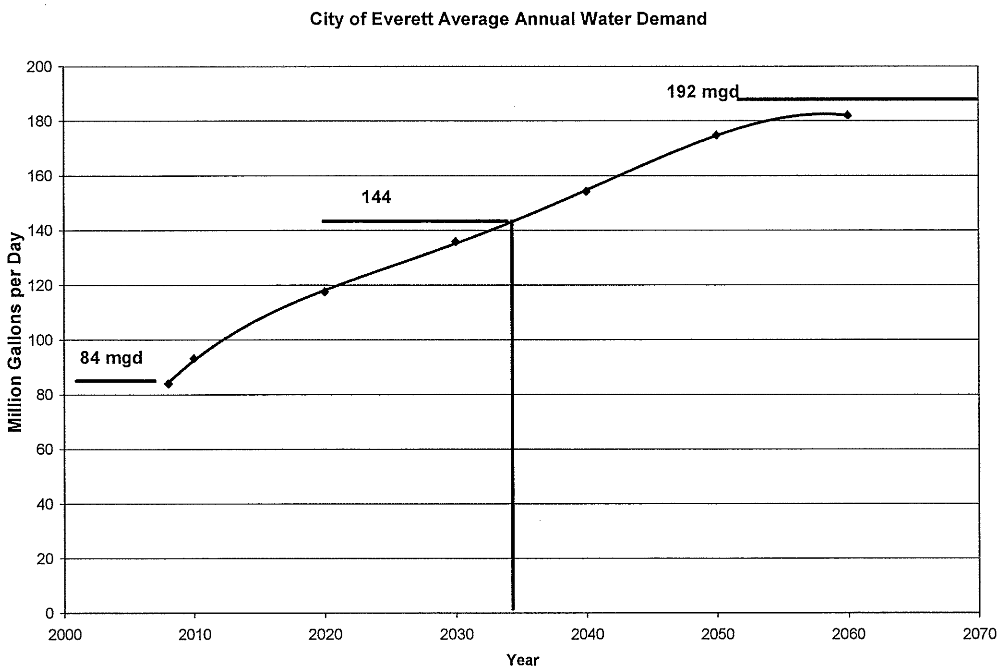

Figure 2: **City of Everett Projected Water Supply Demand With Conservation.**

[2] http://www.ci.everett.wa.us/default.aspx?ID=1649
[3] Snohomish County PUD. 2005. Pre-Application Document.
[4] City of Everett. 2008 Comprehensive Water Plan.

b. Energy Resource

Snohomish PUD is a municipal corporation of the state of Washington, formed by a majority vote of the people in 1936 for the purpose of providing electric and/or water utility service, and is the second largest publicly owned utility in Washington. Snohomish PUD serves about 318,000 electric customers and nearly 20,000 water customers. Our service territory covers over 2,200 square miles, including all of Snohomish County and Camano Island (Figure 3).

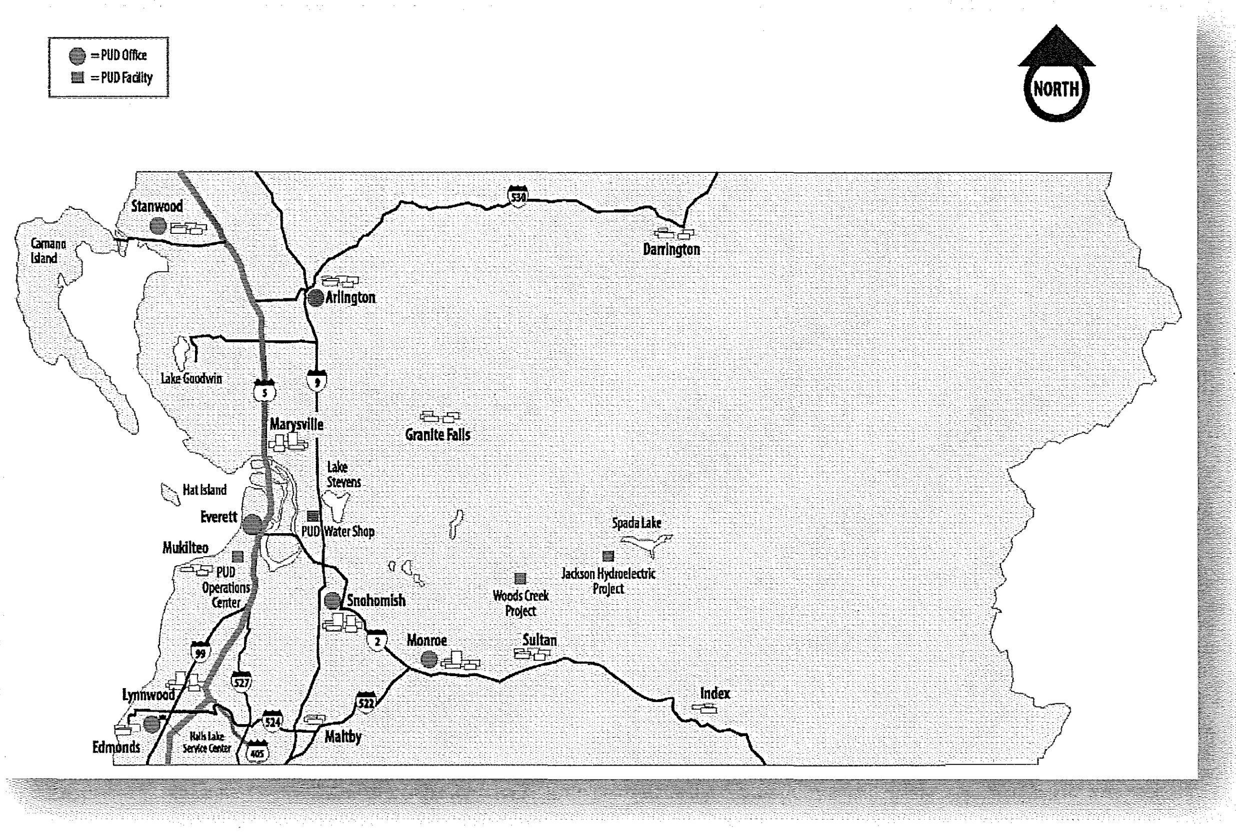

Figure 3: Snohomish PUD Service Territory

By 2020, Snohomish PUD's electrical load is expected to increase by 25 percent. Snohomish PUD is planning to meet this growth through conservation and renewable, non-greenhouse-gas-emitting energy resources. The utility's "Integrated Resource Plan," which provides a long-term strategy regarding future energy resources, positions Snohomish PUD as a leader in conservation and renewable resource development. Future power supplies will include wind, landfill gas, hydroelectric and contracts with the Bonneville Power Administration, and may include geothermal and tidal pending current feasibility studies. Currently, Snohomish PUD primarily receives its power supply from the Bonneville Power Administration (Table 1), providing electrical service to 288,000 residential customer/owners, 29,000 commercial customer/owners, 75 industrial customer/owners, and 320 other customer/owners.

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Table 1: 2009 Power Resources

Bonneville Power Administration	80%
PUD Hydroelectric (Jackson, Packwood, Woods Creek)	4%
Everett Cogeneration	4%
Wind	8%
Landfill Gas / Biomass	1%
Third-Party Contract	3%

Snohomish PUD and the City have a 50-year relationship of working together to meet the water and power needs of their respective ratepayers. Snohomish PUD and the City jointly manage the Spada Lake Reservoir which provides the primary drinking water source for most of Snohomish County and raw water for industrial customers, and also supplies water for energy generation at Snohomish PUD's Jackson Hydroelectric Project.

c. Rucker Hill Hydroelectric Project

Recently, the City and Snohomish PUD jointly developed a plan to produce reliable, clean, renewable energy by adding a generator to harness the energy, which is currently wasted, from one of the City's water transmission lines. The hydroelectric facilities would be added near the pipeline outlet at the City of Everett's Reservoir 4. This hydroelectric project is referred to as the Rucker Hill Hydroelectric Project (Project). If a grant is received as requested, Snohomish PUD would be prime recipient of the grant funds. No ESA issues exist in the geographic area associated with the Project.

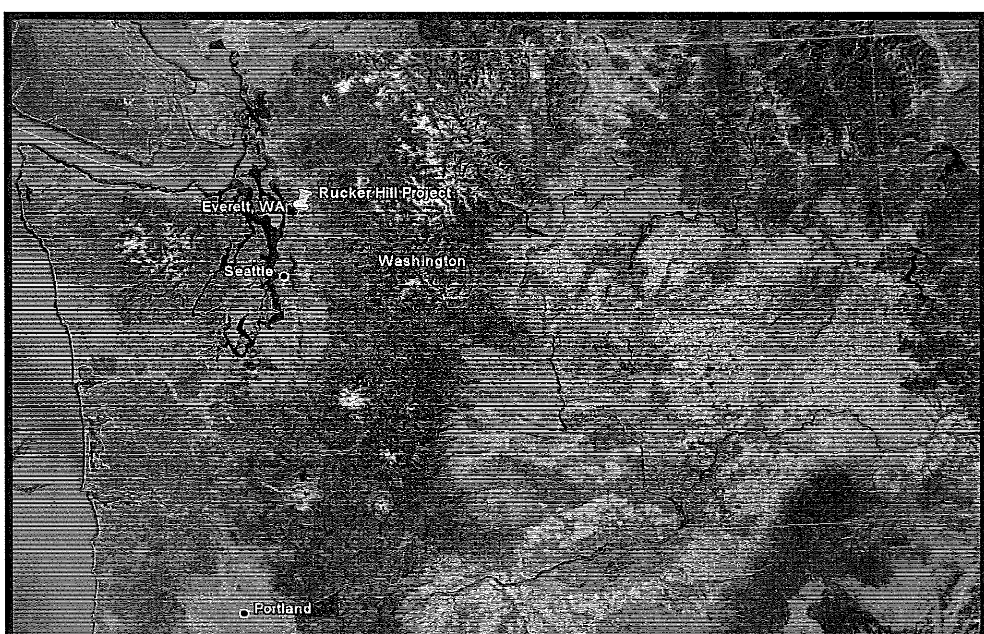

Figure 4: Geographic Location of Rucker Hill Hydroelectric Project in the City of Everett, Washington

3. Technical Project Description

a. Overview

From Lake Chaplain Reservoir, four transmission lines carry the water from the Lake Chaplain Filter Plant into Everett and Snohomish County. Two of these transmission lines carry treated drinking water. The third (called Transmission Line 4) carries untreated water for industrial use at Kimberly-Clark Corp. A fourth line takes a southern route.[5] The Project would be located near the outlet of the untreated water line at Reservoir 4 in Everett, Washington (see Figure 4).

The City's Transmission Line 4 constantly provides over 26 Million Gallons per Day (MGD) of non-potable water to serve a major industrial customer. This water flows 22 miles from the City's Water Treatment Plant at Lake Chaplain (elevation 640 feet msl) to Reservoir 4 (elevation 331 feet msl). Along the way, energy is currently dissipated at two main locations: a flow control structure called Panther Creek Screenhouse, and Reservoir 4 (see Figures 5 and 6). Some additional minor losses occur along the pipeline at bends and other locations.

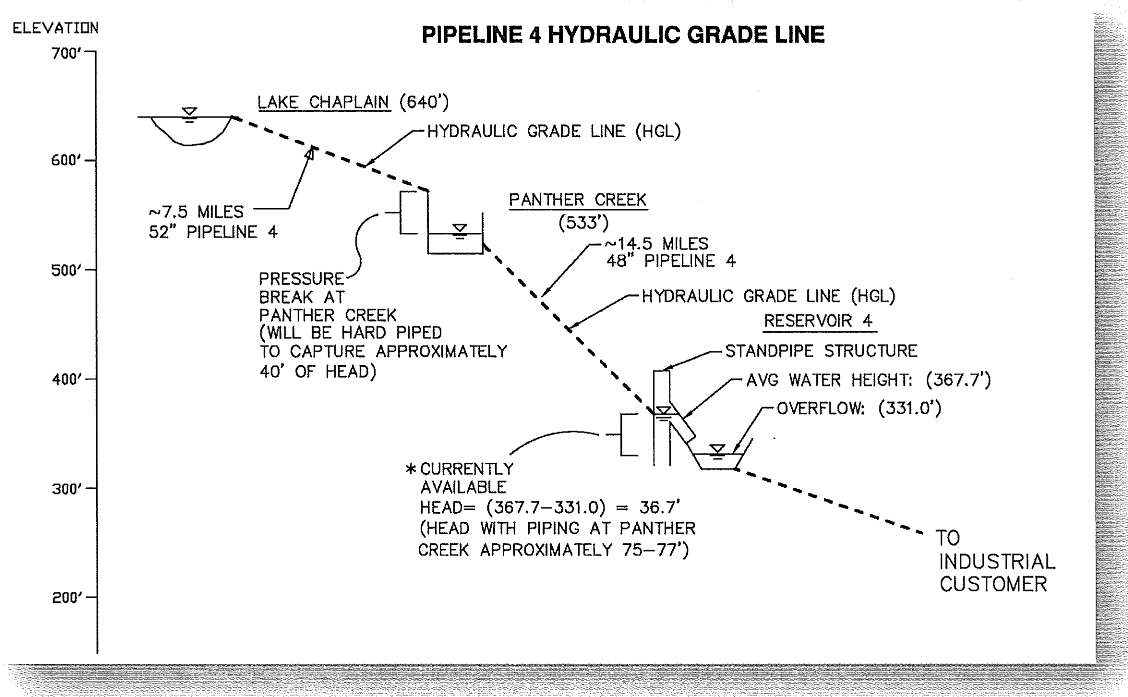

Figure 5: Potential Generation from Pipeline to Reservoir 4 – Simplified View

[5] http://www.everettwa.org/WFPVirtTour/-6-Distribution.html

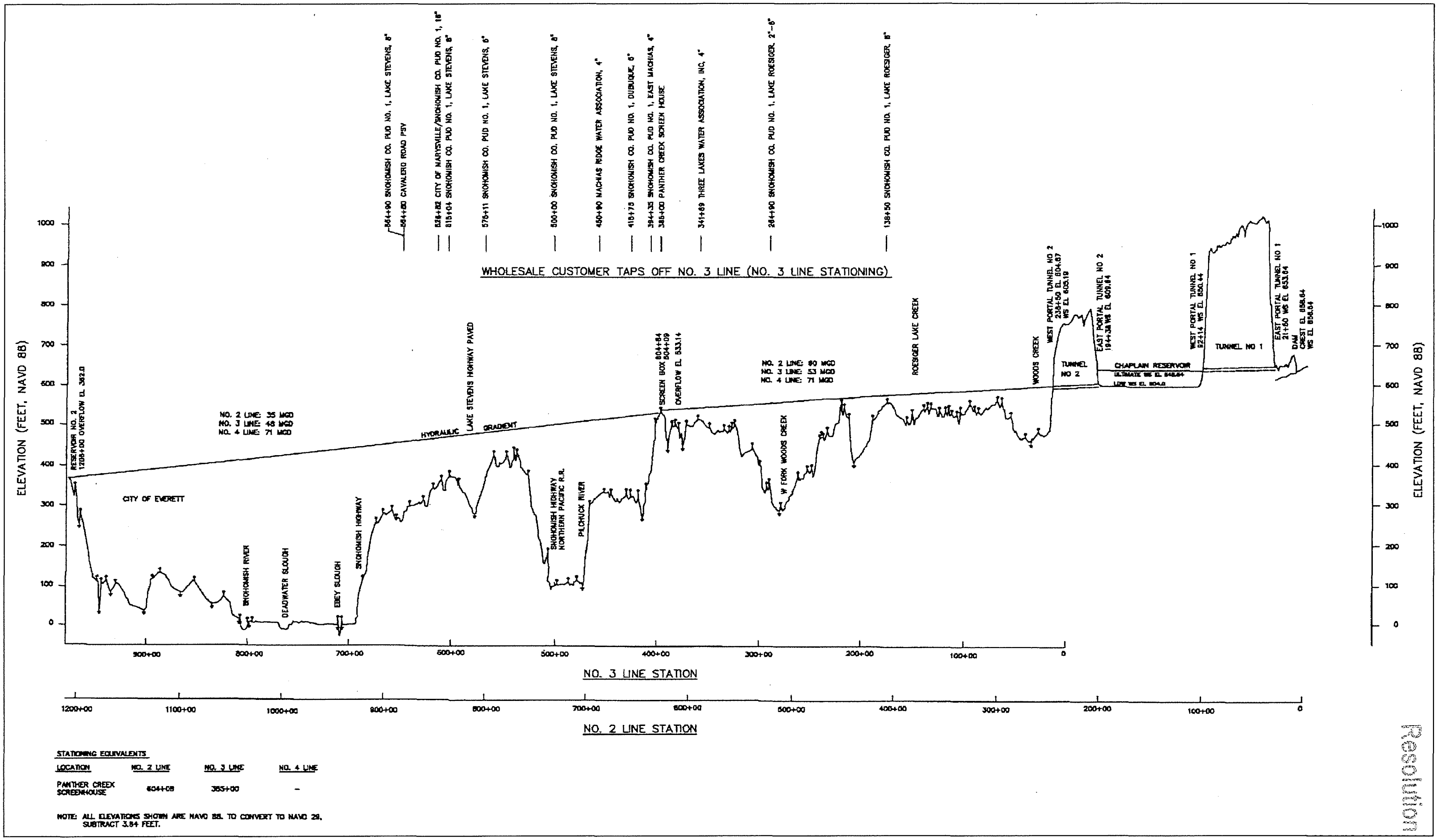

Figure 6: Potential Generation from Pipeline to Reservoir 4 – Hydraulic Gradient

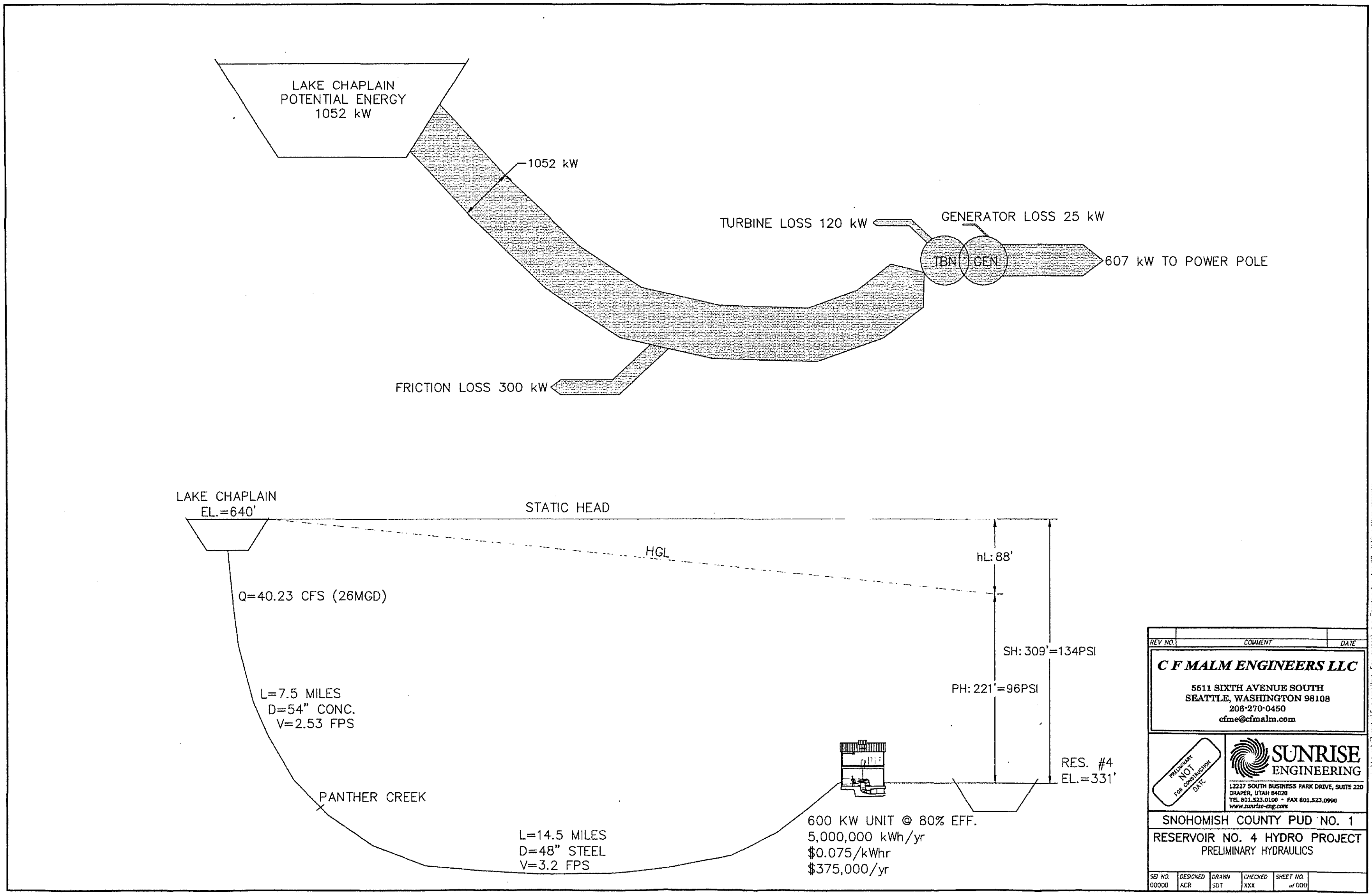

Figure 7: Preliminary Hydraulics of Head to Hydroelectric Project

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Initial design activity will be conducted to confirm the available head through modeling and field measurements. Projections indicate that the effect of improved hydraulics available from modified piping around Panther Creek may be in the range of 40 ft or up to 190 ft of head (see Figure 7).

The considerable variation in the range is contingent on whether or not the water currently flows in an open-channel condition downstream of Panther Creek, consequently not building head. The resolution to this hydraulics question will have a direct result on the potential generation/energy efficiency benefits. In either case, the pipeline is designed to handle the increased head, and the energy available for recovery is substantial.

With relatively minor piping adjustments, this energy, otherwise wasted as turbulence, can be harnessed to power a 220 – 600 kW generator, expected to produce 1,900 – 5,000 MWh annually (see Appendix B for more detailed technical information on the potential generator types). This power would be generated at a small powerhouse to be located adjacent to Reservoir 4 (see Figure 8) and used by Snohomish PUD's customers through a connection with Snohomish PUD's electrical system next to Reservoir 4.

The Project would be maintained and operated by Snohomish PUD under a contract with the City. The City will receive payment from Snohomish PUD to fund proposed piping revisions at the City's Panther Creek Screenhouse. Snohomish PUD will fund the Project with money on hand and currently budgeted to renewable energy resources.

Figure 8: Project Location and Facilities Aerial Photo

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b. Engineering Design Plans

Currently the project has been reviewed by Snohomish PUD and City Engineers. By reviewing the existing design of the transmission pipeline, and interviewing operators familiar with the present field hydraulics, Snohomish PUD and City are confident that there is at least 75 feet of excess head which could be recovered. This available head may be substantially higher depending on whether observed heads are based upon friction, or upon an open-channel flow condition downstream of Panther Creek. Further hydraulic simulation, and potentially field testing will yield an answer to this question. Snohomish PUD has hired a design firm, Murray Smith and Associates and Soar Technologies, to provide a full hydraulics simulation, and final design of the energy recovery facility.

During final design, the features of the Project will be optimized to maximize the Project's economics and longevity of the installation. The preliminary technical details of the Project are expected to consist of the following work at Panther Creek and Reservoir 4.

Panther Creek Screenhouse:
Design and installation of the improvements will be done by the City. The main component within the City's work at the Panther Creek Screenhouse will be routing approximately 250-feet of 48-inch diameter steel pipe around the perimeter of the existing flow control reservoir building (see Figure 9). The work would require hot-tapping the existing transmission line, adding valve(s), fittings, and thrust-blocks as necessary to accomplish revised hydraulics. Clean-up work including restoration of fences and the disturbed roadway would also occur. This work will be done within existing gravel roadways surrounding the site; hence, the environmental impacts and permitting would be minimal.

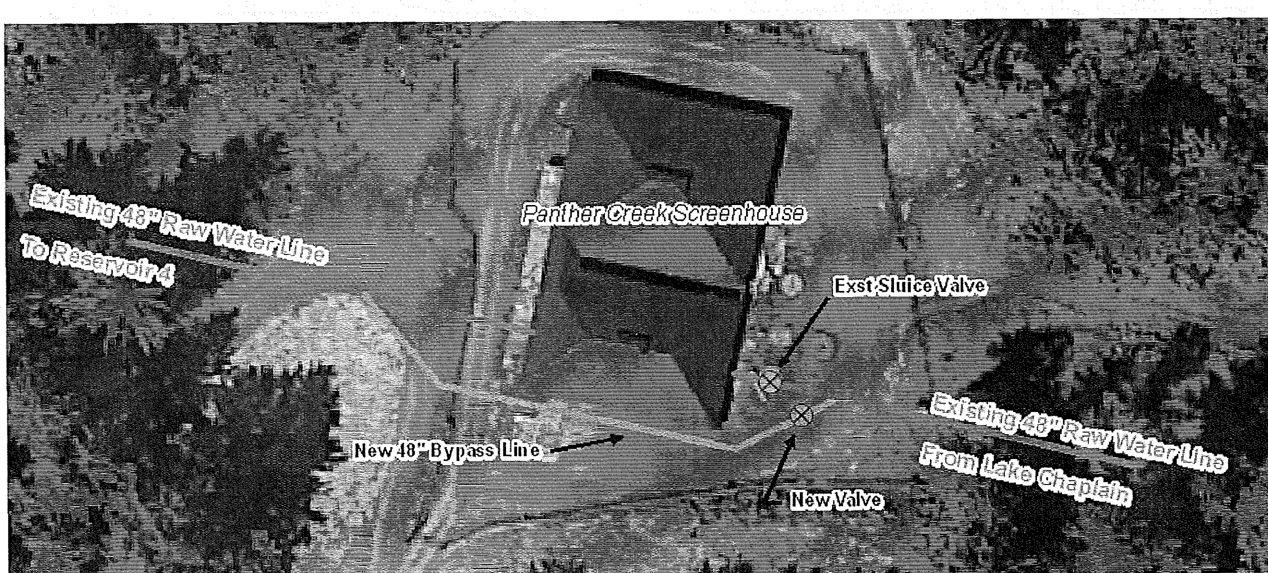

Figure 9: Panther Creek Piping Revisions

Improvements at Reservoir 4:
The powerhouse is anticipated to consist of a partially buried poured concrete, or CMU block building, with metal roof. The building would contain the generation components including a

turbine, turbine isolation valve, 480VAC induction generator, hydraulic power unit, and switchgear/control package. Also included would be a bypass valve and piping to allow the turbine/generator to be taken offline for maintenance without affecting the supply of water. The system is to run in grid parallel operation. The switchyard would consist of a breaker, meter, 225 kVA padmount transformer, and required fencing and grounding.

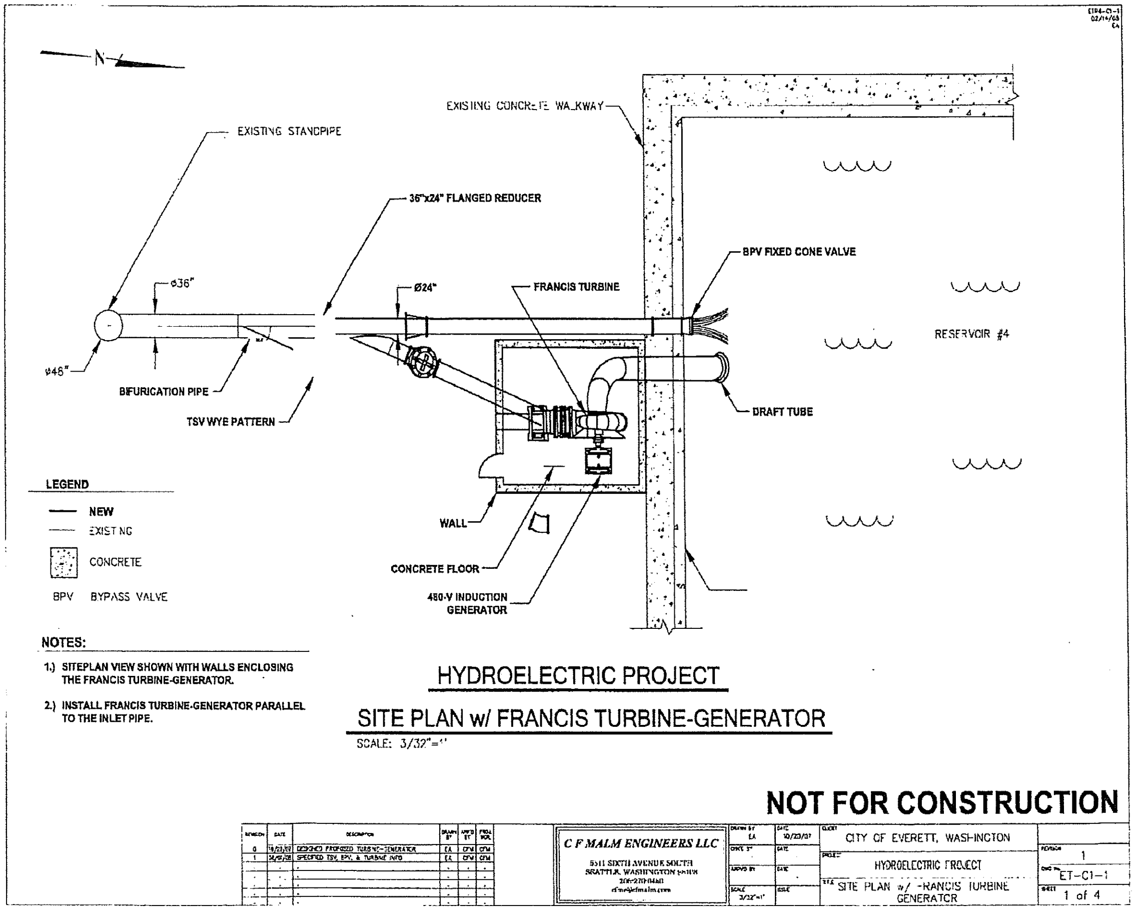

Figure 10: Preliminary Layout for Powerhouse

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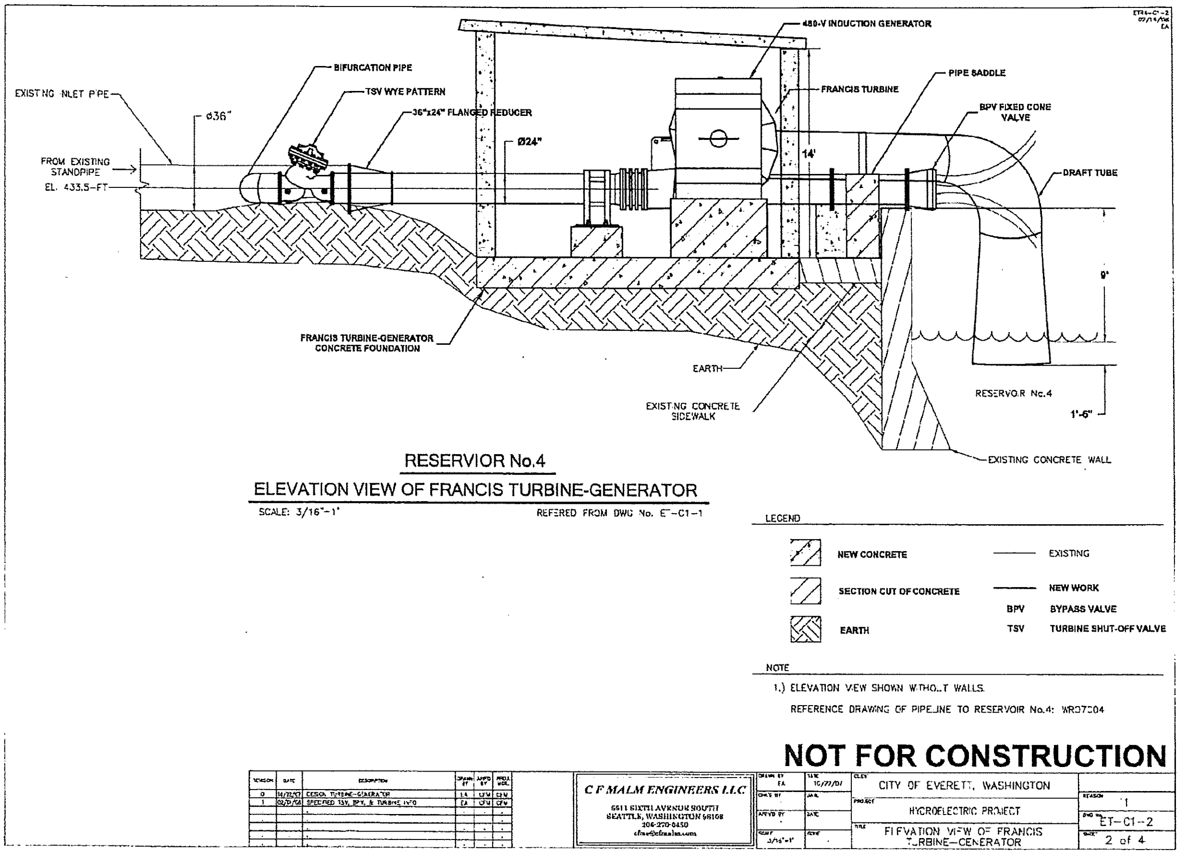
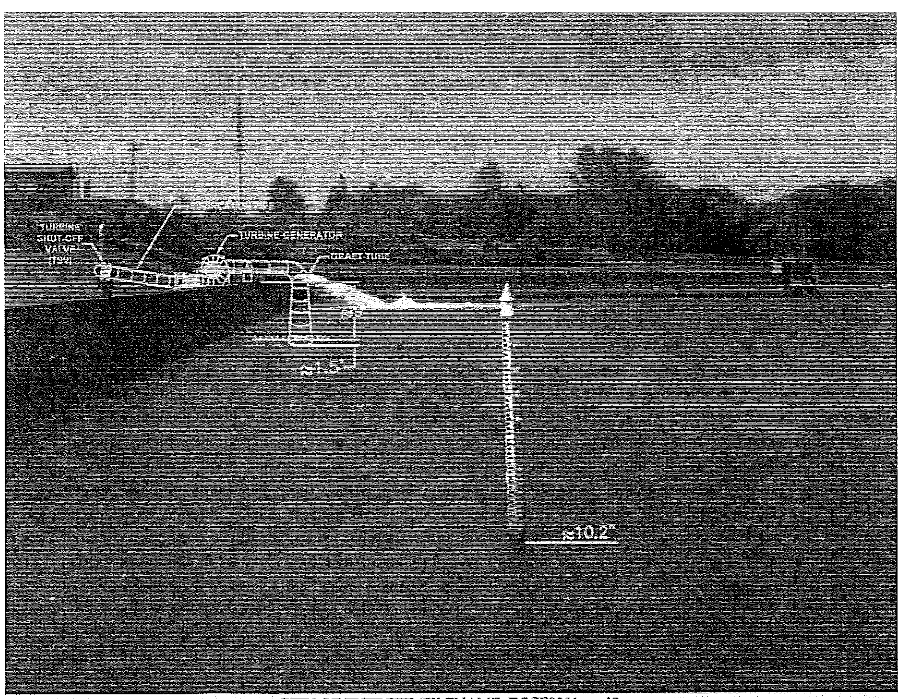


Figure 11: Preliminary Elevation View of Powerhouse



CITY OF EVERETT (FILENAME: DSCF0001-a.pdf) -
Proposed New Turbine-Generator
Rev. 0 - 10/22/07 - Superimposed New Turbine-Generator

Figure 12: Preliminary Layout of Generator and Tailrace

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Based on initial design criteria and research, a Francis Turbine and a Crossflow turbine are the two turbine candidates. Crossflow turbine is most likely as it will limit the potential for surge pressures. See Figure 13 for photo of a Crossflow turbine.

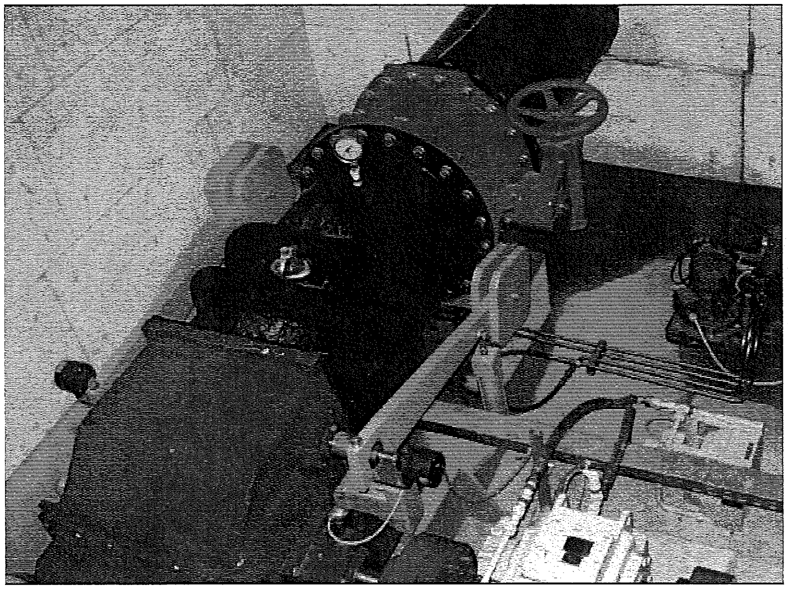

Figure 13: Photo of a Crossflow Turbine

Snohomish PUD's interconnection cost estimate includes the cost of the padmount transformer, and installation of 6,600 feet of fiber optics and 850 feet of underground conductor. This cost is based on an evaluation of the Project by Snohomish PUD's System Protection group.

Additional improvements to the piping at Reservoir 4 would be necessary to address the increased head, powerhouse supply, and flow continuation in the event of grid or unit failure. This is expected to consist of tapping the 48-inch pipeline. The current outfall and standpipe would be modified with a blind-flange and a pressure relief valve if necessary.

The existing 48-inch raw water line would be tapped, and a 30-inch pipe would be run to the powerhouse. The existing concrete lined reservoir would be modified to install the tailrace from the powerhouse.

c. Schedule and Milestones

<u>Phase 1: Project Analysis and Design</u>

Task 1-1: Advertise and Award Engineering Support Contract

Snohomish PUD advertised for engineering consulting services for the Rucker Hill Project in March 2010; selection of a consultant team (Murray Smith and Associates of Everett, WA with SOAR Technologies, Inc. of Woodinville, WA) was made in April 2010. Contract negotiations and finalization will occur in May 2010.

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Task 1-2: Conduct Hydraulics Analysis
Results of this hydraulic analysis are a critical component of the overall Project's design. Since the primary use of the pipeline is for water supply, understanding of surges and high pressure situations on the older pipe with the addition of the hydroelectric Project is essential. The analysis will estimate surge and over pressure potential under all modes of operation. Additionally, with the bypass of the Panther Creek Screenhouse, this analysis will quantify the power potential under the designed Project.

Task 1-3: Conduct Geotechnical Analysis and Survey
A geotechnical analysis will be conducted at the powerhouse site to verify site conditions. A survey will also be conducted to verify topographic data. These data will assist in the development of drawings to ensure stability for powerhouse site.

Task 1-4: Develop Design Requirements
Workshops will be held with the consulting engineer, Snohomish PUD, and City of Everett to discuss design elements and criteria and review alternatives. Based on these workshops and data obtained from the hydraulic analysis, geotechnical analysis and topographic survey, a preliminary design memo will be prepared to guide the development of the Project's design. The preliminary design memo will also include 30% plans and draft specifications for hydroelectric facilities and equipment.

Task 1-5: Develop Water-to-Wire Contract Package
A single vendor will be selected to supply a turbine, generator and controls package which must all work as a unit. This 'water to wire' contract package will consist of guaranteed performance requirements to be met by the supplier. The bids will be evaluated for factors beyond cost, including unit efficiency and maintenance. Snohomish PUD has prior examples of 'water-to-wire' contracts which will be modified for this Project with assistance from Snohomish PUD's consultant.

Task 1-6: Finalize Project Drawings
Project drawings cannot be finalized until the 'water to wire' equipment is selected, as the powerhouse must be sized to fit this equipment. Snohomish PUD's consultant will design the powerhouse to fit the selected equipment, and will also create drawings for the Architectural, Civil, Mechanical, and Electrical drawings for the powerhouse structure, site work, piping modifications, and switchyard to be built for the Project.

ID	Task Name
1	**Project Approvals**
2	Finalize MOU with City of Everett
3	Receive Commission Approval
4	Procure Grant, if possible
5	**Project Analysis and Design**
6	Advertise and Award Engineering Support Contract
7	Conduct hydraulics analysis
8	Conduct geotechnical analysis
9	Develop design requirements
10	Develop water-to-wire contract package
11	Finalize project drawings
12	**Project Permitting**
13	Obtain City of Everett building permits
14	Obtain FERC conduit license/exemption
15	File water right order request
16	**Project Construction**
17	Advertise and Award Water-to-wire contract
18	Advertise and Award construction contract
19	Conduct civil work - piping
20	Conduct civil work - powerhouse
21	Install - turbine
22	Install - electrical
23	Testing
24	Start-up and Commissioning
25	**Project Close-Out**
26	Prepare O&M manual
27	Prepare As-builts
28	Compile Project documentation
29	Post-Implementation Audit

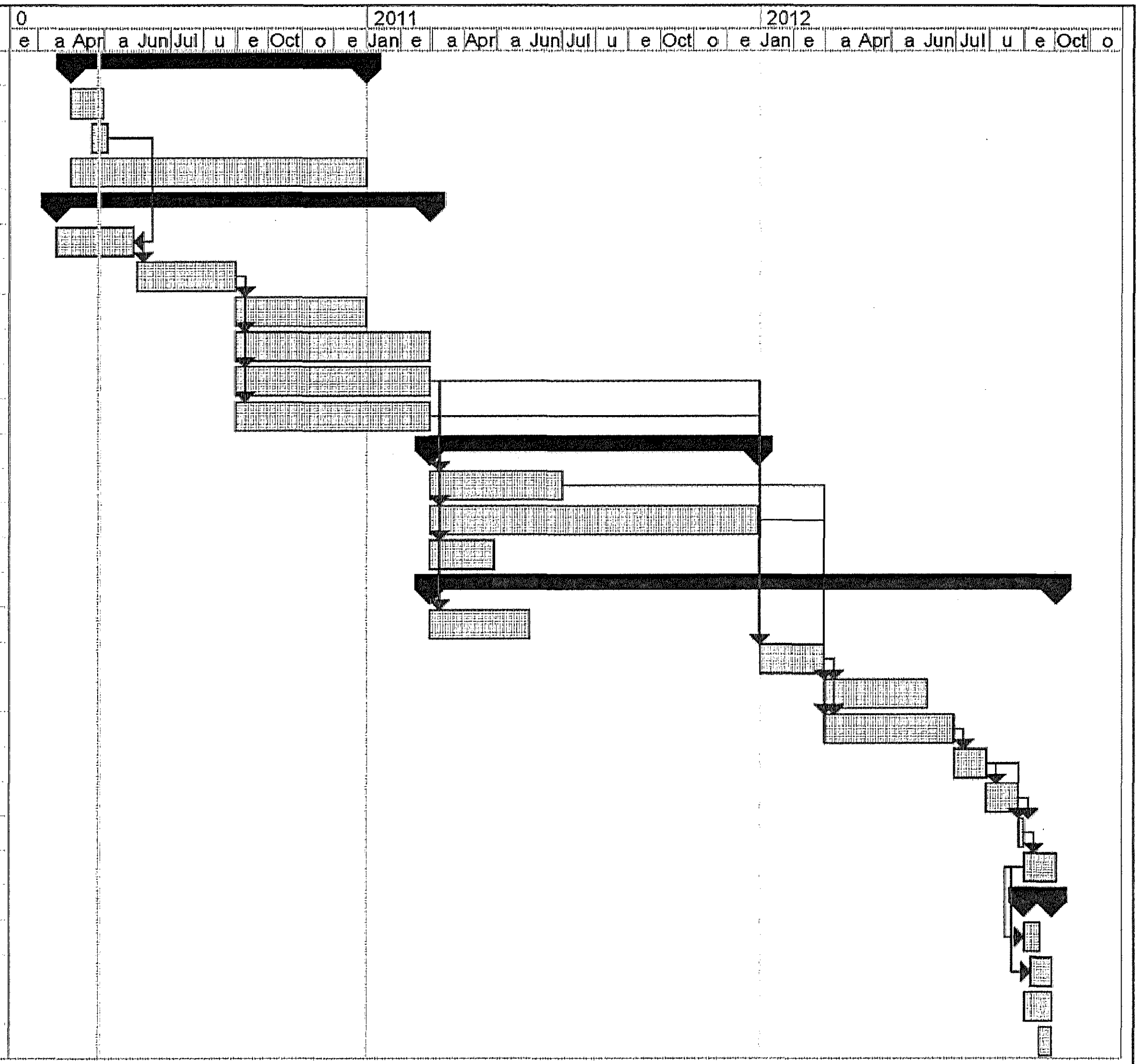

Figure 14: Proposed Project Schedule

Resolution No. 5499

Phase 2: Project Permitting

Task 2-1: Obtain City of Everett Building Permits

The City of Everett maintains permitting authority over its lands and facilities. Once the Project design criteria memo is developed, an application for the appropriate building permits will be filed with the City of Everett for review and processing.

Task 2-2: Obtain FERC Conduit Exemption

This Project will require approval by the Federal Energy Regulatory Commission (FERC). Once the Project design criteria memo is created, an application for the Project will be filed with the FERC for review and processing. The application includes information as required under 18 CFR 4.92(a) and 4.92(b): introductory statement; description of the facility and mode of operation; a general location map that shows the physical structures, among other items; an environmental report that reflects pre-filing consultation requirements. Commensurate with the scope and degree of environmental impact, the application must include a description of the Project's environmental setting, the expected environmental impacts, and a description of alternative means of obtaining an equivalent amount of power; a set of drawings showing the Project structures and equipment; an appendix containing evidence of the necessary real property interests in the lands to develop and operate the Project; and identification of all potentially affected Indian tribes. Snohomish PUD will continue to consult with appropriate stakeholders and requests letters of support; based on preliminary consultation, no stakeholders expressed concern for this Project since any environmental impacts are extremely minimal. The FERC has a track record of processing such application within 6-9 months.

Task 2-3: File Water Right Order Request

An existing water right will be used for this Project. The water right files maintained by the Washington State Department of Ecology (Ecology) will need to be updated to reflect the addition of proposed new generating facility. Such an update requires the issuance of an order by Ecology adding the new facility to each of the certificate files. Snohomish PUD will submit a letter requesting such an order be issued. The letter will also provide the information required under Revised Code of Washington 90.03.260(2) for power generation applications.

Phase 3: Project Construction

Task 3-1: Advertise and Award Water-to-Wire Contract

The water-to-wire package will be advertised and awarded with enough lead time for the acquisition (construction and delivery) of the generation turbine. Standard contracting procedures will be used.

Task 3-2: Advertise and Award Construction Contract

The construction contract will be advertised and awarded using standard contracting procedures. The lowest responsive and responsible bidder will be awarded the construction contract.

Task 3-3: Conduct Civil Work - Piping

The selected general contractor will excavate and tap the existing 48-inch pipeline at Reservoir 4, and will add blind flanges to the existing stand-pipe and outlet pipe to be sealed at the conclusion of the powerhouse construction. The general contractor will install new pipe between the 48-inch pipeline and powerhouse, as well as a flow-continuation valve and pipeline.

Task 3-4: Conduct Civil Work - Powerhouse
The selected general contractor will excavate for the powerhouse to be located adjacent to the Reservoir, install subfloor conduit, pour foundation, install a jib-crane, build the tailrace and modify the reservoir wall, build CMU block walls and a metal roof.

Task 3-5: Install - Turbine
The selected general contractor will install the turbine, generator, transition pipe, valving, and control unit provided by the 'water to wire' equipment supplier. This will be done per manufacturer requirements.

Task 3-6: Install – Electrical
The selected general contractor will install a simple switchyard including the transformer, meter and disconnect switch. Snohomish PUD's transmission group would construct the transmission and fiber optic improvements from the meter to the interconnection point with Snohomish PUD's grid. A PLC for the powerhouse would be programmed in conjunction with Snohomish PUD and the general contractor.

Task 3-7: Testing
Start-up testing will include verifying that the unit performs in various conditions of operation including normal conditions and overspeed. Testing will be conducted by the general contractor in conjunction with Snohomish PUD, design engineer and equipment supplier.

Task 3-8: Start-up and Commissioning
Start-up and commissioning will follow equipment testing, and will be a collective work effort by Snohomish PUD, design engineer and equipment supplier to verify operation, and begin the warranty period for the installed facilities.

Phase 4: Project Close-Out
Task 4-1: Prepare O&M manual
An operations and maintenance manual will be developed for the constructed Project. The manual will provide a narrative of the constructed Project, operating parameters and conditions, and design. The manual will also identify recommended maintenance tasks and schedule to maximize the life span of the hydroelectric equipment.

Task 4-2: Prepare As-Builts
Project as-built drawings will be developed for the constructed Project. The as-builts will be compiled into the Project Documentation files and filed with the FERC as appropriate.

Task 4-3: Compile Project Documentation
Project documentation will be compiled and reviewed for thoroughness. Any gaps in documentation will be filled so complete and accurate information can be accessible for the life of the Project. Final documentation will be available in paper and electronic formats.

Task 4-4: Post-Implementation Audit
Snohomish PUD will hold a workshop with the Team to discuss the Project's process, including successes and areas for improvement. The Team will also review the Project's goal and performance measures.

Task 4-5: Final Report
A final report will be developed to quantify the actual Project benefits.

d. Project Team

Project Lead
Scott Spahr, P.E.

ENGINEERING SUPPORT
Kim Moore, P.E.
Danny Miles, P.E.
Sam Nietfeld, P.E.
Souheil Nasr, P.E.

RESOURCE SUPPORT
Dawn Presler
Jeff Deren, P.E.
Eric Christensen

Reservoir 4 Conduit Hydro Project Grant Team

Scott Spahr is a licensed professional engineer, and a 2001 graduate from the University of Washington with a degree in Civil Engineering. Scott has 10 years of relevant work experience within both the drinking water field as well as the hydroelectric projects. Scott has served as Project manager for multi-million dollar capital projects. Scott is currently employed by Snohomish PUD as a senior engineer in support of the development of new low-impact hydroelectric projects, including the 7.5 MW Youngs Creek Hydroelectric Project, which is currently under construction.

Time Allocation: 20%; *Role on Team:* **Project Lead**: Overall responsible party for Project implementation, assign tasks, monitor schedule and budget, establish parts and construction contract documents, review engineering plans, point of contact between Snohomish PUD/City, implementation site inspector, permitting

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Kim Moore is a licensed professional engineer, and a 1980 honors graduate from the University of Washington with a degree in Civil Engineering. He has 30 years of relevant work experience within the electrical generation, construction management, hydraulics, and public works infrastructure areas. Prior to coming to Snohomish PUD in 2007, Kim was the assistant generation manager at Tacoma Power for over 15 years and led numerous related Projects. Kim is currently the assistant general manager at Snohomish PUD for Water and Generation Resources.

Time Allocation: 5% *Role on Team:* **Lead Support Engineer:** Provide technical engineering expertise for all Project areas; review contract and engineering documents

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Technical Proposal

Danny Miles is a licensed professional mechanical engineer, and a 1980 graduate from Washington State University with a Bachelor of Science degree in Mechanical Engineering. Danny has 29 years of relevant work experience within the electric utility, hydroelectric projects and drinking water field. Danny has served as project manager for multi-million dollar capital projects. Danny is currently employed by Snohomish PUD as a principal engineer and is the project manager for the 7.5 MW Youngs Creek Hydroelectric Project which is currently under construction.

Time Allocation: 5% *Role on Team:* **Support Engineer:** Provide technical mechanical engineering expertise for all Project areas; review contract and engineering documents

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Sam Nietfeld is a licensed professional electrical engineer, and a 1988 graduate from the University of Nebraska – Lincoln with a Bachelors of Science degree in Electrical Engineering. Sam has 22 years of relevant work experience within the electric utility industry, including substation design, system planning, system protection, and hydroelectric projects. Sam is currently employed by Snohomish County PUD as a principal engineer for their Jackson Hydroelectric Project and is Snohomish PUD lead electrical engineer for the 7.5 MW Youngs Creek Hydroelectric Project currently under construction.

Time Allocation: 5% *Role on Team:* **Support Engineer:** Provide technical electrical engineering expertise for all Project areas; review contract and engineering documents

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Souheil Nasr is a licensed professional engineer with 30 years of experience in water supply and distribution. Mr. Nasr is a 1980 graduate with a Masters Degree in Civil Engineering from the University of Washington. Before joining the City of Everett, nine years ago, he was a consulting engineer working on a multitude of water and utility projects. Mr. Nasr is currently a principal engineer managing the Utility Planning Section and responsible for the water and sewer capital improvement projects for the City of Everett.

Time Allocation: 5% *Role on Team:* **Support Engineer:** Provide technical engineering expertise for all Project areas, review engineering design and bid documents, point of contact between Snohomish PUD/City

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Dawn Presler received her Bachelor of Arts degree in Anthropology from Western Washington University in 1997 and a Masters of Science degree in Information Management from University of Washington in 2004. With 13 years of professional experience, Dawn has participated in and led organizational policy setting, compliance monitoring, and stakeholder collaboration in a broad range of administrative, hydroelectric licensing, cultural and natural resource areas. Dawn is currently employed as a relicensing specialist with Snohomish PUD in support of the relicensing of the Jackson Hydroelectric Project with the Federal Energy Regulatory Commission, licensing and permitting compliance with two other hydroelectric projects and technical writing/editing as needed.

Time Allocation: 5% *Role on Team:* **Grant Compliance Coordinator:** Manage Project documentation, prepare/edit reports, coordinate environmental review and stakeholder communications, permitting assistance, FERC point of contact

Jeff Deren is a licensed professional engineer and received a Bachelor of Science from the U.S. Merchant Marine Academy, a Masters of Science from the University of Wisconsin, and a Masters of Business Administration from St. Mary's College. He has over 25 years of experience in the electric utility business predominately in power generation and resource acquisition. Jeff is currently employed by Snohomish PUD as a principal utility analyst in Power, Rates, & Transmission Management department. He is working on Snohomish PUD's long term resource plan and the implementation and acquisition of renewable energy projects.

Time Allocation: 5% *Role on Team:* **Economic Analyst:** Review and analyze economics and power production of proposed Project

Eric Christensen earned an honors degree in biology from the University of Kansas (1984) and an honors law degree from Stanford University (1987). Eric provides legal assistance to the utility in a number of areas, including contracts, regulatory law, legislation, transactions with the Bonneville Power Administration, and environmental compliance. Eric joined the Snohomish PUD in 1997 after spending ten years in Washington, DC, practicing in the areas of regulatory, environmental, and energy law and litigation, including five years defending federal appeals as a trial attorney in FERC's Office of the Solicitor. As assistant general counsel for Snohomish PUD, Eric is the primary attorney responsible for litigation arising from the Western Energy Crisis of 2000-01 and the collapse of Enron into bankruptcy.

Time Allocation: 5% *Role on Team:* **Legal Counsel:** Provide legal support for contracts review, contract development with the City, FERC and other permitting issues

Murray, Smith and Associates and SOAR Technologies - Consulting Engineers
Role on Team: Provide professional architecture and engineering services for the analysis, design and plans for the Project. See Appendix E for resumes of Consulting Engineer Leads.

e. Funding

Snohomish PUD is able to fund this Project with money on-hand from its renewable resource projects account. No other entity is providing funding for this Project.

f. Water Efficiency and Sustainability

This Project is an innovative renewable energy source that harnesses water falling through an existing municipal water line. The power of such falling water is commonly wasted because most drinking water systems use pressure relief valves or reservoir turbulence to reduce high-pressure transmission mains to lower pressure for distribution to customers.

In Washington State, this situation is especially common because area water systems were engineered to take advantage of local climate and topography. Many Washington cities have placed supply reservoirs at higher elevations to capture abundant rainfall. Water flows by gravity to the users in the lowlands, often requiring pressure reduction before distribution to customers. This is the true for water systems in Everett, Seattle, Tacoma, Skagit PUD, Port Angeles, and others. Within Everett's water system there are four transmission lines, among other locations, where currently wasted energy could be captured if the Project proves successful. In total, there are thousands of pressure-reducing valves in Washington, many of which can be modified to harness lost renewable energy.

Snohomish PUD will design the Project, to the greatest extent possible, to be replicable in other water systems across the State. As public agencies, Snohomish PUD and City will share the Project details with other organizations and utilities to promote broader adoption of the concept. The potential for capturing this renewable energy, with little to no environmental impact, and creating green jobs is immense in the State of Washington.

4. Evaluation Criteria

a. Water Conservation

i. Subcriteria 1: Quantifiable Water Savings

The Panther Creek portion of the work would eliminate water loss at the Panther Creek Screenhouse. The exact quantity of water loss is unknown but relatively small. The City of Everett has a long range capital improvement plan to eliminate the Panther Creek Screenhouse due in part to the leakage. This Project will expedite that work along with the eliminating the associated water losses.

Routing water around the Panther Creek Screenhouse will allow the City to utilize the full 50 MGD capacity of Transmission 4.

Snohomish PUD and the City have reached contract terms to have Snohomish PUD fund the Panther Creek Screenhouse work as part of the overall Project. Obtaining this grant will free up over $300,000 to be used on other capital improvements by the City of Everett on their entire water system. These improvements include replacing aging infrastructure that has reached the end of its useful life and provide much-improved water conservation. In addition, these funds could be used to install water meters on many currently unmetered residential connections.

The actual water saved based on 26MGD for 52 weeks of operation is 29,682 acre-feet. This water savings comes from Snohomish PUD not having to acquire the water from another water source (such as a stream or river).

ii. Subcriteria 2: Percentage of Total Supply

The City supplies approximately 80MGD, of which 26 MGD is piped to Reservoir 4. Therefore, 32.5% of the City's water is better managed/utilized for power generation with the installation and operation of the Project.

$$\%\text{ improved water management} = \frac{26\text{ MGD}}{80\text{ MGD}} \text{ x } 100 = 32.5\%$$

iii. Subcriteria 3: Improved Water Management

29,682 acre-feet of water or one third of the City's daily demand will be better managed as water will not be released into the Panther Creek Screenhouse but will piped around that facility which

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will allow early completion of that planned capital improvement. Panther Creek Screenhouse is planned to be eliminated in part due to the water losses, security concerns with above ground water supply, and the need for added pressure that is needed to deliver water to areas in north Snohomish County utilizing gravity.

iv. Subcriteria 4: Reasonableness of Costs

Total Project cost = $2,275,000

Acre-feet conserved (better managed) = $\frac{41\text{ cfs} \times 60\text{ s/m} \times 60\text{ m/h} \times 24\text{ h/d} \times 365\text{ d/yr}}{43{,}560\text{ sq ft/ac}}$ = 29,682 acre-feet

Improvement Life = 50 years. The lifespan of the hydroelectric unit is approximately 50 years with regular inspection and maintenance. The lifespan of the civil improvements (powerhouse building, Panther Creek piping, etc.) is approximately 100 years with regular inspection and maintenance. Snohomish PUD is using the 50 year lifespan as a variable since the generator/turbine is the bulk of the improvement cost and the focus of this grant application.

Reasonableness of Costs = $\frac{2{,}275{,}000}{(29{,}682)(50)}$ = 1.53

b. Energy Efficiency

i. Subcriteria 1: Implementation of Renewable Energy Projects

Role of Renewables:

Snohomish PUD's action plan identified in its Integrated Resource Plan (IRP) positions the utility as a leader in conservation and renewable resource development. The IRP calls for 96 average-megawatts of new cost-effective conservation and future power supplies would come from renewable resources including geothermal, tidal, wind, landfill gas, small hydroelectric and contracts with the Bonneville Power Administration.

For Snohomish PUD, the push for more locally generated green energy resources is less about state mandates and more about creating a diverse, carbon-free energy supply. The Board of Commissioners has made a commitment to meeting growing energy needs through cost-effective conservation and renewable energy resources. The utility faces potential load growth of 25 percent by 2020. The service area is expected to reach nearly 1 million residents in the next 15 years.

Snohomish PUD is pursuing a broad range of renewable energy resources. It has secured contracts for wind energy from three facilities in Washington and Oregon. Two local cogeneration facilities supply renewable energy using wood waste. Snohomish PUD also has emerged as a leader in tidal and geothermal energy research, with $2.7 million in federal funding secured to date for these green initiatives.

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At Snohomish PUD, our customer research surveys have shown consistent support for including renewable resources in our power supply mix — even if that resource is more expensive than traditional power sources. Green energy currently accounts for about 12.5% of our power portfolio. In 2009 the utility launched a comprehensive solar program to install demonstration projects in the community and offer resources to customers interested in installing their own systems.

Readiness to Proceed:
Snohomish PUD and the City have reached a contract terms for using the City's pipeline for the construction, operation and maintenance of this Project. Initial analysis and designs have been developed. Snohomish PUD is poised to issue a contract for engineering services to refine the analyses and designs and to conduct geotechnical investigations for the powerhouse foundations and piping.

Snohomish PUD and the City of Everett are excited about this joint Project and therefore, anxious to get it underway.

Snohomish PUD has staff and consultant expertise on-hand to finalize Project design, obtain permits, construct, and put the proposed Project into service by the September 30, 2012 deadline. The Project will involve a partnership with the City of Everett. Snohomish PUD and the City have developed an agreement in principle to the continuing commitment of both parties towards the Project. Snohomish PUD holds two FERC hydroelectric licenses and has recently applied for many permits related to these licenses. Snohomish PUD is therefore well prepared to apply for all necessary permits for this Project, including the limited FERC license required for this Project. Additionally, because the Project is sited in an area of current utility development, it will have negligible environmental impact, which will allow for expedited permitting and licensing.

Expected Infrastructure Improvements:
Snohomish PUD is evaluating two options for electrical interconnection. The first option includes converting 665 feet of an existing 12kV two phase overhead tap to a three phase tap. The tap runs from pole 3-45 to pole 3-19. At pole 3-19, the tap would extend 100 feet underground to the 12kV/480 volt generation transformer. This tap extends from the existing circuit 12-119 out of the Everett substation. The second option includes extending a three phase underground tap off of pole 3-45, also off of Everett circuit 12-119, approximately 600 feet to the generation transformer. The plant PLC will connect to Snohomish PUD Wonderware SCADA system with basic control functions to start and stop the unit. Monitoring will include voltages, currents, generator on-line/off-line, and security.

Estimated Renewable Energy Generated:
This proposed Project is expected to produce between 1,900 and 5,000 MWh annually. The life expectancy for this Project is 50 years for the generating unit and 100 years for the civil components.

Percentage of Total Renewable Energy:
100 percent of the energy produced by this Project is considered a renewable resource.

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Environmental Benefits:
Rerouting of the piping around the Panther Creek Screenhouse will protect the ground water/surrounding environment as chlorinated water currently leaking at the Screenhouse ultimately ends up in Panther Creek.

Additionally, since Snohomish PUD is proposing to use a source of water already being utilized/conveyed, incremental environmental impacts are eliminated by Snohomish PUD not having to acquire the same amount of water from another water body.

Quantity of Energy Savings:
Currently, all of the energy potential is being wasted. With the implementation of the Project, 100 percent of the energy potential from the water supply to Reservoir 4 will be utilized.

Energy Efficiency:
Efficiency of the generating unit is an important factor for this Project, thus, the selection of the final unit will consider its expected efficiency based on the hydrologic conditions and requirements of the water supply infrastructure. The expected energy efficiency of the turbine is 80-85 percent.

Expected Reduction of Energy from Reclamation:
The Federal Columbia River System (FCRPS) is a unique collaboration among three U.S. governmental agencies – The Bonneville Power Administration (BPA), the U.S. Army Corps of Engineers, and the Bureau of Reclamation (Bureau). The Bureau owns and operates 10 of the 31 FCRPS hydrogenating facilities while the BPA markets the output of the FCRPS. In 2008, Snohomish PUD purchased 87 percent of its energy needs or approximately 7,497,000 MWh from BPA.

The Regional Dialogue Decision called for allocating Federal System power to Bonneville's preference customers using a tiered rate construct. Beginning October 2011, utilities will purchase power from Bonneville's existing Federal System resource base ("Tier 1 Power") at cost (the "Tier 1 Rate") in an amount equal to their share of the total load placed on Bonneville in 2010 or in some cases, in a fiscal year prior to 2010. In 2011, Bonneville will determine the amount of energy each utility will be eligible to purchase at the Tier 1 Rate. The allocation will reflect the utility's actual 2010 (or in some cases, in a fiscal year prior to 2010) retail load (in aMW), less certain resources the utility has contractually defined to serve its load. This amount will be considered the utility's "High Water Mark."

A utility may elect to purchase power from Bonneville for customer loads above its High Water Mark ("Tier 2 Power"), at a rate reflecting Bonneville's incremental costs for additional resources ("Tier 2 Rate"). Alternatively, a utility may acquire power itself to serve loads above its High Water Mark. In either case, publicly-owned utilities will face the cost of new resource acquisitions directly and will be responsible for serving their own load growth. Bonneville will no longer combine the costs of existing and new resources in its power rates.

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In October 2009, the Board of Commissioners elected to use its existing resources [including the Rucker Hill Hydroelectric Project] to serve Snohomish PUD's customer load above its High Water Mark for the 2012 through 2014 period. Snohomish PUD has the option to purchase Tier 2 Power from Bonneville in later periods as long as it provides formal notice of its intent to do so. These notice periods are (i) September 2011 for Fiscal Years 2015-2019, (ii) September 2016 for fiscal years 2020-2024 and (iii) September 2021 for fiscal years 2025-2028.

The quantity of Tier 1 Power Snohomish PUD will be allocated will vary from rate period to rate period depending on: (1) Snohomish PUD's actual load measured in 2010 (or in some cases, a fiscal year prior to 2010); (2) the forecast output capability of the Federal System; (3) and the total demand for Tier 1 Federal System power from all of Bonneville's preference customers. Preliminary estimates from Bonneville indicate Snohomish PUD could receive roughly 815 aMW of Tier 1 power annually through the end of the contract period.

Beneficiaries:

The beneficiaries of the renewable energy system will be two-fold: the ratepayers of Snohomish PUD and the recipients of the City of Everett's water supply. The ratepayers of Snohomish PUD will benefit through their power rates by Snohomish PUD having a predictable energy supply source that is not predicated on the volatile energy market.

The City of Everett water supply recipients will be beneficiaries of the Project as well due to the increased efficiencies of the upgraded water supply piping. Additionally, the contract established between the City of Everett and Snohomish PUD provides for sharing the energy production post capital construction costs are paid by Snohomish PUD. This will provide the City of Everett's water supply system with additional funds that can be allocated to continued water supply system capital improvements.

c. Addressing Endangered Species Concerns

Endangered species are not present in the Project area, therefore, are not impacted by the Project. However, due to Snohomish PUD's need for renewable resources, the Project offsets potential impacts that could occur from the acquisition of renewable resources from other renewable sources (hydroelectric, wind, geothermal, tidal, etc.). Therefore, endangered species are likely benefitted by the Project by Snohomish PUD not having to acquire the 26 MGD from another water sources.

Based on preliminary discussions about the Project, the various federal, state, non-governmental organizations, and tribes have expressed support for this Project since there are no known environmental impacts.

d. Other Contributions to Water Supply Sustainability

The Project will not make additional water available although it is expected the work at Panther Creek Screenhouse will reduce water loss at that reservoir. After power is generated at Reservoir 4 the water is marketed to a local industry which supports over 800 jobs within the City Everett.

The energy currently being lost is dissipated at both Panther Creek and Reservoir 4; this Project will capture that lost energy. Chlorinated water currently leaking at Panther Creek Screenhouse ultimately ends up in Panther Creek.

Snohomish PUD and the City have a long history in collaborating to address regional water storage and supply issues. The first major agreement was executed in 1961 which led to the construction of Culmback dam and the creation of Spada Reservoir and the 1984 agreement led to raising Culmback Dam to allow for water supply for 80 percent of Snohomish residents well into the 21st century. The CONTRACT currently being finalized will continue the collaboration and improve the working relationship between Snohomish PUD and the City to provide residents of Snohomish County long term water and electrical assets.

e. Water Marketing and Banking

No water marketing or banking are included as part of the Project.

f. Demonstrated Results

WCP/SOR:

The City has a Water Conservation Program and a Drought Response Plan which are included in Appendix C and Appendix D.

Project Planning:

The North Snohomish County Coordinated Water System Plan (CWSP) indicates that the 1977 Public Water System Coordination Act and the Water Resources Act of 1971 both recognize and encourage the joint use of public water facilities to promote regional efficiency and resource management. Joint administration, through intergovernmental agreements, is an essential component of an effective implementation program. The proposed Project supports the CWSP goal of the joint use of public water facilities for the benefit of the resource.

Performance Measures and Calculations:

The performance of the Project will be tracked in two ways. The power produced by the generation component of the Project will be continuously metered and tracked by Snohomish PUD. As this is a new generation source, all the power output will be attributable to the Project. The second performance meter will be the savings to water from reduction of leakage. This will be measured by monitoring the amount of water sent to the industrial customer post-Project as compared to pre-Project water usage.

g. Project Financing and Cost Sharing

i. Subcriteria 1: Allocation of Costs

Snohomish PUD believes that the costs identified in the budget section (see section X) are reasonable and appropriate to the work proposed. Snohomish PUD requested quotes from vendors on the generator/turbine unit and used financial data based on other comparable work for another hydroelectric project currently under construction.

Technical Proposal

ii. Subcriteria 2: Additional non-Federal Funding

Snohomish PUD is requesting a $300,000 grant under this funding opportunity. Based on the overall total cost of the Project, Snohomish PUD will fund $1,975,000 (86.8%) of the overall Project cost of $2,275,000 if the grant amount requested is received. This is well above the 50% minimum cost share percentage.

$$\text{Non-federal Funding} = \frac{\$1{,}975{,}000}{\$2{,}275{,}000} \times 100\% = 86.8\%$$

$$\text{Federal Funding} = \frac{\$300{,}000}{\$2{,}275{,}000} \times 100\% = 13.2\%$$

h. Connection to Reclamation Project Activities

The Rucker Hill Hydroelectric Project is not directly connected to a Reclamation project or activity. However, Snohomish PUD is connected to the same grid used by Reclamation projects and thereby adds power routed on the same grid.

##

Post-Project Benefits

1. Performance Measure of Post-Project Benefits

Assumption and methodology used to calculate the energy generated are based on standard practices for the estimation of generation available for hydroelectric sources.

Based upon City of Everett field observations of the adjacent standpipe, 36.7 feet of head is dissipated at Reservoir 4 and 40 feet of head is being dissipated at Panther Creek. Allowing for minor losses, approximately 75 feet of head should be available to be captured by the Project. The City confirms that their industrial customer consistently uses between 26 to 27 MGD of water, which equates to an average flow rate of 41.1 cubic feet per second (cfs). Using these values of flow and head, a turbine generator manufacturer has calculated that the generator unit would be 220 kW. Because the source runs continuously, a straight-forward calculation demonstrates that in one year, the unit would produce just over 1,900 MWh of electricity. However, based on results of the hydraulic analysis to be completed summer/fall 2010, the head available could be much higher, thus producing up to 5,000 MWh of electricity annually.

As discussed elsewhere in the application, the piping of Panther Creek may result in more than 40 feet of head recovery. Modeling the pipeline using typical Hazen-Williams C-factors for the existing pipeline would indicate up to 221 feet of head may actually be available for energy recovery. If this is determined to be the case, the generator unit would have an installed capacity of 600 kW, capable of producing 5,000 MWh of electricity annually.

All of the Project's output would be metered on a real-time basis allowing very precise measurement of the energy output. The City meters the amount of water sent to the industrial customer on a continuous basis. The water savings realized from the piping of Panther Creek will be evident by comparing the current annual flow volume to the annual flow volume with the Project completed.

The Project should also possess an exceptional lifespan. With regular maintenance, comparable hydroelectric facilities have lifespans of 50 to 100 years. Wind, solar and biomass generators all have significantly shorter lifespans. Consequently, the Project will produce clean, renewable energy for much longer than other generation sources without requiring a reinvestment of capital or material.

The output of the generation and the flow into Reservoir 4 will be measured using the SCADA system. Snohomish PUD will provide a final report to the Bureau of Reclamation within four months of Project completion; this will allow ample time for the operations of the Project to be fine-tuned and to quantify a consistent future output. If a shorter turnaround time for the Final Report is desired by Reclamation, this can be discussed during the development of the financial assistance agreement.

2. Potential Environmental Impacts

The Project sites are under the City's control. Power produced would be fed to Snohomish PUD's existing electric distribution system. The environmental impact will be negligible as the Project only modifies existing facilities.

Post-Project Benefits

Surrounding Environmental Impacts:
No ESA-listed species are in the project vicinity based on review of Washington State Department of Fish and Wildlife's (WDFW) Priority Habitats and Species (PHS) database.

The impacts to the surrounding environment are minimal and mostly limited to the construction phase of the Project. Installing pipes at Panther Creek Screenhouse and at Reservoir 4 will occur in existing road beds in developed areas. Excavation of these sites and the powerhouse site will have temporary impacts to the immediate soil, and possible noise disturbance to wildlife in the surrounding habitat. No impacts to the physical habitat of wildlife are anticipated. Due to the close proximity to the water supply reservoirs, silt fences or other protection methods will be used as appropriate to keep silt out of these water bodies.

Bald eagle nests are located in the project vicinity based on review of the PHS database. WDFW and US Fish and Wildlife Services will be consulted prior to construction activities to review Project-specific data and protection measures necessary to meet the requirements of the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. Noise disturbance during construction will be limited to daytime working hours, and will not occur sunset to sunrise.

Endangered or Threatened Species:
No ESA-listed species are in the project vicinity based on review of Washington State Department of Fish and Wildlife's Priority Habitats and Species (PHS) database.

Wetlands:
No wetlands are within the Project boundaries.

Water Delivery System Constructed:
The water delivery system was constructed over several decades. Ongoing maintenance, expansions and replacements have been conducted since construction.

Irrigation System:
The Project does not impact an irrigation system.

Archaeological Sites:
No known archaeological sites are in the Project area. Past development has already heavily disturbed the area, so it is unlikely any archaeological sites will be found during construction of the Project.

3. Required Permits and Approvals

As described in the Project Plan section above, the Phase 2: Project Permitting tasks include:

Task 2-1: Obtain City of Everett building permits
The City of Everett maintains permitting authority over its lands and facilities. Once the Project design criteria memo is developed, an application for the appropriate building permits will be

filed with the City of Everett for review and processing. The estimated time of receipt for the building permit is 2 months.

Task 2-2: Obtain FERC Conduit Exemption
This Project will require approval by the Federal Energy Regulatory Commission (FERC). Once the Project design criteria memo is created, a conduit license exemption application for the Project will be filed with the FERC for review and processing. The application includes information as required under 18 CFR 4.92(a) and 4.92(b): introductory statement; description of the facility and mode of operation; a general location map that shows the physical structures, among other items; an environmental report that reflects prefiling consultation requirements. Commensurate with the scope and degree of environmental impact, the application must include a description of the Project's environmental setting, the expected environmental impacts, and a description of alternative means of obtaining an equivalent amount of power; a set of drawings showing the Project structures and equipment; an appendix containing evidence of the necessary real property interests in the lands to develop and operate the Project; and identification of all potentially affected Indian tribes. Snohomish PUD will continue to consult with appropriate stakeholders and requests letters of support; based on preliminary consultation, no stakeholders expressed concern for this Project since any environmental impacts are extremely minimal. The estimated time for the conduit exemption, based on the FERC's track record of processing such applications, is within 6-9 months.

Task 2-3: File water right order request
An existing water right will be used for this Project. The water right files maintained by the Washington State Department of Ecology (Ecology) will need to be updated to reflect the addition of proposed new generating facility. Such an update requires the issuance of an order by Ecology adding the new facility to each of the certificate files. Snohomish PUD will submit a letter requesting such an order be issued. The letter will also provide the information required under Revised Code of Washington 90.03.260(2) for power generation applications. The estimated time for this order is within 2 months.

4. Funding Plan

Snohomish PUD is requesting a $300,000 ratio grant match to support the implementation of this proposed Project. Snohomish PUD will use cash on hand from its Reserve Account for the remainder of the funds. No other funding is currently being requested from other Federal or non-Federal partners.

5. Official Resolution

Based on the schedule of the Board of Commissioners meetings, an official Resolution is not included in this grant application. The Board of Commissioners will be meeting on May 4 to approve an official resolution as described in the opportunity. Once approved and signed, a copy will be forwarded to Reclamation to support this application packet.

Post-Project Benefits

6. Budget Proposal

a. Budget Table

Table 2 – Summary of Project Budget Including Funding Source

BUDGET ITEM DESCRIPTION	COMPUTATION			RECIPIENT FUNDING	RECLAMATION FUNDING	TOTAL COST
	$/Unit	Unit	Quantity			
SALARIES AND WAGES[1]						
Employees are as listed in Section d. Project Team	$23,200.00	EA	1	$ 23,200.00	-	$ 23,200
FRINGE BENEFITS[1]						
Full-time employees	$45,022.50			$ 45,022.50	-	$ 45,023
TRAVEL[2]	-			100%	0%	-
EQUIPMENT[3]						
'Water to Wire' Equipment Package - Turbine,Generator,Governor by Single Supplier[4]	$674,856	EA	1	$ 674,856	-	$ 674,856
SUPPLIES/MATERIALS						
Construction[5]	-			-	-	-
CONTRACTUAL						
Survey, Geotechnical, and Real Estate Services	$ 30,000	EA	1	$ 30,000	-	$ 30,000
Consulting Engineering Design and Planning Services	$ 230,000	EA	1	$ 230,000	-	$ 230,000
City of Everett - Hardpiping of Panther Creek[6]	$ 317,000	EA	1	$ 317,000	-	$ 317,000
System Interconnection Costs (Communication & System Protection)[7]	$ 200,000	EA	1	$ 200,000	-	$ 200,000
Start-up and Inspection Services	$ 500	$/Day	30	$ 15,000	-	$ 15,000
CONSTRUCTION[8]						
Public Works Contract for Powerhouse at Reservoir 4	$ 663,499	EA	1	$ 363,499	$300,000	$ 663,499
ENVIRONMENTAL AND REGULATORY COMPLIANCE	$ 76,850	EA	1	$ 76,850	-	$ 76,850
TOTAL PROJECT COSTS						$ 2,275,428

Notes:

1. Salaries and wages are for District personnel as listed to cover design, FERC licensing and permitting. Environmental and regulatory compliance are listed separately. Because the District will not be asking for a Reclamation match for internal labor, salary details are not provided, however breakdown of activities are included in expanded budget exhibit.
2. Travel expenditures are not anticipated as part of District expenses.
3. As noted in the expanded budget exhibit, other equipment will be purchased by the General Contractor selected to build the powerhouse and revise the piping at Reservoir 4.
4. Budgetary quote provided by Canyon Hydro of Deming, WA.
5. Included in Construction - Public Works Contract for Powerhouse at Reservior 4. See expanded budget exhibit.
6. Cost provided by City of Everett to be reimbursed by District.
7. Cost provided by District System Protection group. See exhibits.
8. See expanded budget exhibit for cost breakdown.

Post-Project Benefits

Table 3 – Expanded Budget Summary

PRELIMINARY COST ESTIMATE					
Rucker Hill Hydroelectric Project on Existing Reservoir 4 Supply Pipeline					
					ESTIMATED COST
Engineering and Agency Coordination	*QUANTITY*	*UNIT*	*UNIT PRICE*	*SALES TAX*	*TOTAL*
Salaried Staff Time - Project Management, Legal & Admin:					
Finalize MOU with City of Everett					
AGM Water Resources	20	HR	$ 60.00		$ 1,200
Legal Counsel	40	HR	$ 60.00		$ 2,400
Administrative Assistant	20	HR	$ 20.00		$ 400
Project Management & Design Review					
Scott Spahr, Project Lead, Senior Engineer	200	HR	$ 40.00		$ 8,000
AGM Water Resources	40	HR	$ 60.00		$ 2,400
Senior Engineer, Mechanical & Electrical	120	HR	$ 45.00		$ 5,400
Preparation of Bid Package					
Scott Spahr, Senior Engineer	40	HR	$ 40.00		$ 1,600
Contracts Administrator	60	HR	$ 30.00		$ 1,800
				Subtotal:	$ 23,200.00
Salaried Staff Time - Environmental & Regulatory Compliance:					
FERC Conduit Hydroelectric Exemption					
Scott Spahr, Project Lead, Senior Engineer	200	HR	$ 40.00		$ 8,000
Relicensing Information Coordinator	800	HR	$ 35.00		$ 28,000
Legal Counsel	400	HR	$ 60.00		$ 24,000
Administrative Assistant	400	HR	$ 20.00		$ 8,000
Building Permit Acquistion and Coordination					
Scott Spahr, Project Lead, Senior Engineer	20	HR	$ 40.00		$ 800
Sr. Mgr, Environmental Affairs	10	HR	$ 45.00		$ 450
Relicensing Information Coordinator	40	HR	$ 35.00		$ 1,400
Administrative Assistant	20	HR	$ 20.00		$ 400
Administration of Grant					
Scott Spahr, Project Lead, Senior Engineer	40	HR	$ 40.00		$ 1,600
AGM Water Resources	10	HR	$ 60.00		$ 600
Relicensing Information Coordinator	80	HR	$ 35.00		$ 2,800
Administrative Assistant	40	HR	$ 20.00		$ 800
				Subtotal:	$ 76,850.00
Fringe Benefits					
Fringe Benefit rate 45%			45%		
				Subtotal:	$ 45,022.50
Travel					
No travel costs are anticipated for the Project					-
Supplies/Materials					
Supplies and materials are not anticipated for the Project cost					-
Contractual Services:					
Site Survey and Easements	1	EA	$ 15,000		$ 15,000.00
Geotechnical Study	1	EA	$ 15,000		$ 15,000.00
Engineering & Drafting	1	EA	$ 230,000		$ 230,000.00
Inspection & Start-up Testing Engineer	30	DAYS	$ 500		$ 15,000.00
City of Everett Cost for hardpiping of Panther Creek	1	EA	$ 317,000	incl	$ 317,000.00
System Interconnection Costs (Comm. & System Protection)	1	EA	$ 200,000	incl	$ 200,000.00
				Subtotal:	$ 792,000.00
Equipment Purchases					
'Water to Wire' Equipment - Turbine, Generator, Governor	1	LS	$618,000	$56,856	$674,856

Post-Project Benefits

Construction & Materials - Powerhouse at Reservoir 4					
Mobilization	1	EA	$50,000	$4,600	$54,600
Civil & Earthwork					
Excavation of Existing Pipeline and Powerhouse:					
Excavator time	160	HR	$180	$2,650	$31,450
Laborer	240	HRS	$60	$1,325	$15,725
10-Yard Dump Truck	80	HRS	$150	$1,104	$13,104
Trench Safety	1	LS	$4,000	$368	$4,368
Erosion Control - Silt Fence and/or Rock Check Dams	500	LF	$6	$276	$3,276
Modify Existing Piping:					
Hot-tap Existing 48-inch Pipe	1	EA	$4,000	$368	$4,368
Blind-flange(s) existing standpipe and outfall	2	EA	$2,000	$368	$4,368
30-inch Pipe	200	LF	$200	$3,680	$43,680
30-inch Butterfly Valve	1	EA	$25,000	$2,300	$27,300
Fittings	4	EA	$4,000	$1,472	$17,472
Bedding	50	CY	$20	$92	$1,092
Concrete Thrust Blocks	20	CY	$400	$736	$8,736
Excavator time	60	HR	$180	$994	$11,794
Laborer – Straight Time	120	HRS	$60	$662	$7,862
Foundation powerhouse base and tailrace:					
Crushed rock for structure base and surround	20	CY	$40	$74	$874
Reinforced Concrete, In place (incl forming, rebar, pour)	35	CY	$500	$1,610	$19,110
Sawcut Reservoir Wall	1	LS	$15,000	$1,380	$16,380
Laborer – Straight Time	240	HRS	$60	$1,325	$15,725
Jib Crane					
Jib Crane - Material	1	LS	$15,000	$1,380	$16,380
Labor, Install Jib Crane	40	HRS	$60	$221	$2,621
Architectural:					
Metal Roof and Trusses Material	1	EA	$25,000	$2,300	$27,300
Roof and Trusses Installation	120	HRS	$60	$662	$7,862
Steel Double-Door	1	EA	$2,500	$230	$2,730
Louvers & Security Bars	1	EA	$5,000	$460	$5,460
Stairs & Handrails	1	EA	$4,000	$368	$4,368
CMU Walls - Material	1	LS	$40,000	$3,680	$43,680
Architectural Elements Install - Labor	200	HRS	$60	$1,104	$13,104
Site Restoration and Cleanup					
Hydroseed	500	SQ FT	$12	$552	$6,552
Placement of Turbine/Generator Unit					
Mobile Crane Mobilization	1	EA	$12,000	$1,104	$13,104
Mobile Crane Time	40	HR	$300	$1,104	$13,104
Laborer – Straight Time	320	HRS	$60	$1,766	$20,966
Mechanical					
Motor Control Center	1	EA	$10,000	$920	$10,920
Valves	4	EA	$1,000	$368	$4,368
HPU piping	1	LS	$10,000	$920	$10,920
Labor	200	HRS	$65	$1,196	$14,196
Electrical, and Controls					
Lighting	1	LS	$1,000	$92	$1,092
Station Service	1	EA	$3,000	$276	$3,276
Electrical and Communication Conduit & Wire	500	FT	$50	$2,300	$27,300
Switchyard Material	1	LS	$60,000	$5,520	$65,520
Electrical and Communications Labor	360	HR	$65	$2,153	$25,553
PLC and SCADA	1	LS	$20,000	$1,840	$21,840
				Subtotal:	$663,499.20
Total of Project Costs					**$ 2,275,427.70**

Post-Project Benefits

b. Budget Narrative

To the extent it was possible to do so, Snohomish PUD has expressed the Project budget in the format as required by the Bureau of Reclamation. Snohomish PUD has done our best to present as accurate of a budget estimate as possible. Where it was possible to do so, Snohomish PUD received Project-specific budgetary quotes from turbine/generator suppliers (the 'water-to-wire' package), from the City of Everett for the pipeline improvements at Panther Creek, and from Snohomish PUD's system protection group for interconnection costs.

The construction costs for the finished Project will be based on a public bid; however, presented as an expanded budget exhibit are estimated unit costs and extended costs based upon recent comparable bids received. Internal costs related to staff time, travel, fringe benefits, reporting and environmental compliance are listed. However, as indicted in Table 2 these costs will all be the responsibility of Snohomish PUD.

##

Resolution No. 5499

RECLAMATION
Managing Water in the West

Funding Opportunity Announcement No. R10SF80157

WaterSMART:

Water and Energy Efficiency Grants for FY2010

U.S. Department of the Interior
Policy and Administration
Bureau of Reclamation
Denver, Colorado

March 2010

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Synopsis

Federal Agency Name:	Department of the Interior, Bureau of Reclamation, Policy and Administration
Funding Opportunity Title:	WaterSMART: Water and Energy Efficiency Grants for FY2010
Announcement Type:	Funding Opportunity Announcement (FOA)
Funding Opportunity Number:	R10SF80157
Catalog of Federal Domestic Assistance (CFDA) Number:	15.507
Dates: (See FOA Sec. IV.B)	Application due date: May 4, 2010, 4:00 p.m. Mountain Daylight Time
Eligible Applicants: (See FOA Sec. III.A)	Irrigation and water districts, tribal water or power delivery authorities, State governmental entities with water or power management authority (e.g., State agencies, departments, boards, etc.), and other entities with water or power delivery authority located in the western United States or United States Territories as identified in the Reclamation Act of June 17, 1902, as amended
Recipient Cost Share: (See FOA Sec. III.E)	50 percent or more of project costs
Federal Funding Amount: (See FOA Sec. II.B)	**Funding Group I:** Up to $300,000 per agreement **Funding Group II:** $300,001 to $1,000,000 per agreement
Estimated Number of Agreements to be Awarded: (See FOA Sec. II.B)	**Funding Group I:** 30 - 40 **Funding Group II:** 4 - 8
Total Amount of Funding Available for Award: (See FOA Sec. II.A)	**Funding Group I:** Approximately $9,000,000 to $10,000,000 **Funding Group II:** Approximately $4,000,000 to $5,000,000

Application Checklist

The following table contains a summary of the information that you are required to submit with a WaterSMART Grant application.

√	What to submit	Required content	Form or format	When to submit
	Cover page	See Sec. IV.D.2.a.	Form SF 424, available at: <http://www.grants.gov/agencies/aapproved_standard_forms.jsp#1> Page 16	*
	Assurances	See Sec. IV.D.2.b.	Form SF 424B or SF 424D, as applicable, available at: <http://www.grants.gov/agencies/aapproved_standard_forms.jsp#1> Page 16	*
	Title page	See Sec. IV.D.2.c.	Page 16	*
	Table of contents	See Sec. IV.D.2.d.	Page 16	*
	Technical proposal: • Executive Summary • Background data • Technical project description	See Sec. IV.D.2.e. See Sec. IV.D.2.e.(1) See Sec. IV.D.2.e.(2) See Sec. IV.D.2.e.(3)	Page 16 Page 17 Page 17 Pages 17-24	* * * *
	Description of Performance Measures	See Sec. IV.D.2.f	Page 24	*
	Description of potential environmental impacts	See Sec. IV.D.2.g.	Page 24	*
	Required permits and approvals	See Sec. IV.D.2.h.	Page 25	*
	Funding plan	See Sec. IV.D.2.i.	Page 25	*
	Commitment letters	See Sec. IV.D.2.i	Page 25	**
	Official resolution	See Sec. IV.D.2.j.	Page 26	**
	Project budget proposal: • General requirements • Budget format • Budget narrative • Budget form	See Sec. IV.D.2.k. See Sec. IV.D.2.k.(1) See Sec. IV.D.2.k.(2) See Sec. IV.D.2.k.(3) See Sec. IV.D.2.k.(4)	Pages 27-30 Page 27 Page 27 Page 27 Form SF 424A or SF 424C, as applicable, available at: <http://www.grants.gov/agencies/aapproved_standard_forms.jsp#1> Page 30	* * * * *

* Submit materials with your application on May 4, 2010
** Documents should be submitted with your application; however, please refer to the applicable Section of the FOA for extended submission dates.

Acronyms and Abbreviations

AOR	Authorized Organization Representatives
ARC	Application Review Committee
CCR	Central Contractor Registration
CE	Categorical Exclusion
CEC	Categorical Exclusion Checklist
DU	Distribution Uniformity
DUNS	Data Universal Number System
EA	Environmental Assessment
E-Biz POC	E-Business Point of Contact
EIN	Employer Identification Number
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ET	Evapo-transpiration
FAQ	Frequently Asked Question
FOA	Funding Opportunity Announcement
FONSI	Finding of No Significant Impact
GO	Grants Officer
IRS	Internal Revenue Service
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
O&M	Operation and maintenance
OMB	Office of Management and Budget
OM&R	Operations, Maintenance, and Replacement
SCADA	Supervisory Control and Data Acquisition
SOR	System Optimization Review
TIN	Taxpayer Identification Number
USFWS	U.S. Fish and Wildlife Service
WaterSMART	Sustain and Manage America's Resources for Tomorrow

Contents

Section I—Funding Opportunity Description

A. WaterSMART: Water and Energy Efficiency Grants

The Nation faces an increasing set of water resource challenges. Aging infrastructure, rapid population growth, depletion of groundwater resources, impaired water quality associated with particular land uses and land covers, water needed for human and environmental uses, and climate variability and change all play a role in determining the amount of fresh water available at any given place and time. Water shortage and water-use conflicts have become more commonplace in many areas of the United States, even in normal water years. As competition for water resources grows–for irrigation of crops, growing cities and communities, energy production, and the environment–the need for information and tools to aid water resource managers also grows. Water issues and challenges are increasing across the Nation, but particularly in the West due to prolonged drought.

These water issues are exacerbating the challenges facing traditional water management approaches which by themselves no longer meet today's needs. The Department's WaterSMART (Sustain and Manage America's Resources for Tomorrow) program is working to achieve a sustainable water strategy to meet the Nation's water needs. Through WaterSMART Grants, Reclamation provides cost-shared funding on a competitive basis for on-the-ground water conservation and energy efficiency construction projects.

For further information on the WaterSMART Program, see <http://www.usbr.gov/WaterSMART/>.

B. Objective of Funding Opportunity Announcement

The objective of this Funding Opportunity Announcement (FOA) is to invite States, Indian Tribes, irrigation districts, water districts and other organizations with water or power delivery authority to leverage their money and resources by cost sharing with Reclamation on projects that save water, improve energy efficiency, address endangered species and other environmental issues, and facilitate transfers to new uses.

Water conservation, use of water markets, and improved efficiency are crucial elements of any plan to address western U.S. water issues. With leveraged water sustainability grants, an important step will be taken towards increasing conservation for a more efficient use of water in the West.

C. Program Authority

This FOA is issued under the authority of Section 9504 of the Secure Water Act, Subtitle F of Title IX of the Omnibus Public Land Management Act of 2009, P.L. 111-11(42 USC 10364).

D. Frequently Asked Questions

A list of Frequently Asked Questions (FAQs) about WaterSMART and this FOA can be found on-line at <http://www.usbr.gov/WaterSMART>. The list of FAQs will be updated periodically during the application period.

Section II—Award Information

A. Total Project Funding

It is expected that up to a total of $14,000,000 will be available for project awards under this FOA. This year, Reclamation plans to award projects in two Funding Groups, as described immediately below.

B. Project Funding Limitations

Funding will be awarded in two groups:

Funding Group I: Between $9,000,000 and $10,000,000 in Federal funds will be available for awards up to $300,000 per project. Estimated number of agreements to be awarded: 30-40.

Funding Group II: Between $4,000,000 and $5,000,000 in Federal funds will be available for awards between $300,001 to $1,000,000 per project. Estimated number of agreements to be awarded: 4-8.

Reclamation's share of any one proposed project shall not exceed 50 percent of the total project costs.

Multiple applications for funding may be submitted for consideration. ***However, no more than $1,000,000 in Federal funds will be awarded to any one applicant under this FOA.***

C. Reclamation Responsibilities

Project awards will be made through grants or cooperative agreements as applicable to each project. If a cooperative agreement is awarded, the recipient should expect Reclamation to have substantial involvement in the project. Substantial involvement by Reclamation will include:

- **Collaboration and participation** with the recipient in the management of the project and close oversight of the recipient's activities to ensure that the program objectives are being achieved.
- **Oversight** may include review, input, and approval at key interim stages of the project.

At the request of the recipient, Reclamation can provide technical assistance after award of the project. If you receive Reclamation's assistance, you must account for these costs in your budget. To discuss assistance available and these costs, contact your local Reclamation office, which can be identified at <http://www.usbr.gov/main/regions.html>.

D. Award Date

It is expected that the names of potential award recipients will be announced in late June, 2010. Within one to three months after the initial announcement, assistance agreements will be awarded to applicants that successfully pass all pre-award reviews and clearances.

Section III—Eligibility Information

A. Eligible Applicants

In accordance with P.L. 111-11, Section 9502, eligible applicants include:

- State or Territory agencies or departments with water or power delivery authority, e.g., State departments of water resources, State engineer's offices, and other State or Territory agencies, departments, and boards with water management authority.
- Federally recognized Indian tribes with water or power delivery authority. The term "Indian tribe" has the meaning given in Section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450b).
- Irrigation and water districts.
- Entities created under State or Territorial law with water management authority, which may include water user associations; water conservancy districts; and canal, ditch, and reservoir companies.
- Municipal water or power delivery authorities.
- Other organizations with water or power delivery authority.

Applicants must also be located in the western U.S. or Territories as identified in the Reclamation Act of June 17, 1902, as amended and supplemented; specifically, Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming, American Samoa, Guam, the Northern Mariana Islands, and the Virgin Islands.

Those not eligible include entities without water or power delivery authority, such as:

- Other State governmental entities
- Federal governmental entities
- Institutions of higher education
- Individuals

B. Eligible Projects

All projects must be completed by September 30, 2012. Projects should seek to conserve and use water more efficiently, increase the use of renewable energy, protect endangered and threatened species, facilitate water markets, or carry out other activities to address climate-related impacts on water or prevent any water-related crisis or conflict.

Tasks A-D, below, describe projects eligible for funding under this FOA. Applications may include any one, or a combination, of the types of projects described in Tasks A-D. In general, if you are seeking funding for multiple projects (for example, a Task A project and a Task C project) and the projects are interrelated or closely related, they should be combined in one application. Conversely, if the projects can be completed independently and are easily separated or phased, they may be applied for separately.

Applicants may submit multiple project proposals; however, no more than $1,000,000 will be awarded to any one applicant under this FOA. Other projects that are similar to those listed below may be submitted for consideration and will be allowed to the extent consistent with program authorization and goals.

Task A–Water Conservation: Projects that result in quantifiable and sustained water savings or improve water management.

1. **Canal Lining and Piping**: Projects that line or pipe canals resulting in conserved water. Projects include but are not limited to:

    - Installing new proven lining materials or technology

    - Converting open canals to pipeline

2. **Improved Water Management**: Projects that retrofit or modernize existing facilities to improve water management through the use of technology. Projects include but are not limited to:

    - Automation of canal gates or other control structures with associated telemetry equipment for offsite control.

    - Installation of Supervisory Control and Data Acquisition (SCADA) programs to remotely monitor and operate key river and canal facilities.

    - Installation of evapo-transpiration (ET) controllers to improve water applications.

- Installation of advanced water measurement equipment, such as acoustic meters, magnetic meters, propeller meters, and weirs or flumes with reliable continuous totalizing sensors and recorders.

- Construction of facilities to allow or increase aquifer recharge.

Task B – Energy Efficiency: Projects that increase the use of renewable energy sources in the management and delivery of water as well as projects that upgrade existing water management facilities resulting in quantifiable and sustained energy savings. Projects include but are not limited to:

(a) **Implementation of Renewable Energy Improvements Related to Water Management and Delivery**

- Installation of small-scale hydroelectric, solar-electric, wind energy, or geothermal power systems, or other facilities that enable use of these or other renewable energy sources (e.g., replacing fossil fuel powered pumps with renewable energy based pumps or installing low-head hydrokinetic power generation units in a water system, etc.)

- Production and use of biomass or renewable fuels that include woody and herbaceous crops and residues, solid waste, sewage, and liquid fuels from agricultural products (e.g., developing or using technology that would transform algae into a renewable oil source)

(b) **Increasing Energy Efficiency in Water Management**

- Retrofit or modernization of water management facilities or equipment to increase energy efficiency (e.g., installing Variable Frequency Drives, Advanced Meter Readings, or "smart grid" technology on pump and water systems)

- Quantifiable reductions in energy consumption through water conservation projects that reduce pumping or diversions

Task C – Addressing Endangered Species Concerns: Projects that benefit federally listed species (threatened or endangered) or designated critical habitat affected by a Reclamation facility or action as well as projects that benefit federally recognized candidate species. Projects include but are not limited to:

- Habitat improvements, including habitat restoration, making additional water available, and vegetation management.

- Installation of fish bypasses and fish screens, and hatchery improvements.

Task D – Water Banks and Water Markets: Projects that implement or use water markets and water banks to make water available to meet other existing water supply needs or uses (e.g., agricultural, municipal, or dedication to instream flows). Projects include but are not limited to:

- Development of a water bank that would provide a mechanism for willing participants to buy, sell, lease, or exchange water to avoid or reduce water conflicts
- Projects that would result in the contribution of conserved water to an existing water market or bank
- Projects involving an individual sale, lease, or exchange of conserved water to another water user for agricultural, municipal, or instream uses

C. Ineligible Projects

Projects that are considered normal Operations, Maintenance, and Replacement (OM&R) are not eligible. OM&R is described as system improvements that replace or repair existing infrastructure or function without providing increased efficiency or effectiveness of water distribution over the expected life of the improvement.

Examples of ineligible OM&R projects include:

- Replacing malfunctioning components of an existing facility with the same components
- Improving an existing facility to operate as originally designed
- Performing an activity on a recurring basis even if that period is extended (e.g., 10-year interval)
- Sealing expansion joints of concrete lining because the original sealer or the water stops have failed
- Replacing broken meters with new meters of the same type
- Replacing leaky pipes

D. Length of Projects

Proposed projects should be completed within 24 months from the project start date. Applications for projects requiring more than 2 years will be considered if you can demonstrate that there will be measureable on-the-ground accomplishments each year.

E. Cost-Sharing Requirement

Applicants must be willing to cost share 50 percent or more of the total project costs. Cost sharing may be made through cash or in-kind contributions from the applicant or third-party partners. Cost share funding from sources outside the applicant's organization, e.g., loans or state grants, is to be secured and available to the applicant by no later than September 1, 2010. Funding commitment letters must be submitted in accordance with Section IV.C. below, and contain the information stated at Section IV.D.2.i. Applicant cost sharing in excess of 50 percent will be more favorably ranked during the selection process.

1. Regulations

All cost-share contributions must meet the criteria established in the Office of Management and Budget's (OMB) administrative and cost principles circulars that apply to the applicant. These circulars are available at <http://www.whitehouse.gov/omb/circulars/>.

- **STATE, LOCAL, AND TRIBAL GOVERNMENTS** that are recipients or subrecipients shall use:

  Circular A-87, revised May 10, 2004, "Cost Principles for State, Local, and Indian Tribal Governments"

  Circular A-102, as amended August 29, 1997, "Grants and Cooperative Agreements with State and Local Governments" (Grants Management Common Rule, Codification by Department of Interior, 43 CFR 12, Subpart C)

  Circular A-133, revised June 27, 2003, "Audits of States, Local Governments, and Non-Profit Organizations"

- **NONPROFIT ORGANIZATIONS** that are recipients or subrecipients shall use:

  Circular A-110, as amended September 30, 1999, "Uniform Administrative Requirements for Grants and Agreements With Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations" (Codification by Department of Interior, 43 CFR 12, Subpart F)

Circular A-122, revised May 10, 2004, "Cost Principles for Non-Profit Organizations"

Circular A-133, revised June 27, 2003, "Audits of States, Local Governments, and Non-Profit Organizations"

- **ORGANIZATIONS OTHER THAN THOSE INDICATED ABOVE** that are recipients or subrecipients shall use the basic principles of OMB Circular A-110 (Codification by Department of Interior, 43 CFR 12, Subpart F), and cost principles shall be in accordance with 48 CFR Subpart 31.2, titled "Contracts with Commercial Organizations," which is available at <http://www.gpoaccess.gov/ecfr/>

Additionally, please reference 43 CFR 12.77 for further regulations that cover the award and administration of subawards by State governments.

2. In-Kind Contributions

In-kind contributions constitute the value of noncash contributions that benefit a federally assisted project. These contributions may be in the form of real property, equipment, supplies and other expendable property, as well as the value of goods and services directly benefiting and specifically identifiable to the project or program. The cost or value of in-kind contributions that have been or will be relied on to satisfy a cost-sharing or matching requirement for another Federal financial assistance agreement, a Federal procurement contract, or any other award of Federal funds may not be relied on to satisfy the cost-share requirement for WaterSMART Grant applications.

3. Pre-Award Costs

Project pre-award costs that have been incurred prior to the date of award but after the date of authorization and appropriation for this Program may be submitted for consideration as an allowable portion of the recipient's cost share for the project. **In no case will pre-award costs incurred prior to October 28, 2009, be considered for cost share purposes.**

For example, such costs might include design or construction plans and environmental compliance costs directly supporting the proposed project. Reclamation will review the proposed pre-award costs to determine if they are allowable in accordance with the authorizing legislation and applicable cost principles. To be considered allowable, any pre-award costs proposed for consideration under the new awards must comply with all applicable requirements under this FOA.

4. Indirect Costs

Indirect costs that will be incurred during the development or construction of a project, which will not otherwise be recovered, may be included as part of the applicant's cost share. Indirect costs are those: (1) incurred for a common or joint purpose benefiting more than one cost objective, and (2) not readily assignable to any one cost objective. For further information on indirect costs, refer to the applicable OMB cost principles circular referenced above.

F. Requirements for Agricultural Operations [Public Law 111-11, Section 9504(a)(3)(B)]

In accordance with Section 9504(a)(3)(B) of Public Law 111-11, grants and cooperative agreements under this authority will not be awarded for an improvement to conserve irrigation water unless the applicant agrees not—

- To use any associated water savings to increase the total irrigated acreage of the eligible applicant or

- To otherwise increase the consumptive use of water in the operation of the eligible applicant, as determined pursuant to the law of the State in which the operation of the eligible applicant is located

G. Other Requirements

Applicants shall adhere to Federal, State, Territorial, and local laws, regulations, and codes, as applicable, and shall obtain all required approvals and permits. Applicants shall also coordinate and obtain approvals from site owners and operators.

1. Title to Improvements [Public Law 111-11, Section 9504(a)(3)(D)]

If the activities funded through an agreement awarded under this FOA result in an infrastructure improvement to a federally owned facility, the Federal Government shall continue to hold title to the facility and improvements to the facility.

2. Operation and Maintenance Costs [Public Law 111-11, Section 9504(a)(3)(E)(iv)]

The non-Federal share of the cost of operating and maintaining any infrastructure improvement funded through an agreement awarded under this FOA shall be 100 percent.

3. Liability [Public Law 111-11, Section 9504(a)(3)(F)]

(a) **In General**—Except as provided under chapter 171 of title 28, United States Code (commonly known as the "Federal Tort Claims Act"), the United States shall not be liable for monetary damages of any kind for any injury arising out of an act, omission, or occurrence that arises in relation to any facility created or improved through an agreement awarded under this FOA, the title of which is not held by the United States.

(b) Tort Claims Act—Nothing in this section increases the liability of the United States beyond that provided in chapter 171 of title 28, United States Code (commonly known as the "Federal Tort Claims Act").

Section IV—Application and Submission Information

A. Address to Request Application Package

This document contains all information, forms, and electronic addresses required to obtain the information required for submission of an application.

If you are unable to access this information electronically, you can request paper copies of any of the documents referenced in this FOA by contacting:

By mail:	Bureau of Reclamation Acquisition Operations Group Attn: Stephanie Bartlett Mail Code: 84-27810 P.O. Box 25007 Denver CO 80225
E-mail:	sbartlett@usbr.gov
Phone:	303-445-2025

B. Application Submission Date and Time

Application submission date deadline:

- May 4, 2010, 4:00 p.m. Mountain Daylight Time

Proposals received after the application deadline will not be considered unless it can be determined that the delay was caused by Federal government mishandling or by the Grants.gov application system.

C. Application Delivery Instructions

Applications may be submitted electronically through <http://www.grants.gov> or hard copies may be submitted as follows:

By mail:

Bureau of Reclamation
Acquisition Operations Group
Attn: Stephanie Bartlett
Mail Code: 84-27810
P.O. Box 25007
Denver CO 80225

Express delivery/mail services:

Bureau of Reclamation
Attn: Stephanie Bartlett, Mail Code: 84-27810
Denver Federal Center, Bldg. 67 Rm. 152
6th Avenue and Kipling Street
Denver CO 80225

Telephone: 303-445-2025

D. Instructions for Submission of Project Application

Each applicant shall submit an application in accordance with the instructions contained in this section.

- Applicants shall submit an **original and one copy** of all application documents for hardcopy submissions. Each document should be clearly identified as the "ORIGINAL" or as a "COPY."
- Please do not use "comb," "spiral," or adhesive methods to bind the documents.
- Hard copy applications may be submitted by mail or express methods to the addresses listed in Section IV.C, above.
- Materials arriving separately will not be included in the application package and may result in the application being rejected or not funded.
- Faxed copies of application documents will not be accepted.
- Do not include a cover letter or company literature/brochure with the application. All pertinent information must be included in the application package.
- Electronic applications must be submitted through Grants.gov at <http://www.grants.gov>.

- o Please note that submission of an application electronically requires prior registration through Grants.gov, which may take 7-21 days. See Section VIII.D for further information on submission of applications through Grants.gov.

- o Applicants have sometimes experienced significant delays when attempting to submit applications through Grants.gov. If you plan to submit your application through Grants.gov, you are encouraged to submit your application several days prior to the application deadline. If you are a properly registered Grants.gov applicant and encounter problems with the Grants.gov application submission process, you must contact the Grants.gov Help desk to obtain a "Case Number." This Number will provide evidence of your attempt to submit an application prior to the submission deadline.

- Regardless of the delivery method used, you must ensure that your proposal arrives by the date and time deadline stated in Section IV.B., above. Late applications will not be accepted unless it is determined that the delay was caused by Federal government mishandling or by a problem with the Grants.gov application system.

1. Application Format and Length

The total application package shall be no more than **100 consecutively numbered** pages and shall be single spaced and printed single-sided. If an application exceeds 100 pages, only the first 100 pages will be evaluated. The font shall be at least 12 points in size and easily readable. Page size shall be 8 ½" x 11," except for an occasional larger size for charts, maps, or drawings. The Technical Proposal section shall be limited to a maximum of **30** (thirty) pages.

Applications will be prescreened for compliance to the page number limitations.

2. Application Content

The application must include the following elements in order to be considered complete:

- SF-424 Core Form – Application cover page
- SF-424 B or D Form, as applicable to the project
- Title page
- Table of contents
- Technical proposal (limited to 30 pages)
    - o Executive summary
    - o Background data
    - o Technical project description
- Post-project benefits (performance measures)

- Potential environmental impacts
- Required permits and approvals
- Funding plan and letters of commitment
- Letters of project support (do not submit separately)
- Official resolution
- Project budget application
  - Budget proposal
  - Budget Narrative
  - SF-424 A or C Form, as applicable to the project

SF-424, SF-424A, SF-424B, SF-424C and SF-424D forms may be obtained at <http://www.grants.gov/agencies/aapproved_standard_forms.jsp#1>.

a. SF-424 Application Cover Page

This fully completed form must be signed by a person legally authorized to commit the applicant to performance of the project. **Failure to submit a properly signed SF-424 may result in the elimination of the application from further consideration.**

b. SF-424 Assurances

A SF-424B – Assurances – Non-Construction Programs or an SF-424D – Assurances – Construction Programs, signed by a person legally authorized to commit the applicant to performance of the project shall be included. Questions regarding whether to use SF-424B or SF-424D should be referred to Stephanie Bartlett at: sbartlett@usbr.gov. **Failure to submit a properly signed SF-424B or SF-424D may result in the elimination of the application from further consideration.**

c. Title Page

Provide a brief, informative, and descriptive title for the proposed work that indicates the nature of the project. Include the name and address of the applicant, and the name and address, e-mail address, telephone, and facsimile numbers of the project manager.

d. Table of Contents

List all major sections of the technical proposal in the table of contents.

e. Technical Proposal and Evaluation Criteria

The technical proposal (30 pages maximum) includes: (1) the Executive Summary, (2) Background Data, and (3) Technical Project Description. To ensure accurate and complete scoring of your application, your proposal should address each subcriterion in the order presented here. Where applicable, the point value is indicated.

(1) **Technical Proposal: Executive Summary.** The executive summary should include:

- The date, applicant name, city, county, and state.
- A one-paragraph project summary that specifies the Task Area (A, B, C, or D) and briefly identifies how the proposed project contributes to accomplishing the goals of this task area (see Section III.B, "Eligible Projects").
- List the following amounts, in acre feet:
  - The average annual acre-feet of water supply
  - The estimated amount of water saved after the project is completed
  - The estimated amount of water better managed
  - The estimated and current amount of water marketed
- State the length of time and estimated completion date for the project.

(2) **Technical Proposal: Background Data.** Provide a map of the area showing the geographic location (State, county, and direction from nearest town). Describe the source of water supply, the water rights involved, current water uses (agricultural, municipal, domestic, or industrial), the number of water users served, and the current and projected water demand. Also, identify potential shortfalls in water supply. If water is primarily used for irrigation, describe major crops and total acres served. If the application includes renewable energy or energy efficiency elements, describe existing energy sources and current energy uses.

In addition, describe the applicant's water delivery system. For agricultural systems, please include the miles of canals, miles of laterals, and existing irrigation improvements (i.e., type, miles, and acres). For municipal systems, please include the number of connections and/or number of water users served and any other relevant information describing the system.

If applicable, describe any Endangered Species Act (ESA) issues that exist in the geographic area.

Identify any past working relationships with Reclamation. This should include the date(s), description of prior relationships with Reclamation, and a description of the projects(s).

(3) **Technical Proposal: Technical Project Description.** The technical project description should describe the work in detail and the approach to be used to carry it out. Break the work out into major tasks. This description shall have sufficient detail to permit a comprehensive evaluation of the proposal. The technical project description should also include:

- An estimated project schedule that shows the stages and duration of the proposed work, including major milestones and dates
- Engineering plans, designs, and analyses prepared in connection with the proposed work
- Mechanism by which the project will conserve water, improve delivery efficiency, and/or develop water banks and water markets
- Explanation of the ways that the project will improve sustainable water supplies and demonstrate results, such calculations of project benefits
- Identification of sources and support for non-Federal funding.

(4) Technical Proposal: Evaluation Criteria. The Technical Proposal portion of your application should thoroughly address each of the following criteria and subcriteria in the order presented to assist in the complete and accurate evaluation of your proposal.

(a) Water Conservation (32 points). Up to **32 points** may be awarded for a proposal that will conserve water and improve efficiency. Points will be allocated to give consideration to projects that are expected to result in significant water savings.

Subcriteria No. 1—Quantifiable Water Savings:
*Up to **15 points** may be allocated based on the quantifiable water savings expected as a result of the project.*

Describe the amount of water saved. For projects that conserve water, state the estimated amount of water conserved in acre-feet per year (include direct water savings only).

Subcriteria No. 2—Percentage of Total Supply:
*Up to **8 additional points** may be allocated based on the percentage of the applicant's total average water supply that will be conserved directly as a result of the project.*

Describe the improvement to the applicant's overall delivery efficiency, including the following: State the applicant's total average annual water supply in acre-feet. (This is the amount actually diverted, pumped, or released from storage, on average, each year. This does not refer to the applicant's total water right or potential water supply.) Explain how this calculation was made. State the existing transport losses and delivery efficiency.

Subcriteria No. 3—Improved Water Management:
*Up to **5 points** may be awarded if the proposal will improve water management through measurement, automation, advanced water measurement systems, or through other approaches where water savings are not quantifiable.*

For projects that improve water management but which may not result in measurable water savings, **state the amount of water expected to be better managed, in acre-feet per year and as a percentage of the average annual water supply.**

Subcriteria No. 4—Reasonableness of Costs:
*Up to **4 additional points** may be awarded for the reasonableness of the cost for the benefits gained. Please include information related to the total project cost, annual acre-feet conserved (or better managed), and the expected life of the improvement. Use the following calculation*

$$\frac{\text{Total Project Cost}}{\text{Acre-Feet Conserved (or better managed) x Improvement Life}}$$

Failure to include this required calculation will result in no score for this section.

For all projects involving physical improvements, **specify the expected life of the improvement in number of years.**

(b) ***Energy Efficiency*** ***(16 points).*** Up to **16 points** may be awarded based on the extent to which the project increases the use of renewable energy or otherwise results in energy conservation in the management and delivery of water.

Subcriteria No. 1—Implementation of Renewable Energy Projects
*Up to **12 points** may be awarded for projects that include construction or installation of renewable energy components (i.e., small-scale hydroelectric units, solar-electric facilities, wind energy systems, or facilities that otherwise enable the use of renewable energy). Projects such as small scale solar resulting in minimal energy savings or production will be considered under Subcriteria No. 2 below.*

Points may be awarded based on the applicant's readiness to proceed, including the completion of all necessary permits and power purchase agreements; the extent to which the applicant plans to create renewable energy projects in rural areas and/or serve Native American tribes; and/or the extent to which the project is expected to produce quantifiable benefits to a community or to make energy available to groups other than the project applicant.

For projects that include construction of renewable energy facilities, please describe the renewable energy system, including the following elements:

(1) Role of the renewable energy system in the operations of the applicant

(2) Discussion of the applicant's readiness to proceed, including discussion of any necessary permits

(3) Expected infrastructure improvements to the applicant's operation

(4) Estimated quantity of energy to be generated by the renewable energy system

(5) Percentage of total energy supply that is expected to be renewable as a result of the project

(6) Expected environmental benefits of the renewable energy system

(7) Quantity of energy savings to be derived from the activity, as demonstrated by an energy audit

(8) Expected energy efficiency of the renewable energy system

(9) Any expected reduction in the use of energy currently supplied through a Reclamation project

(10) Anticipated beneficiaries of the renewable energy system

Subcriteria No. 2—Increasing Energy Efficiency from Enhanced Water Management or Water Conservation
*Up to **4 points** may be awarded for projects that address energy demands by retrofitting equipment to increase energy efficiency or through water conservation improvements that result in reduced pumping or diversions (e.g. installing solar as part of a SCADA system).*

Please describe any energy efficiency improvements that are expected to result from implementation of the project. Include support for the calculation of any energy savings expected to result from water conservation improvements.

(c) <u>Addressing Endangered Species Concerns</u> (12 points). Up to **12 points** may be awarded for projects expected to benefit federally-listed threatened or endangered species or federally-recognized candidate species.

For projects that will accelerate the recovery of threatened species or endangered species or address designated critical habitats, please include the following elements:

(1) Relationship of the species to a Reclamation project water supply

(2) Likely impacts that would result from an interruption in the water supply

(3) Extent to which the proposed project would reduce the likelihood of listing or would otherwise improve the status of the species

For projects that will benefit federally-recognized candidate species, please include the following elements:

(1) Relationship of the species to water supply

(2) Likely impacts that would result from an interruption in the water supply

(3) Extent to which the proposed project would reduce the likelihood of listing or would otherwise improve the status of the species

Projects that benefit both federally-listed endangered species and federally-recognized candidate species will receive additional consideration under this criterion.

(d) <u>Other Contributions to Water Supply Sustainability</u> (12 points). Up to **12 points** may be awarded for projects that contribute to a more sustainable water supply in ways not covered by other criteria (e.g., addressing specific local concerns, water supply shortages due to climate variability, significant population growth, or drought).

(1) Will the project make water available to address a specific concern, e.g. water supply shortages due to climate variability and/or heightened competition for finite water supplies; will it market water to other users, or generally make more water available in the water basin where the proposed work is located?

(2) Where will the conserved water go? Where is that water currently going (i.e., back to the stream, spilled at the end of the ditch, seeping into the ground, etc.)?

(3) Does the project promote and encourage collaboration among parties? Is there widespread support for the project? Will the project help to prevent a water-related crisis or conflict?

(e) __Water Marketing and Banking__ (10 points). Up to **10 points** may be awarded for projects that propose water marketing elements, with maximum points for projects that establish a new water market or bank.

Briefly describe any water marketing or banking elements included in the proposed project. Include the following elements:

(1) Estimated amount of water to be marketed/banked

(2) A detailed description of the mechanism through which water will be marketed (e.g., individual sale, contribution to an existing market/bank, the creation of a new water market/bank, or construction of a recharge facility)

(3) Number of users, types of water use, etc. in the water market/bank

(4) A description of any legal issues pertaining to water marketing or banking (e.g., restrictions under reclamation law or contracts, individual project authorities, or State water laws)

(5) Estimated duration of the water transfer or market

(f) __Demonstrated Results__ (8 points). Up to **8 points** may be awarded for proposals that can demonstrate results based on the level of planning supporting the project. Up to **3 of these points** may be awarded for proposals with planning efforts that provide support for the proposed project.

Does the project have a Water Conservation Plan, System Optimization Review (SOR), and/or district or geographic area drought contingency plans in place? Please self-certify, or provide copies, where appropriate to verify there is a water conservation plan, SOR, and/or district or geographic area drought contingency plans in place.

Provide the following information regarding project planning:

(1) Identify any district-wide, or system-wide, planning that provides support for the proposed project. This could include a Water Conservation Plan, SOR, or other planning efforts done to determine the priority of this project in relation to other potential projects.

(2) Identify and describe any engineering or design work performed specifically in support of the proposed project.

(3) Describe how the project conforms to and meets the goals of any applicable State or regional water plans, and identify any aspect of the project that implements a feature of an existing water plan(s).

Up to 3 ***additional points*** *may be awarded to proposals that provide support for the development of performance measures to quantify actual project benefits upon completion of the project.*

Provide a brief summary describing the performance measure that will be used to quantify actual benefits upon completion of the project (i.e., water saved, marketed, or better managed, or energy saved). For more information calculating performance measure, see Section VIII, "Other Information."

Up to 2 ***additional points*** *may be awarded to proposals which provide support for how estimates of the benefits were made (i.e., calculations, measurements, and references).*

Summarize the information regarding how direct and indirect project benefits were calculated, and reference any supporting documents.

(g) ***Project Financing and Cost Sharing*** *(6 points).* Up to **6 points** will be awarded for proposals based on the extent to which costs are reasonable for the work proposed and the extent to which the non-Federal cost-share exceeds minimum requirements.

Subcriteria No. 1—Allocation of Costs:
Up to ***4 points*** *may be awarded for proposed projects for which the costs are reasonable, appropriate for the work proposed, necessary, and predominantly allocated to direct costs.*

Does the budget identify direct, indirect, environmental, and contingency costs? If not, explain.

Subcriteria No. 2—Additional non-Federal Funding:
Up to 2 ***additional points*** *may be awarded to proposals that provide non-Federal funding in excess of 50 percent of the project costs.*

State the percentage of non-Federal funding provided.

(h) ***Connection to Reclamation Project Activities*** *(4 points).* Up to **4 points** may be awarded if the proposed project is in a basin with connections to Reclamation project activities. No points will be awarded for proposals without connection to a Reclamation project or Reclamation activity.

How is the proposed project connected to Reclamation project activities?

Does the applicant receive Reclamation project water?

Is the project on Reclamation project lands or involving Reclamation facilities?

Is the project in the same basin as a Reclamation project or activity?

Will the proposed work contribute water to a basin where a Reclamation project is located?

f. Performance Measure for Quantifying Actual Postproject Benefits

All proposals must describe how you will quantify actual project benefits (water saved, marketed or better managed) upon completion of the project (also known as a "performance measure"). You should identify a performance measure for their project and explain how the measure will be applied to their project.

Upon completion of the project, WaterSMART Grant recipients will be required to submit a Final Report describing the completed project and quantifying the actual project benefits. If information regarding project benefits is not available immediately upon completion of the project, the financial assistance agreement may be modified to remain open until such information is available, and until a Final Report is submitted.

g. Description of Potential Environmental Impacts

In order to allow Reclamation to assess the probable environmental impacts and costs associated with each application, all applicants must respond to the following list of questions focusing on the requirements of the National Environmental Policy Act (NEPA), the ESA, and the National Historic Preservation Act (NHPA). Please answer the following questions to the best of your knowledge. If any question is not applicable to the project, please explain why. Additional information about environmental compliance is provided in this section at paragraph k(3)(g), "Environmental and Regulatory Compliance Cost" and in Section VIII B., "Environmental Compliance Requirements." If you have any questions, please contact your regional or area Reclamation office (see <http://www.usbr.gov/main/regions.html>) with questions regarding ESA compliance issues or you may contact Dean Marrone, WaterSMART Program Coordinator, at 303-445-3577 for further information.

(1) Will the project impact the surrounding environment (i.e., soil [dust], air, water [quality and quantity], animal habitat, etc.)? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.

(2) Are you aware of any endangered or threatened species in the project area? If so, would they be affected by any activities associated with the proposed project?

(3) Are there wetlands inside the project boundaries? If so, please estimate how many acres of wetlands there are and describe any impact the project will have on the wetlands.

(4) When was the water delivery system constructed?

(5) Will the project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.

(6) Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? A cultural resources specialist at your local Reclamation office or the State Historic Preservation Office can assist in answering this question.

(7) Are there any known archeological sites in the proposed project area?

h. Required Permits or Approvals

Applicants must state in the application whether any permits or approvals are required and explain the plan for obtaining such permits or approvals.

i. Funding Plan and Letters of Commitment

Describe how the non-Reclamation share of project costs will be obtained. Reclamation will use this information in making a determination of financial capability.

Project funding provided by a source other than the applicant shall be supported with letters of commitment from these additional sources. This is a **mandatory requirement**. Letters of commitment shall identify the following elements:

(1) The amount of funding commitment

(2) The date the funds will be available to the applicant

(3) Any time constraints on the availability of funds

(4) Any other contingencies associated with the funding commitment

Commitment letters should be included with your project application. If a final funding commitment has not been received by the date of application, commitment letters are to be submitted by no later than September 1, 2010, to the address shown in Section IV.C, above.

The funding plan must include all project costs, as follows:

(1) How you will make your contribution to the cost-share requirement, e.g., monetary and/or in-kind contributions and source funds contributed by the applicant (e.g., reserve account, tax revenue, and/or assessments).

(2) Describe any in-kind costs incurred before the anticipated project start date that you seek to include as project costs. The description of these costs shall include

(a) What project expenses have been incurred

(b) How they benefitted the project

(c) The amount of the expense

(d) The date of cost incurrence

(1) Provide the identity and amount of funding to be provided by funding partners, as well as the required letters of commitment.

(2) Describe any funding requested or received from other Federal partners. **Note:** Other sources of Federal funding may not be counted towards the applicant's 50 percent cost share unless otherwise allowed by statute.

(3) Describe any pending funding requests that have not yet been approved, and explain how the project will be affected if such funding is denied.

j. Official Resolution

Include an official resolution adopted by the applicant's board of directors or governing body, or for state government entities, an official authorized to commit the applicant to the financial and legal obligations associated with receipt of WaterSMART Grant financial assistance, verifying:

- The identity of the official with legal authority to enter into agreement
- The board of directors, governing body, or appropriate official who has reviewed and supports the application submitted

- The capability of the applicant to provide the amount of funding and/or in-kind contributions specified in the funding plan

- That the applicant will work with Reclamation to meet established deadlines for entering into a cooperative agreement

An official resolution meeting the requirements set forth above is mandatory. If the applicant is unable to submit the official resolution by the application deadline because of the timing of board meetings or other justifiable reasons, the official resolution may be submitted up to 30 days after the application deadline.

k. Budget Proposal

(1) General Requirements. Include a project budget with the annual estimated project costs and an estimate of any increase or decrease in operation and maintenance (O&M) costs resulting from the project. Include the value of in-kind contributions of goods and services and sources of funds provided to complete the project. The proposal must clearly delineate between Reclamation and applicant contributions.

(2) Budget Proposal Format. The project budget shall include detailed information on the categories listed below and must clearly identify all project costs and the funding source(s) (i.e., Reclamation or other funding sources). Unit costs shall be provided for all budget items including the cost of work to be provided by contractors. **Lump sum costs are not acceptable.** Additionally, applicants shall include a narrative description of the items included in the project budget. It is strongly advised that applicants use the budget format shown on table 1 at the end of this section or a similar format that provides this information.

(3) Budget Narrative Format. Submission of a budget narrative is mandatory. An award will not be made to any applicant who fails to fully disclose this information. The Budget Narrative provides a discussion of, or explanation for, items included in the budget proposal. Listed below are examples of the types of information to include in the narrative.

(a) Salaries and Wages. Indicate program manager and other key personnel by name and title. Other personnel may be indicated by title alone. For all positions, indicate salaries and wages, estimated hours or percent of time, and rate of compensation proposed. All labor estimates, including any proposed subcontractors, shall be allocated to specific tasks as outlined in the recipient's technical project description. Labor rates and proposed hours shall be displayed for each task.

Clearly identify any proposed salary increases and the effective date.

Generally, salaries of administrative and/or clerical personnel should be included as a portion of the stated indirect costs. If these salaries can be adequately documented as direct costs, they may be included in this section; however, a justification should be included in the budget narrative.

(b) Fringe Benefits. Indicate rates/amounts, what costs are included in this category, and the basis of the rate computations. Indicate whether these rates are used for application purposes only or whether they are fixed or provisional rates for billing purposes. Federally approved rate agreements are acceptable for compliance with this item.

(c) Travel. Include purpose of trip, destination, number of persons traveling, length of stay, and all travel costs including airfare (basis for rate used), per diem, lodging, and miscellaneous travel expenses. For local travel, include mileage and rate of compensation.

(d) Equipment. Itemize costs of all equipment having a value of over $500 and include information as to the need for this equipment. If equipment is being rented, specify the number of hours and the hourly rate.

(e) Materials and Supplies. Itemize supplies by major category, unit price, quantity, and purpose, such as whether the items are needed for office use, research, or construction.

(f) Contractual. Identify all work that will be accomplished by subrecipients, consultants, or contractors, including a breakdown of all tasks to be completed, and a detailed budget estimate of time, rates, supplies, and materials that will be required for each task. If a subrecipient, consultant, or contractor is proposed and approved at time of award, no other approvals will be required. Any changes or additions will require a request for approval.

(g) Environmental and Regulatory Compliance Costs. Applicants must include a line item in their budget to cover environmental compliance costs. "Environmental compliance costs" refer to costs incurred by Reclamation or the recipient in complying with environmental regulations applicable to a WaterSMART Grant, including costs associated with any required documentation of environmental compliance, analyses, permits, or approvals. Applicable Federal environmental laws could include NEPA, ESA, NHPA, and the Clean Water Act, and other regulations depending on the project. Such costs may include, but are not limited to:

- The cost incurred by Reclamation to determine the level of environmental compliance required for the project

- The cost incurred by Reclamation, the recipient, or a consultant to prepare any necessary environmental compliance documents or reports

- The cost incurred by Reclamation to review any environmental compliance documents prepared by a consultant

- The cost incurred by the recipient in acquiring any required approvals or permits, or in implementing any required mitigation measures

The amount of the line item should be based on the actual expected environmental compliance costs for the project. However, the minimum amount budgeted for environmental compliance should be equal to at least 1-2 percent of the total project costs. If the amount budgeted is less than 1-2 percent of the total project costs, you must include a compelling explanation of why less than 1-2 percent was budgeted. Any environmental compliance costs that exceed the amount you budgeted for must generally be paid for solely by you.

How environmental compliance activities will be performed (e.g., by Reclamation, the applicant, or a consultant), and how the environmental compliance funds will be spent, will be determined pursuant to subsequent agreement between Reclamation and the applicant. If any portion of the funds budgeted for environmental compliance is not required for compliance activities, such funds may be reallocated to the project, if appropriate.

(h) Reporting. Recipients are required to report on the status of their project on a regular basis. Include a line item for reporting costs (including final project and evaluation costs). Please see Section VI.C for information on types and frequency of reports required.

(i) Other. Any other expenses not included in the above categories shall be listed in this category, along with a description of the item and what it will be used for. No profit or fee will be allowed.

(j) Indirect Costs. Show the proposed rate, cost base, and proposed amount for allowable indirect costs based on the applicable OMB circular cost principles (see Section III E., "Cost Sharing Requirement") for the recipient's organization. It is not acceptable to simply incorporate indirect rates within other direct cost line items.

If the recipient has separate rates for recovery of labor overhead and general and administrative costs, each rate shall be shown. The applicant should propose rates for evaluation purposes, which will be used as fixed or ceiling rates in any resulting award. Include a copy of any federally approved indirect cost rate agreement.

If you do not have a federally approved indirect cost rate agreement, or if unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate. Information on "Preparing and Submitting Indirect Cost Proposals" is available from Interior, the National Business Center, and Indirect Cost Section, at <http://www.aqd.nbc.gov/services/ICS.aspx>.

(k) Total Cost. Indicate total amount of project costs, including the Federal and non-Federal cost-share amounts.

(4) **Budget Form.** In addition to the above-described budget information, the applicant must complete an SF-424A, Budget Information – Nonconstruction Programs, or an SF-424C, Budget Information – Construction Programs. These forms are available at <http://www.grants.gov/agencies/aapproved_standard_forms.jsp#1>.

E. Funding Restrictions

See Section III.E.3 for restrictions on incurrence and allowability of pre-award costs.

Table 1. Sample Budget Proposal Format

BUDGET ITEM DESCRIPTION	COMPUTATION		RECIPIENT FUNDING	RECLAMATION FUNDING	TOTAL COST
	$/Unit and Unit	Quantity			
SALARIES AND WAGES					
Employee 1					
Employee 2					
Employee 3					
FRINGE BENEFITS					
Full-time employees					
Part-time employees					
TRAVEL					
Trip 1					
Trip 2					
Trip 3					
EQUIPMENT					
Item A					
Item B					
Item C					
SUPPLIES/MATERIALS					
Office supplies					
Construction					
CONTRACTUAL/[1] CONSTRUCTION					
Item 1					
Item 2					
ENVIRONMENTAL AND REGULATORY COMPLIANCE[2]					
OTHER					
Reporting					
TOTAL DIRECT COSTS					
INDIRECT COSTS - __%					
TOTAL PROJECT COSTS					

[1] Contracts should be broken out into specific line items. **Lump sum estimates are not acceptable.** Applicants may attach a separate, detailed budget for each contract to adequately address all contractor budget items.

[2] Environmental and regulatory compliance should be at least 1-2 percent unless a justification is provided for a lesser amount.

Section V—Application Review Information

A. Review and Selection Process

The Government reserves the right to reject any and all applications which do not meet the requirements of this FOA, or are outside the scope of WaterSMART Grants. Awards will be made for projects most advantageous to the Government. Award selection may be made to maintain balance among the program tasks listed in Section III.B. The evaluation process will be comprised of three steps.

1. First-Level Screening

All applications will be screened to ensure that:

- The application meets the requirements of the FOA package, including submission of technical and budget proposals, a funding plan, letter(s) of commitment, and related forms.
- The application contains a properly executed SF-424 Application for Financial Assistance and a form SF-424B, Assurances–Non-Construction Programs, or SF-424D, Assurances–Construction Programs.
- The application includes an official resolution, adopted by the applicant's board of directors, governing body, or appropriate authorized official.
- At least 50 percent of the cost of the project will be paid for with non-Federal funding. Cost share funding commitments are to be submitted to Reclamation by September 1, 2010.
- The applicant meets the eligibility requirements stated in this document.
- The application meets the description of eligible projects in Section III.B., "Eligible Projects," of this document (Tasks A-D) and is within the scope of WaterSMART Grants.
- The project can be completed by September 30, 2012.

An application must pass all First-Level Screening criteria in order for it to be forwarded for further consideration at the Second-Level Evaluation phase.

2. Second-Level Evaluation (Technical Review)

Technical criteria will comprise 100 points of the total evaluation weight as stated in Section IV.D.2.e(4). Applications will be scored against the technical criteria by an Application Review Committee (ARC), made up of experts in relevant disciplines selected from across Reclamation.

3. Third-Level Evaluation (Managerial Review)

Management will prioritize projects to ensure the total amount of all awards does not exceed available funding levels, to ensure balance among the program tasks, and to ensure that the projects meet the scope and priorities of the WaterSMART program. Positive or negative past performance by the applicant and any partners in previous working relationships with Reclamation may be considered.

B. Pre-Award Clearances and Approvals

After completion of the third-level evaluation, Reclamation will notify applicants whose proposals have been selected for award consideration and will forward their applications to the appropriate Reclamation regional or area office for completion of environmental compliance.

The local Reclamation office will also complete a business evaluation and determination of responsibility. During these evaluations, the Grants Officer (GO) will also consider several factors which are important, but not quantified, such as:

- Pre-award clearances, determinations, reviews, and approvals
- Allowability and allocability of proposed costs
- Financial strength and stability of the organization
- Past performance, including satisfactory compliance with all terms and conditions of previous awards, such as environmental compliance issues, reporting requirements, proper procurement of supplies and services, and audit compliance
- Adequacy of personnel practices; procurement procedures; and accounting policies and procedures, as established by applicable OMB circulars.

If the results of all pre-award reviews and clearances are satisfactory, an award of funding will be made once the agreement is finalized (approximately one to three months from date of initial selection).

Section VI—Award Administration Information

A. Award Notices

Successful applicants will receive, by electronic or regular mail, a notice of award.

B. Award Document

If the applicant is awarded a financial assistance agreement as a result of this FOA, the proposed project and other relevant information from the application will be referenced in the agreement. Examples of award documents, including applicable terms and conditions, may be viewed at <http://www.usbr.gov/mso/aamd/doing-business-financial-assistance.html>. The agreement document must be signed by a Reclamation GO before it becomes effective.

C. Reporting Requirements and Distribution

If the applicant is awarded an agreement as a result of this FOA, the applicant will be required to submit the following types of reports during the term of the agreement.

1. Financial Reports

- SF-425, Federal Financial Report

2. Program Performance Reports

- Semi-annual reports
- Final report (please note final reports are public documents and will be made available on Reclamation's website)

3. Significant Development Reports

Section VII—Agency Contacts

There will be no pre-application conference. Organizations or individuals interested in submitting applications in response to this FOA may ***direct questions to Reclamation in writing***. Questions may be submitted to the attention of Stephanie Bartlett, GO, as follows:

By mail:

Bureau of Reclamation
Acquisition Operations Group
Attn: Stephanie Bartlett
Mail Code: 84-27810
P.O. Box 25007
Denver CO 80225

Overnight delivery:

Bureau of Reclamation
Attn: Stephanie Bartlett
Mail Code: 84-27810
Denver Federal Center, Bldg. 67 Rm. 152
6th Avenue and Kipling Street
Denver CO 80225

By e-mail:

sbartlett@usbr.gov

Section VIII—Other Information

A. Performance Measures

All WaterSMART Grant applicants are required to propose a method (or "performance measure") of quantifying the actual benefits of their project once it is completed. Actual benefits are defined as water actually conserved, marketed, or better managed, as a direct result of the project. A provision will be included in all assistance agreements with WaterSMART Grant recipients describing the performance measure, and requiring the recipient to quantify the actual project benefits in their final report to Reclamation upon completion of the project. Quantification of project benefits is an important means of determining the relative effectiveness of various water management efforts, as well as the overall effectiveness of WaterSMART Grants.

The following information is intended to provide applicants with examples of some acceptable performance measures that may be used to estimate pre-project benefits and to verify water saved or marketed after the project is completed. **However, the following is not intended to be an exclusive list of acceptable performance measures. Applicants are encouraged to propose alternatives to the measures listed below if another measure is more effective for the particular project.** Reclamation understands that, in some cases, baseline information may not be available, and that methods other than those suggested below may need to be employed. If an alternative performance measure is suggested, the applicant must provide information supporting the effectiveness of the proposed measure as applied to the proposed project.

1. Canal Lining or Piping

Canal lining or piping projects are implemented to decrease canal seepage and evaporation.

Pre-project estimations of baseline data:

To calculate potential water savings, physical measurements of seepage losses are necessary. Two testing procedures which can be used are listed below:

- **Ponding tests:** Conduct ponding tests along canal reaches proposed for lining or piping.

- **Inflow/Outflow testing:** Measure water flowing in and out of the canal reach, taking evaporation into consideration.

If ponding or inflow/outflow tests cannot be performed, document the estimated historical seepage and evaporation rates for the canal reach based on historical knowledge.

Postproject methods for quantifying the benefits of canal lining or piping projects:

- Using tests listed above, compare preproject and postproject test results to calculate water savings. For inflow and outflow testing, remember to consider losses from evaporation.

- If ponding or inflow/outflow tests cannot be performed, benefits can be calculated by comparing the estimated historic seepage and evaporation rates for the canal reach to the post project seepage and evaporation.

- Results can be verified using a ratio of historic diversion-delivery rates. Also include a comparison of historical canal efficiencies and current canal efficiencies. For example, if an irrigation district needed to divert 6 acre-feet of water to deliver 2 acre-feet of water to a field through an unlined or unpiped canal, this would be a 67-percent inefficiency ([100%-(2 acre-feet/6 acre-feet *100)]=67% inefficiency). If after lining or piping the canal, the irrigation district only needed to divert 4 acre-feet of water to deliver the 2 acre-feet; this would be a 17-percent improvement in efficiency ([100%-(2 acre-feet/4 acre-feet *100)]=50% inefficiency).

- Record reduction in water purchases by shareholders and compare to historical water purchases. Use of this method would require consideration and explanation of other potential reasons for decreased water purchases.

For more information regarding canal seepage monitoring and verification, visit <http://www.agwatercouncil.org/Monitoring-Protocols/Monitoring-Protocols/menu-id-61.html>.

2. Measuring Devices

Good water management requires accurate water measurement. Potential benefits derived from measurement include:

- Quantification of system losses between measurement locations

- Accurate billing of customers for the actual amount of water used

- Facilitation of accurate and equitable distribution of water within a district

- Implementation of future system improvements such as remote flow monitoring and canal operation automation

Installation of measuring devices may include, but are not limited to, the following:

- Flow meters
- Weirs
- Flumes
- Meter gates

Preproject estimations of baseline data:
Preproject flows are difficult to estimate without a measuring device in place. However, the applicant may be able to use data from measurement devices located elsewhere in the delivery system (if available). Otherwise, the applicant may have to rely on other historical data.

Postproject methods for quantifying the benefits of projects to install measuring devices:

- Compare postproject water measurement (deliveries or consumption) data to preproject water uses.

- Compare preproject and postproject consumptive use by crop via remote-sensing information.

- Survey users to determine utility of the devices for decision making.

- Document the benefits of any rate structure changes made possible by the installation of measuring devices. For example, if districts are able to convert from billing water users at a flat rate to billing for actual water use using a volumetric or tiered water pricing structure. (Assumes conversion from a nonmetered to metered district.)

3. New Technologies for Improved Water Management

a. Data Acquisition

Proposals may involve the installation or expansion of a SCADA system that monitors flows in an individual district or in a basin including several districts. SCADA systems provide water managers with real-time data on the flow and volume of water at key points along a water delivery system. Access to such data allows water managers to make accurate and timely deliveries of water, reducing over-deliveries and spillage at the end of the canal.

Preproject estimations of baseline data:

- Collect data on diversions and deliveries to water users, making estimates if necessary

- Document employee time spent preproject on ditch/canal monitoring and water control

Postproject methods for quantifying benefits of SCADA system projects:

- Calculate amount of increased carryover storage in associated reservoirs. This is a long-term measure which will be more meaningful over a period of years.

- Track and record the diversions to water users and compare to preproject diversions. This would show results of improved management if yearly fluctuations in weather are accounted for.

- Report delivery improvements (i.e., changes in supply, duration, or frequency that are available to end users because of SCADA).

- Document other benefits such as less mileage by operators on dusty roads (which saves time and influences air quality) and less damage to canal banks due to fluctuating water levels in canals.

b. System Control

Proposals may include system automaton projects aimed at *preventing* spillage from canals, or drainage capture/reuse projects focused on *intercepting* spills and redirecting them to drains, canals, or reregulation reservoirs for reuse.

(1) Spillage Reduction through System Automation.

Preproject estimations of baseline data:

- Establish baseline data by measuring existing spillage or document historic spillage. A rated measuring device should be positioned to measure spillage losses. To account for temporal variations, a minimum of a one-year history of preproject measurements is desirable for future comparison to postproject water usage. Spillage volumes can vary substantially between wet and dry years; therefore, some multiyear estimates of spillage may be necessary.

- Track preproject water diversions using district or State diversion records.

Postproject methods for quantifying benefits of spillage reduction projects:

- Using rated devices, measure postproject flows. Gather enough data to account for seasonal and temporal variations. Using baseline and postproject data, calculate savings using the following calculation: Savings = $(\text{Spillage})_{\text{w/o project}} - (\text{Spillage})_{\text{w/project}}$.

- Track postproject changes in the amount of water diverted and compare to preproject diversion data.

- Compare estimated historic spills from district/project boundaries to postproject spills.

- Document how the additional water resulting from the reduction in spillage was used (i.e., water retained in the river to support riparian habitat, transferred for another use, or used to meet normal water demands in times of drought).

- Report specific volume changes to spills, diversions, or deliveries due to system automation.

For more information regarding canal seepage monitoring and verification, visit <http://www.agwatercouncil.org/images/stories/monitoring_and_verification_canal_seepage.pdf>

(2) Drainage Reuse Projects. Drain water reuse can be a district level or regional conservation effort that consists of recovering residual irrigation water from drains and returning it to the water supply system for delivery to users.

Several types of projects can focus on drainage and reuse, including:

- Pump stations with constant flow rates

- Variable speed pump stations without SCADA controls

- Variable pump stations with SCADA controls

- Storage reservoirs with pump stations and constant flow rate

- Storage reservoirs with variable speed pump stations and SCADA controls

Preproject estimations of baseline data:

- A rated measuring device should be positioned to measure drain water losses. To account for temporal variations, a minimum of a one-year history of preproject measurements is desirable for future comparison to postproject water usage. Drainage volumes can vary substantially between wet and dry years; therefore, some multiyear measurements of drain water losses may be necessary.

Postproject methods for quantifying benefits of drainage reuse projects:

Using rated devices, measure post-project flows. Gather enough data to account for seasonal and temporal variations. Using baseline data and post-project data, calculate savings using the following calculation: Savings = (Drainage $_{\text{w/o project}}$- Drainage $_{\text{w/project}}$) + (Spillage $_{\text{w/o project}}$-Spillage $_{\text{w/project}}$).

- Take readings from measuring devices positioned to measure drain water loss. A system analysis can be done with the following calculation: Drainage $_{\text{w/project}}$ = (1-%Reuse)*Drainage $_{\text{w/o project}}$.

- Measure and record post-project water deliveries to fields, tailwater volumes entering reservoirs and tailwater volumes recycled to fields. Compare this data to previous history.

- Estimate any benefits to farmers, such as improved flexibility in water management, reduction in shortages of supply to tailenders, etc. If it is not possible to quantify these benefits in acre-feet, a narrative explanation is acceptable.

For more information regarding drainage reuse monitoring and verification, visit <http://www.agwatercouncil.org/Monitoring-Protocols/Monitoring-Protocols/menu-id-61.html>.

c. Evapo-transpiration Controllers

An ET controller automatically adjusts the amount of water applied to landscape based on weather conditions. The "smart" ET controller receives radio, pager, or Internet signals with ET information, so that watering is limited to the replacement of only the moisture that the landscape lost due to heat, humidity, and wind. Other controllers use historical data to adjust the watering program.

Preproject estimations of baseline data:

Domestic (interior) water usage: In many cases, landscape water use and domestic water use are measured together. In these cases, domestic water use can be estimated and then subtracted from the total water use to estimate landscape water use using one of the following methods:

- Domestic water use can be estimated based on the number of persons in the household and type of plumbing (low flow or not).

- Domestic usage can also be estimated using the assumption that landscape water is negligible during certain parts of the year, and therefore, Domestic Usage = (Average Use per Capita) $_{\text{determined non-irrigation season.}}$

Once the domestic usage value is obtained, landscape water applied can be calculated using the following calculation:

(Landscape water applied) $_{\text{w/o ET Controllers}}$ = Total water use - Domestic Water

Postproject suggested methods for quantifying benefits of ET controllers:

- To calculate water savings, the following calculation can be applied: Estimated Savings = N [(Average amount of landscape water applied per participant) $_{\text{w/o ET Controller}}$ – (Average amount of landscape water applied per participant) $_{\text{w/ ET Controller}}$] where N = number of participants (households or landscapes)

- Compare meter readings prior to ET controller installation and postinstallation.

- Compare actual water applied postproject to estimated water application if only using sprinkler controller on a set timer application.

For more information regarding ET controller monitoring and verification, visit <http://www.agwatercouncil.org/Monitoring-Protocols/Monitoring-Protocols/menu-id-61.html>.

d. On-Farm System Improvements

On-farm system improvements increase the efficiency of the irrigation system by reducing water losses from deep percolation and unrecoverable tailwater.

Irrigation system improvements may include:

- Converting to more efficient irrigation systems based on crops, soil, terrain, and weather conditions.

- Upgrading existing irrigation systems (i.e., shifting sprinkler nozzle size, upgrading to surge irrigation).

- Improving irrigation scheduling, management, or delivery methods.

Preproject estimations of baseline data:

Documentation of water savings based on delivered water is complicated by the fact that crops are rotated from year to year, and weather patterns and water availabilities also change. However, you should record on-farm water deliveries and crop ET of irrigation water to make post-project comparisons possible.

Postproject methods for quantifying the benefits of on-farm improvements:

- Record postproject on-farm water deliveries and crop ET of irrigation water and apply the following forming:
  Savings = [(On-farm delivery)/(Crop ET of irrigation water) $_{\text{w/o project}}$] – [(On-farm delivery)/(Crop ET of irrigation water)] $_{\text{w/project}}$

- Monitor delivery to affected fields and calculate water savings using delivery records and calculation above.

- Compare postproject volume of water applied and runoff with the historical water volume applied and runoff.

- Document the Distribution Uniformity (DU) of the original system and compare it to the new system DU because yield and water savings may be difficult to document over a 1-year study period due to yearly and crop variations.

For more information regarding canal seepage monitoring and verification visit <http://www.agwatercouncil.org/Monitoring-Protocols/Monitoring-Protocols/menu-id-61.html> .

4. Water Banks and Water Markets

a. Water Marketing (Transfers)

Water marketing is the temporary or long-term transfer of the right to use water from one user to another, by sale, lease, or other form of exchange, as allowed under State laws. Water marketing is a method of moving water supplies to areas of greatest financial value and can be a useful mechanism to increase the beneficial use of existing water supplies. Depending on the State laws, there are various methods in which a seller can make water available for transfer.

Examples include:

1. Ground water substitution is one method in which a seller uses their ground water resources in-lieu of receiving surface water. This frees up the surface water for transfer.

2. Crop idling or shifting, whereby sellers agree to idle fields or shift from higher to lower water using crops, can make water available for transfer. The seller is then able to transfer water based on the difference in crop consumption that is realized from the idling or shifting.

3. Conserved water made available through canal modernization or other conservation projects may also be available for transfer, depending on State laws.

To identify other methods that can be used by a seller to transfer water, consult State law.

Preproject estimations of baseline data:
Collect preproject monthly ground water pumping, water consumption, water quality, diversion, and cropping information, using measuring devices and/or historical data.

Postproject methods for quantifying benefits of water marketing projects:

Ground Water Substitution Transfers

- Track monthly diversions, by year and type of use (agriculture, municipal, environmental, etc.), for both the buyer and seller of the marketed water and compare to preproject diversions.

- For all wells utilized in the transfer, track monthly ground water pumping, by year and type of use and compare to preproject pumping volumes. This should be done with inline flowmeters.

- Provide a map indicating location of ground water wells and all features of the underlying aquifer to ensure that the ground water is not impacting streamflows.

- Compare postproject ground water pumping costs, including capital and O&M costs to preproject costs.

Crop Shifting or Idling Transfers

- Track monthly diversions by year and type of use and/or crop, before and after project implementation, for both the buyer and seller of the marketed water.

- Compare cropping records by year and crop type, and compare preproject and postproject records for seller of the marketed water.

- Devise a field monitoring procedure to verify that fields remain fallowed.

- Use remote-sensing technology to verify fallowed fields, crop water consumption, and uniformity of crop water consumption on seller(s)' fields.

Other Transfers

- Compare prewater market streamflow measurements with streamflow measurements during the water market period.

- Compare pre- and post-water market effects in terms of the length of the irrigation season. Determine whether or not water marketing helped extend the irrigation season.

- Compare pre- and post-water balances that are associated with the seller(s)' transfer where the differences were used or stored. The water balance should include all water supplies, uses, and losses associated with the water that was transferred.

- Measure the benefits resulting from the application of the transferred water. For example, state how many acres were irrigated that could not otherwise have been irrigated or whether the transfer had environmental benefits, such as providing flows for endangered fish or aquatic species or maintaining wetland areas.

- Compare pre-water market stream water quality measurements with measurements during the water market period. This may include pre/post changes in water temperature during critical months, pathogens, bacteria count, etc.

- Document local economic impacts of transfer.

b. Ground Water Banking (Conjunctive Use)

Some districts are implementing programs regarding ground water banking to control water quantity and quality issues. Program elements may address:

- Active accounting of water supply and monitoring of water quality

- Rules regulating ground water deposits and withdrawals including production limits

- Creation or expansion of recharge and/or recharge capabilities

- Pricing incentives for users to use conjunctive use of water supplies

- Securing reliable surface water supply

Preproject estimations of baseline data:

- Establish a baseline with historical data from existing wells, including pumping volumes (amount, duration, and timing) and depth to ground water elevations

- Document streamflows and spring discharges

Postproject methods for quantifying the benefits of ground water banking projects:

- Compare preproject and postproject recharge and/or pumping volumes

- Compare preproject and postproject changes (amount, duration, and timing) in affected streamflows or changes in spring discharge related to ground water banking

- Compare preproject and postproject depth to ground water elevations

- Determine changes in net ground water use through a water table-specific yield method coupled with a detailed sub-basin hydrologic balance

5. Energy Efficiency

Energy efficiency projects are intended to increase the use of renewable energy and increase overall energy efficiency in the management and delivery of water. Applicants should address the following as part of the performance measures they submit with their applications:

a. Implementation of Renewable Energy Improvements Related to Water Management and Delivery

- Explain the methodology used for quantifying the energy generated from the renewable energy system

- Explain the methodology for calculating the quantity of energy savings resulting from the activity

- Explain anticipated cost savings for the project

- Include an estimate of energy conserved

b. Increasing Energy Efficiency in Water Management

- Explain the methodology for calculating the quantity of energy savings resulting from the water management improvements or water conservation improvements

- Explain anticipated cost savings

6. Endangered Species Concerns
Improved water management and delivery should benefit endangered and/or candidate species. Applicants should address:

- The methodology used for determining the recovery rate of the threatened and/or candidate species

- How their projects will address designated critical habitats, including acres covered, species present, and how the water savings are expected to benefit the habitat

B. Environmental Compliance Requirements

Before approving expenditures for the implementation of a WaterSMART Grant project, Reclamation is required to comply with applicable environmental laws. Such compliance requires the participation and cooperation of both Reclamation and WaterSMART Grant recipients. This information is intended to inform applicants about the environmental compliance process associated with WaterSMART Grant projects and to summarize the requirements of certain Federal environmental laws.

Reclamation addresses environmental compliance issues for WaterSMART Grant applications as 1) an initial review and 2) a more detailed view of projects initially recommended for award. First, as part of the initial recommendation process, Reclamation evaluates the appropriateness of the amount budgeted for environmental compliance. Reclamation also examines the proposal to determine whether any significant environmental issues are involved in the project. Second, once a proposal has been initially recommended for funding, Reclamation undertakes a more detailed examination of environmental issues associated with the proposed project to comply with applicable law.

1. Review within the Application Evaluation Process
In the evaluation and selection process, Reclamation performs an initial review of the WaterSMART Grant applications for potential environmental issues. At this stage, Reclamation's review is focused on whether:

- The applicant has budgeted appropriately for environmental compliance
- Any significant environmental issues (i.e., issues that would make the project infeasible) are apparent.

Applicants for WaterSMART Grant funding must include a line item in their budget estimating the cost of environmental compliance for their project. The amount budgeted should be based on the actual expected environmental compliance costs, but should be equal to *at least* 2 percent of the total project costs. If less than 2 percent is budgeted, you must provide justification. Applications will be scored based on whether the amount budgeted appears reasonable.

Environmental compliance costs that are included in the your budget proposal are considered project costs and may be cost shared by the recipient and Reclamation. Any actual costs above the amount you budgeted for must generally be paid for solely by you. If too much is budgeted for environmental compliance, any remaining funding may generally be reallocated to cover other project costs.

Environmental compliance costs have varied greatly for past projects. A minimal number of projects have incurred environmental compliance costs in excess of the 2-percent budgeted amount. In each of those cases, the overage has been the result of issues involving historic properties, the presence of endangered species, or other compliance concerns requiring a more lengthy assessment of specific issues.

In addition to budgeting for environmental costs, the FOA requests that applicants for WaterSMART Grant project funding answer a series of questions about the potential environmental impacts of their proposed project. In general, applications will not be scored lower in this first step of the environmental review based on the significance of the environmental issues involved. Rather, the information about environmental impacts is used by Reclamation primarily to determine if the you have budgeted appropriately. However, in some extreme cases, a proposal may be eliminated from further consideration at this stage if the magnitude of the environmental issues would make the project infeasible.

2. Review of Initially Recommended Projects

If a proposal is initially recommended for funding, a detailed analysis will be performed to determine the actual environmental impacts of the project, to agree on any mitigation measures needed, and to document environmental compliance. The recipient will then work with Reclamation to provide the information necessary for Reclamation to complete the environmental compliance work.

To the extent possible, environmental compliance will be completed before a cooperative agreement is signed by the parties. In all other cases, **the award will be made contingent on completion of environmental compliance**, and the assistance agreement will describe how compliance will be carried out and how it will be paid for. WaterSMART Grant funding may not be applied to construction or implementation of the project itself unless and until this second level of environmental analysis is completed to comply with all applicable environmental laws.

3. Overview of Relevant Environmental Laws

Following is a brief overview of NEPA, NHPA, and ESA. While these statutes are not the only environmental laws that may apply to WaterSMART Grant projects, they are the Federal laws that most frequently do apply. Compliance with all applicable environmental laws will be initiated by Reclamation concurrently, immediately following the initial recommendation of a WaterSMART Grant award. The descriptions below are intended to provide you with information about the environmental compliance issues that may apply to your projects and to help you budget appropriately for the associated compliance costs.

a. National Environmental Policy Act

NEPA requires Federal agencies such as Reclamation to evaluate—during the decision-making process—the potential environmental effects of a proposed action and any reasonable mitigation measures. Before Reclamation can make a decision to fund a WaterSMART Grant project, Reclamation must comply with NEPA. Compliance with NEPA can be accomplished in several ways, depending upon the degree and significance of environmental impacts associated with the proposal:

- Some projects may fit within a recognized **Categorical Exclusion (CE)** to NEPA (i.e., one of the established categories of activities that generally do not have significant impacts on the environment). If a project fits within a CE, no further NEPA compliance measures are necessary. Use of a CE can involve simple identification of an applicable **Departmental CE** or documentation of a **Reclamation CE** using a **Categorical Exclusion Checklist (CEC)**. If a CE is being considered, Reclamation will have to determine the applicability of the CE and whether extraordinary circumstances (i.e., reasons that the CE cannot be applied) exist. That process takes anywhere from 1 day to about 30 days, depending upon the specific situation.

- If the project does not fit within a CE, compliance with NEPA might require preparation of an **Environmental Assessment/Finding of No Significant Impact (EA/FONSI).** Generally, where no CE applies but there are not believed to be any significant impacts associated with the proposed action, an EA will be required. The EA is used to determine whether any potentially significant effects exist (which would trigger the further step of an Environmental Impact Statement, below). If no potentially significant effects are identified, the EA process ends with the preparation of a FONSI. The EA/FONSI process is more detailed than the

CE/CEC process and can take weeks or even months to complete. Consultation with other agencies and public notification are part of the EA process.

- The most detailed form of NEPA compliance, where a proposed project has potentially significant environmental effects, is completion of an **Environmental Impact Statement (EIS)** and **Record of Decision.** An EIS requires months or years to complete, and the process includes considerable public involvement, including mandatory public reviews of draft documents. It is not anticipated that projects proposed under this program will require completion of an EIS.

During the NEPA process, potential impacts of a project are evaluated in context and in terms of intensity (e.g., will the proposed action affect the only native prairie in the county? Will the proposed action reduce water supplied to a wetland by 1 percent? or 95 percent?) The best source of information concerning the potentially significant issues in a project area is the local Reclamation staff, who have experience in evaluating effects in context and by intensity. You are encouraged to contact your regional or area Reclamation office (See <http://www.usbr.gov/main/regions.html>) with questions regarding NEPA compliance issues or you may contact Dean Marrone, WaterSMART Program Coordinator, at 303-445-3577 for further information.

b. National Historic Preservation Act

To comply with Section 106 of the NHPA, Reclamation must consider whether a proposed project has the *potential to cause effects to historic properties*, before it can award a WaterSMART Grant. **"Historic properties"** are cultural resources (historic or prehistoric districts, sites, buildings, structures, or objects) that qualify for inclusion in the National Register of Historic Places. In some cases, **water delivery infrastructure that is over 50 years old** can be considered a "historic property" that is subject to review.

If a proposal is selected for initial award, WaterSMART Grant recipients will work with Reclamation to complete the Section 106 process. Compliance can be accomplished in several ways—depending on how complex the issues are—including:

- If Reclamation determines that the project does *not* have the potential to cause effects to historic properties, then Reclamation will document its findings and the Section 106 process will be concluded. This can take anywhere from a couple of days to one month.

- If Reclamation determines that the proposed project *could* have effects on historic properties, a multi-step process, involving consultation with the State Historic Preservation Officer and other entities, will follow. Depending on the nature of the project and impacts to cultural resources, consultation can be complex and time consuming. The process includes a determination as to whether additional information is necessary; evaluation of the significance of identified cultural resources; assessment of the effect of the project on historic properties; and, if the project would have an adverse effect, evaluation of alternatives or modifications to avoid, minimize, or mitigate the effects. A Memorandum of Agreement is then used to record and implement any necessary measures. At a minimum, completion of the multi-step Section 106 process takes about two months.

Among the types of historic properties that might be affected by WaterSMART Grants are **historic irrigation systems** and **archaeological sites**. An irrigation system or a component of an irrigation system (e.g., a canal or headgate) is more likely to qualify as historic if it is more than 50 years old, if it is the oldest (or an early) system/component in the surrounding area, and if the system/component has not been significantly altered or modernized. In general, WaterSMART Grant projects that involve ground disturbance, or the alteration of existing older structures, are more likely to have the potential to affect cultural resources. However, the level of cultural resources compliance required and the associated cost, depends on a case-by-case review of the circumstances presented by each proposal.

You should contact your State Historic Preservation Office and your local Reclamation office's cultural resources specialist to determine what, if any, cultural resources surveys have been conducted in the project area. See <http://www.usbr.gov/cultural/crmstaff.html> for a list of Reclamation cultural resource specialists. If an applicant has previously received Federal financial assistance, it is possible that a cultural resources survey has already been completed.

c. Endangered Species Act

Pursuant to Section 7 of the ESA, each Federal agency is required to consult with the U.S. Fish and Wildlife Service (USFWS) or the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service to ensure any action it authorizes, funds, or carries out is not likely to *jeopardize the continued existence of any endangered or threatened species* or *destroy or adversely modify any designated critical habitat.*

Before Reclamation can approve funding for the implementation of a WaterSMART Grant project, it is required to comply with Section 7 of the ESA. The steps necessary for ESA compliance vary, depending on the presence of endangered or threatened species and the effects of the project. A rough overview of the possible course of ESA compliance is:

- If Reclamation can determine that there are no endangered or threatened species or designated critical habitat in the project area, the ESA review is complete and no further compliance measures are required. This process can take anywhere from one day to one month.

- If Reclamation determines that endangered or threatened species may be affected by the project, then a **"Biological Assessment"** must be prepared by Reclamation. The Biological Assessment is used to help determine whether a proposed action may affect a listed species or its designated critical habitat. The Biological Assessment may result in a determination that a proposed action *is not likely to adversely affect* any endangered or threatened species. If the USFWS/NOAA Fisheries Service concurs in writing, then no further consultation is required and ESA compliance is complete. Depending on the scope and complexity of the proposed action, preparation of a Biological Assessment can range from days to weeks or even months. The USFWS/NOAA Fisheries Service generally respond to requests for concurrence within 30 days.

- If it is determined that the project *is likely to adversely affect* listed species, further consultation ("**formal consultation**") with USFWS or NOAA Fisheries Service is required to comply with the ESA. The process includes the creation of a **Biological Opinion** by the USFWS/NOAA Fisheries Service, including a determination of whether the project would **"jeopardize"** listed species and, if so, whether any **reasonable and prudent** alternatives to the proposed project are necessary to avoid jeopardy. Nondiscretionary **reasonable and prudent measures** and **terms and conditions** to minimize the impact of incidental take may also be included. Under the timeframes established in the ESA regulations, the Biological Opinion is issued within 135 days from the date that formal consultation was initiated, unless an extension of time is agreed upon.

Obviously, the time, cost, and extent of the work necessary to comply with the ESA depends upon whether endangered or threatened species are present in the project area and, if so, whether the project might have effects on those species significant enough to require formal consultation.

ESA compliance is often conducted parallel to the NEPA compliance process and, as in the case of categorical exclusion checklists, documented simultaneously. The best source of information concerning the compliance with the ESA in a particular project area is the local Reclamation environmental staff, who can be helpful in determining the presence of listed species and possible effects that would require consultation with the USFWS or National Marine Fisheries Service. You are encouraged to contact your regional or area Reclamation office (see <http://www.usbr.gov/main/regions.html>) with questions regarding ESA compliance issues or you may contact Dean Marrone, WaterSMART Program Coordinator, at 303-445-3577 for further information.

C. General Provisions

The General Provisions applicable to this agreement are available at: <http://www.usbr.gov/mso/aamd/doing-business-financial-assistance.html>. The General Provisions are included within the Standard Document Templates shown on that page. Please review the appropriate recipient and project type template document applicable to your application.

Applicants are advised to review 43 CFR 12 for further guidance relating to the administration of an anticipated agreement beyond the point of award.

D. Electronic Application through Grants.gov

NOTE: Some applicants have experienced difficulties when attempting to submit their applications electronically through Grants.gov. If you encounter problems with the Grants.gov application submission process, you must contact the Grants.gov Help Desk to obtain a "Case Number." This will provide evidence of your attempt to submit an application prior to the submission deadline.

1. Applying for Funds Online at Grants.gov

Reclamation is participating in the Grants.gov initiative that provides the grant community with a single website to find and apply for grant funding opportunities. Reclamation encourages applicants to submit their applications for funding electronically through <http://www.grants.gov/applicants/apply_for_grants.jsp>. Applicant resource documents, and a full set of instructions for registering with Grants.gov and completing and submitting applications online are available at: <http://www.grants.gov/applicants/resources.jsp>.

If you need assistance with Grants.gov, the Contact Center is open 24 hours a day, 7 days a week. You may reach the Grants.gov Contact Center by email at <support@grants.gov> or by calling 1-800-518-4726.

The following checklist is provided to give you a summary of the steps that are required to register with Grants.gov. **This Registration process must be completed prior to submitting an electronic application through Grants.gov.**

Additionally, see Step 2 below for completing the annual Central Contractor Registration (CCR) renewal process.

2. Registering to Use Grants.gov (1-3 week process)

Note: (The following checklist information is available electronically at *<http://www.grants.gov/assets/Organization_Steps_Complete_Registration.pdf>*.)The registration is a **one-time** process, which is **required** before representatives of an organization can submit grant application packages electronically through Grants.gov. **The registration process can take three to five business days or one to three weeks**—depending on your organization and if all steps are met in a timely manner. The checklist in Table 2 provides registration guidance for a company, academic or research institution, State, local or tribal government, not-for-profit, or other type of organization.

Note: If you are an individual applying for a grant on your own behalf and not on behalf of a company, academic or research institution, state, local or tribal government, not-for-profit, or other type of organization, refer to the ***Individual Registration:*** *<http://www.grants.gov/applicants/individual_registration.jsp>. If you apply as an individual to a grant application package designated for organizations, your application will be rejected.*

Table 2. Checklist for Registering Your Organization in Grants.gov

√	Step	Actions to take	Purpose	Time required
	1: Obtain Data Universal Number System (DUNS) Number	**Has my organization identified its DUNS number?** Ask the grant administrator, chief financial officer, or authorizing official of your organization to identify your DUNS number. If your organization does not know its DUNS number or needs to register for one, visit Dun & Bradstreet at <http://fedgov.dnb.com/webform/displayHomePage.do>	The Federal government has adopted the use of DUNS numbers to track how Federal grant money is allocated. DUNS numbers identify your organization.	Same Day. You will receive DUNS number information online.
	2: Register With Central Contractor Registration	**Has my organization registered with the CCR?** Ask the grant administrator, chief financial officer, or authorizing official of your organization if your organization has registered with the CCR. If your organization is not registered, you can apply online by going to <http://www.ccr.gov>. CCR has developed a handbook <https://www.bpn.gov/ccr/doc/UserAccount.pdf> to help you with the process. If AFTER having registered in CCR, you experience any registration problems, you can get help by going to the Federal Service Desk <https://www.fsd.gov>. When your organization registers with CCR, you must designate an E-Business Point of Contact (E-Biz POC). This person will identify a special password called an "M-PIN."	Registering with the CCR is required for organizations to use Grants.gov.	If your organization already has an Employer Identification Number (EIN) or Taxpayer Identification Number (TIN), then you should allow one – three business days to complete the entire CCR registration. The EIN and TIN will come from the Internal Revenue Service (IRS) If your organization does not have an EIN or TIN, then you should allow two weeks for obtaining the information from the IRS when requesting the EIN or TIN via phone or Internet. The additional number of days needed is a result of security information that needs to be mailed to the organization.

√	Step	Actions to take	Purpose	Time required
	2: continued	This M-PIN gives the E-Biz POC authority to designate which staff member(s) from your organization are allowed to submit applications electronically through Grants.gov. Staff members from your organization designated to submit applications are called Authorized Organization Representatives (AORs).		

Note: Your organization needs to renew your CCR registration once a year.** ***You will not be able to move on to Step 3 until you have renewed your CCR registration. This renewal may take up to 5 business days.

	3: Username and Password	**Have the AORs who officially submit applications on behalf of your organization completed their profile with Grants.gov to create their username and password?** To create a username and password, AORs must complete their profile on Grants.gov. AORs will need to know the DUNS number of the organization for which they will be submitting applications to complete the process. After your organization registers with the CCR, AORs must wait one business day before they can complete a profile and create their usernames and passwords on Grants.gov.	An AOR username and password serves as an "electronic signature" when submitting a Grants.gov application.	Same Day. After the AOR has completed their profile they will be prompted to create a username and password that will allow the user to login and check their approval status immediately.
	4: AOR Authorization	**Has the E-Business Point of Contact (E-Biz POC) approved AORs to submit applications on behalf of the organization?** When an AOR registers with Grants.gov to submit applications on behalf of an organization, that organization's E-Biz POC will receive an email notification. The email the AOR submitted in the profile will be the email used when sending the automatic notification from Grants.gov to the E-Biz POC with the AOR copied on the correspondence. The E-Biz POC must then login to Grants.gov (using the organization's DUNS number for the username and the "M-PIN" password (obtained in Step 2) and approve the AOR, thereby giving him or her permission to submit applications. When an E-Biz POC approves an AOR, Grants.gov will send the AOR a confirmation email.	Only the E-Biz POC can approve AORs. This allows the organization to authorize specific staff members or consultants/grant writers to submit grants. Only those who have been authorized by the E-Biz POC can submit applications on behalf of the organization.	This depends on how long it takes the E-Biz POC to login and approve the AOR, once the approval is completed the AOR can immediately submit an application.

√	Step	Actions to take	Purpose	Time required
	Step 5: Track AOR Status	**What is your AOR status?** AORs can also login to track their AOR status using their username and password (obtained in Step 3) to check if they have been approved by the E-Biz POC.	To verify that the organization's E-Biz POC has approved the AOR.	Logging in to check your AOR status is instantaneous. The approval process to become an AOR depends on how long it takes the E-Biz POC to login and approve the AOR.

RESOLUTION NO. 5512

A RESOLUTION Amending District Water Utility Policies and Establishing Low-Income and Senior Low-Income Discount Rate Programs for Single-Family Residential Water Customers

WHEREAS, the Board of Commissioners of Public Utility District No. 1 of Snohomish County, Washington (the "District"), from time to time has adopted, reviewed and amended its Water Utility Policies and Charges for its water system to accommodate changing circumstances and District needs, and to improve customer service; and

WHEREAS, the District has full and exclusive authority under RCW 54.16.030 to regulate and control the use, distribution and price of its water utility services, and has the power and obligation under RCW 54.24.080 to establish, maintain, and collect rates or charges for water and other services supplied by the District which shall be fair, nondiscriminatory, and adequate to provide revenues sufficient for payment of its lawful obligations to fund its planned improvements, and to provide quality water service to its existing and new water service customers; and

WHEREAS, Resolution No. 4848-J delegates to the District's General Manager broad authority to establish certain policies and regulations relating to water service, but reserves in the District's Commission the authority to establish the general terms, conditions and policies for water service provided by the District as set forth in Section 2, and the rates, charges, and fees set forth in Appendix B, of the District's Policies and Procedures Manual for Administration of Water Services, as it may be amended from time to time; and

WHEREAS, staff evaluated a variety of options for implementing water rate discounts for low-income and senior low-income single-family residential customers; and

WHEREAS, having considered the information provided and the recommendation of staff, the Commission finds a proposed revision to the District's Water Utility Policies and Procedures Manual as set forth in the attached Exhibit "A" is reasonable and appropriate, and in the best interests of the District and its customers.

NOW, THEREFORE, BE IT RESOLVED by the Board of Commissioners of Public Utility District No. 1 of Snohomish County, that effective October 1, 2010, Section 2 of the District's Policies and Procedures Manual for the Administration of Water Services shall be amended as set forth in Exhibit "A," incorporated herein by this reference.

PASSED AND APPROVED this 21st day of September, 2010.

Tanya Olson
President

David A. Aldrich
Vice-President

Kathleen Vaughn
Secretary

EXHIBIT "A"

2.6.9 Discounts

~~The District does not currently offer discounts for water service.~~

Effective October 1, 2010, reduced rates for the primary residence for single-family water customers are available for "Low-Income Senior Citizens" and for "Other Low-Income Citizens." The qualifications below shall apply unless amended by the Commission. The Water discount programs will be administered by the District's Customer Service Department in accordance with the criteria set forth in the District's Electric Rate Schedule 7, Paragraphs 3 (b) and (c), and the criteria set forth below.

(a) **Low-Income Senior Citizens.** A "low-income senior citizen" is a person who is 62 years of age or older and whose total combined disposable income, including that of his or her spouse or co-tenant, does not exceed $25,988. The terms "combined disposable income," "disposable income," and "co-tenant" have the meanings set forth in RCW 84.36.383(4), (5) and (6), as they may be amended, except that the term "assessment year" as used therein shall mean the calendar year preceding that during which the reduced rate is requested. Low-income senior citizens whose completed application has been approved by the District are eligible for the following percentage reductions on the Monthly Customer Charge and the Commodity Rate charges in Table B-6 of the District's Water Service Charges and Rates – Single Family:

$ **0 - $ 8,663** combined disposable income – 60% reduction
$ **8,664 - $17,325** combined disposable income – 40% reduction
$ **17,326 - $25,988** combined disposable income – 20% reduction

(b) **Other Low-Income Citizens.** An "other low-income citizen" means a person whose household income does not exceed one hundred twenty five percent (125%) of the federally established poverty level. Other low-income citizens whose completed applications have been approved by the District are eligible for the following percentage reductions on the Monthly Customer Charge and the Commodity Rate charges in Table B-6 of the District's Water Service Charges and Rates – Single Family.

- **Household income between 0% - 75% of federally established poverty level – 60% reduction**
- **Household income between 76% - 100% of federally established poverty level – 40% reduction**
- **Household income between 101% - 125% of federally established poverty level – 20% reduction**

(c) **Primary Residence.** "Primary residence" shall mean the dwelling the person stays in to live and work the majority of the time during the year. A person can have only one "primary residence" at any given time. Guidelines for determining primary residence include, but are not limited to:

- Place of employment
- Mailing address for bills and correspondence
- Address on driver's license and car registration
- Address on federal and state tax returns
- Address on voter registration card

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PASSED AND APPROVED this 21st day of September, 2010.

President

Vice-President

Secretary

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- Place of employment
- Mailing address for bills and correspondence
- Address on driver's license and car registration
- Address on federal and state tax returns
- Address on voter registration card

RESOLUTION NO. 5533

A RESOLUTION Approving Amendment No. 5 to the Collective Bargaining Agreement Between the District and International Brotherhood of Electrical Workers, Local No. 77, for the Period April 1, 2009, through March 31, 2012

WHEREAS, Public Utility District No. 1 of Snohomish County (the "District") staff have proposed a new classification of Water Helper, and discussions between the District and International Brotherhood of Electrical Workers, Local No. 77 (the "IBEW") resulted on March 24, 2011, in a proposed rate of pay for this new classification, as set forth in a tentative agreement, proposed to be approved as Amendment No. 5 to the Collective Bargaining Agreement (the "Agreement") between the District and the IBEW for the period April 1, 2009, through March 31, 2012, in the form set forth in Exhibit A hereto; and

WHEREAS, the Board of Commissioners has considered the recommendations of District staff and believes that, based on the information and evaluation provided by District staff, proposed Amendment No. 5 is in the best interests of the District.

NOW, THEREFORE BE IT RESOLVED that the Board of Commissioners of Public Utility District No. 1 of Snohomish County (the "District") hereby approves the tentative agreement regarding the classification of Water Helper, as Amendment No. 5 to the Collective Bargaining Agreement between the District and International Brotherhood of Electrical Workers, Local 77 (the "IBEW") for the period April 1, 2009, through March 31, 2012, in the form set forth in Exhibit A hereto, and authorizes the execution and delivery of such Amendment No. 5, in the name and on behalf of the District, by the General Manager of the District.

PASSED AND APPROVED this 5th day of April, 2011.

President

Vice – President

Secretary

SNOHOMISH COUNTY PUD PUBLIC UTILITY DISTRICT NO. 1

Your Northwest renewables utility invites you to be a Conservation Sensation.

March 23, 2011

Sent by US Mail
and
Email and/or Scanned Document

Mr. John Cunningham, Asst. Business Manager
IBEW Union Local No.77
P0 Box 12129 - Broadway Station
Seattle, WA 98102

Re: New Job Classification –Water Helper

Dear John:

This is to memorialize the agreement reached at our meeting on Tuesday, March 15, 2011 pursuant to article 2.2.3 of the CBA that the District has concluded a new classification called Water Helper is needed in the Water Department. The classification will be used as an entry-level position to assist the Water Worker and Water Distribution Specialist classifications when the District determines such need.

The District and the Union have agreed to the following step progression for this classification (based on the 1/1/11 wage rates):

Step	Hourly Rate
1st 6 months	$15.87
Thereafter	$17.96

As this is a newly created classification, the District and the Union agree that for the initial filling of this position the District select and appoints the qualified candidate. In the future, any openings will be bid and filled in accordance with the CBA.

This agreement will become effective upon approval by the Union and the District's Board of Commissioners. Please indicate agreement with the above by signing, dating and returning one of the two copies of this agreement. Thank you for your prompt consideration in this matter.

Sincerely,

Bob Oberstein

Bob Oberstein
Labor Relations Manager

I concur with the above agreement;

24 Mar 11

John Cunningham, Assistant Business Agent, IBEW Date

Attachment

cc: B. Gehrke
B. Wood
K. Moore
J. Little

SNOHOMISH COUNTY PUD PUBLIC UTILITY DISTRICT NO. 1

UNION JOB DESCRIPTION

TITLE: Water Helper

DEFINITION:

Works as a member of a crew directing traffic. When not flagging and performing traffic control assists, Water Crews performing construction, restoration and clean up duties in accordance with safety and construction standards and regulations.

DISTINGUISHING CHARACTERISTICS:

This position is a step progression position with time requirements. This position is not eligible to take upgrades to higher classifications.

FIRST SIX (6) MONTHS:

ESSENTIAL JOB FUNCTIONS:

1. Flags and performs traffic control.
2. Performs restoration and clean-up duties.
3. Assists with vehicle loading, unloading and clean-up.
4. Digs out water service boxes and ditches.
5. Drives District vehicles that do not require a CDL and transports loads as required.
6. Assists on water; construction, operation, and maintenance crews as needed.

Knowledge gained:

- CPR and First Aid.
- Defensive Driving training.
- Orientation on tools and equipment of the trade (i.e., jack hammers, chain saws, concrete cutters, compactors, etc.).
- Fueling procedures.
- District Accident Prevention Manual.
- General occupational health standards.

THEREAFTER:

ESSENTIAL JOB FUNCTIONS:

1. All duties outlined for first six (6) months above.
2. Cuts trees and brush along right-of-way as part of hydrant, meter and valve maintenance programs.
3. Performs hydrant, meter and valve inspections.
4. Familiarity with record keeping related to the hydrant, meter and valve maintenance programs.
5. Loads and unloads material and equipment used in the operation, construction and maintenance of water storage, transmission and distribution systems.

Knowledge gained:

- Associated recordkeeping (worksketches, stock issues and return, etc.).
- District Construction Standards.
- Completion of District's Customer Relations course.
- Hazardous Material Spill handling.
- Basic water works practices.

MINIMUM QUALIFICATIONS:

Ability to:

- Use tools and equipment of the trade.
- Adapt to driving and operating all District vehicles that do not require a CDL.
- Interact with customers, government officials, and District employees as necessary to complete assignments.

Education/Experience:

- High School Diploma or equivalent.

License, Certification or Testing:

- Valid Washington State Driver's License, with a good driving record (immediately).
- Valid current Flagging Card. [1]
- Obtain a valid CPR certificate within 6 months from job start date.
- Obtain a valid First Aid certificate within 6 months from job start date.
- Successful completion of the following testing process (Note: the testing process is sequential and applicants/bidders must pass each of the preceding steps to be eligible to move to the next step in the testing process):
  - (a) Pass District Driving Test
  - (b) Pass Entry Helper strength test
  - (c) Pass a collaborative interview process.
  - (d) Pass a criminal background check and driving record check.
  - (e) Pass pre-placement physical exam (to be done after verbal job offer)

[1] Note: Flagging Card is not required for the testing process, but is required on the first day of employment/job start.

PREFERRED QUALIFICATIONS:

- Exposure to construction environment (ex. -, weather, etc.).
- Knowledge of trenching and shoring practices.
- CPR, First Aid certification.

WORKING CONDITIONS:

Work is performed outdoors, in and around an urban street environment and in traffic, in all weather conditions. Must be able to lift and move heavy material and tools weighing up to 65 lbs. Must be able to participate in confined space and trench rescue. Required to stand for long periods of time. This position is subject to seven days a week and 24-hour call out for emergency situations. Must be able to work long hours as storm conditions dictate.

RESOLUTION NO. 5540

A RESOLUTION Authorizing the General Manager to Execute the First Amendment to the 2003 Agreement Between the City of Marysville and the District for Water Supply

WHEREAS, Public Utility District No. 1 of Snohomish County (the "District") entered into a settlement agreement in 2003 ("2003 Settlement Agreement") with the City of Marysville (the "City") to resolve several disputed issues related to a 1991 Agreement among the District, the City and the Tulalip Tribes for construction of a water pipeline through the Sunnyside area; and

WHEREAS, the 2003 Settlement Agreement provided, among other things, that when the City annexed several identified areas of service "overlap," the District would transfer its facilities and customers in the annexed area to the City, in exchange for a pro-rated share of the District's then existing bonded indebtedness, provided that facilities needed to serve the District's remaining customers would not transfer, and the District would contribute funds toward the relocation of a City flow control valve; and

WHEREAS, the 2003 Settlement Agreement provided that the District would transfer its facilities and customers in annexed areas "in the manner provided by law," which was the subject of differing interpretations between the City and the District, and it left undefined the details of what improvements would be necessary to ensure that the transfer would not adversely affect the level of service for the customers in the annexed area, and for the District's remaining customers; and

WHEREAS, after the City annexed a portion of the areas identified as "overlap" in 2008 and requested that the District transfer its facilities and customers, the City and the District undertook a review of the 2003 Settlement Agreement to resolve the manner in which the transfer could legally take place, and to flesh out how such a transfer could best be implemented to avoid service impacts; and

WHEREAS, City staff and District staff have proposed a First Amendment to the 2003 Settlement Agreement that defines and provides for the improvements necessary to effectuate a transfer of customers and facilities without impacting levels of service or District infrastructure, that provides for payment by the District of accumulated maintenance and operation expenses that are the District's obligations under the 2003 Settlement Agreement, and that redefines the purchase price for the transferred facilities and service area on the basis of fair market value, to be negotiated on the basis of a jointly commissioned study; and

WHEREAS, City staff have now successfully obtained a change in RCW 54.16.180, that will enable the City and District to agree to a transfer of a portion of the District's facilities and service area without a public vote, which will become effective on July 22, 2011; and

WHEREAS, District staff recommend approval of the proposed First Amendment to the 2003 Settlement Agreement as an effective mechanism to carry out the intent of the 2003 Settlement Agreement in a way that better protects the interest of the District and its ratepayers than the original agreement; and

WHEREAS, the Commission has considered the recommendation of staff and finds, based upon the information and evaluation provided by staff, that it is in the best interest of the District to approve the proposed First Amendment to the 2003 Settlement Agreement, effective upon July 22, 2011, which is the date that the legislative change to RCW 54.16.180 set forth in HB 1407, Chapter 285, Laws of 2011, becomes effective.

NOW, THEREFORE, BE IT RESOLVED by the Commission of Public Utility District No. 1 of Snohomish County that the General Manager or his designee is authorized to execute the proposed First Amendment to the 2003 Settlement Agreement between the City of Marysville and the District for Water Supply, in substantially the form set forth in Exhibit A, attached hereto and incorporated by this reference, provided that such First Amendment not become effective until the legislative change to RCW 54.16.180 set forth in HB 1407, Chapter 285, Laws of 2011, becomes effective, which is July 22, 2011.

PASSED AND APPROVED this 7th day of June, 2011.

David A. Aldrich
President

Kathleen Vaughn
Vice-President

Tanya Olson
Secretary

Exhibit A

FIRST AMENDMENT TO 2003 AGREEMENT BETWEEN CITY OF MARYSVILLE AND PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY FOR WATER SUPPLY

THIS FIRST AMENDMENT TO THE 2003 AGREEMENT BETWEEN CITY OF MARYSVILLE AND PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH FOR WATER SUPPLY is entered into by and between THE CITY OF MARYSVILLE ("CITY"), and PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY ("PUD"), and is effective upon execution by both parties.

WHEREAS, in 2003 the City and the PUD entered into an agreement for water supply (the "2003 Agreement"); and

WHEREAS, Section II(A) of the 2003 Agreement provides in part that "At such time as the City extends its corporate boundaries to include areas within that "overlap area" described in Exhibit 1, attached hereto and incorporated by this reference, any applicable service area and any part(s) of the PUD's "Distribution Facilities" used to serve PUD water utility customers within such areas, upon written request of the City, shall to the extent and in the manner provided by law, be conveyed by the PUD to the City"; and

WHEREAS, the City has annexed all portions of the original "overlap area" for which it desires to take ownership of the PUD's Distribution Facilities and service area; and

WHEREAS, the City has made written request for conveyance of the Distribution Facilities within the annexed portion of the "overlap area" and the City and PUD wish to implement the conveyance of the Distribution Facilities and service area intended by the 2003 Agreement; and

WHEREAS the 2003 Agreement did not include any provisions addressing the timing and schedule for transferring ownership and control of PUD Distribution Facilities, nor any detail about the actions the parties would need to take to adjust their water system boundaries to avoid adverse impacts on the PUD system, and to take into account each party's respective water system hydraulics and prudent engineering and water system operating practices; and

WHEREAS, the parties have reevaluated the extent of the original "overlap area" defined in 2003 and the compensation to be paid to the PUD for conveying a portion of its Distribution Facilities and service area, and have evaluated and agreed upon the actions the parties ought to take to provide for an orderly and efficient transfer of ownership to the City; and

WHEREAS, the parties have concluded it is beneficial to request a legislative amendment to RCW 54.16.180 in order to implement the conveyance by the PUD to the City "to the extent and in the manner provided by law" as specified in Section II(A) of the 2003 Agreement, and to amend the 2003 Agreement as set forth herein.

FOR AND IN CONSIDERATION OF THE AGREEMENTS SET FORTH HEREIN, THE 2003 AGREEMENT IS HEREBY AMENDED AS FOLLOWS:

Capitalized terms used in this Amendment not defined herein shall have the same meaning as set forth in the 2003 Agreement unless the context shall clearly indicate that another meaning is intended.

1. **Amendment of "Overlap Area."**. The area described in Section II(A) and Exhibit 1 of the 2003 Agreement referenced as the "overlap area" is hereby amended as depicted in **Exhibit 1(A)** attached hereto and incorporated by this reference and as legally described in **Exhibit 1(B)**, also attached hereto and incorporated by this reference (hereinafter the "Amended Overlap Area"), and Exhibits 1(A) and 1(B) are hereby substituted for Exhibit 1. The Amended Overlap Area to be transferred to the City is generally described as the area north of Soper Hill Road and west of SR-9 and will exclude any area east of SR-9 which shall not be subject to future transfer to the City. The Distribution Facilities and service area to be conveyed pursuant to this Section II(A) are generally depicted in **Exhibit 5(A)** attached hereto and incorporated by this reference, and consist of approximately the following (hereinafter the "Transferred Facilities"):

11,823 Lineal Feet (LF) of AC mains, sizes 4-inch to 8-inch
101,581 LF of DI mains, sizes 4-inch to 12-inch
168 Fire Hydrants
Approximately 1,800 services
Various associated valves and other appurtenances
Easements or partial assignments of easements for such facilities

2. **Construction of Improvements by City**. In order to provide the customers in the Amended Overlap Area with a level of water utility service consistent with the service level presently provided by PUD, prior to closing of the transfer of ownership and operation of the Transferred Facilities to the City, the City shall construct, at its expense, the system improvements referenced below entitled "Phase 1 Water Main Improvements." Said improvements are also depicted in **Exhibit 2(A)** attached hereto and incorporated by this reference. The construction of said improvements shall be completed by December 31, 2013, or such dates as may be mutually agreed to by the parties.

Phase 1 Water Main Improvements
Construct 2013

Location			Proposed Diameter (inches)	Length (LF)
In	Start	End		
Soper Hill Rd	87th Ave	71st Ave	12	6,120
83rd Ave	60th St	~47th St.	16	4,110
49th St	~70th Dr	71st Dr	8	145
Sunnyside Blvd	~32nd St	71st Ave	12	2,974
*99th Ave	~SR 92	42nd St	12	2,200
*42nd St NE	99th Ave	SR9	12	3,000

*[Subject to (3) below]

3. **Construction of New 12-Inch Main by City**. In addition to those improvements referenced in Section (2) above and in **Exhibit 2(A)**, and prior to the closing of the transfer of ownership and operation of the Transferred Facilities to the City, the City will construct and convey by bill of sale substantially in the form attached as **Exhibit 3(A)**, at no cost to the PUD, a new 12-inch main from the end of the PUD's existing 6-inch AC main south of SR-92, north along 99th Avenue, N.E., to 42nd Street, N.E., and then west along 42nd Street, N.E., to the intersection of 42nd Street, N.E., and SR-9 (approximately one mile). For a period of ten years from the date of closing of the transfer and conveyance to the City of the Transferred Facilities, the PUD will pay to the City the applicable portion of each Distribution System Charge collected by PUD for any new connection to this 12-inch main pursuant to Section 3.3.9 of its published Water System Policies and Procedures, as amended from time to time. "Distribution System Charge" means the Distribution System Charge required by the PUD as a condition of approving and installing a new water service connection, as set forth in the most current version of the PUD's published water rate schedules, as amended from time to time. Payment shall be made to the City approximately thirty days of PUD's receipt of the Distribution System Charge from the customer.

4. **Amendment of Purchase Price.**

A. 2003 Agreement. The following language of Section II(A) of the 2003 Agreement is hereby deleted and replaced with the language below, identified for this Amendment as subsections 4(B) and 4(C) below:

> "The purchase price to be paid by the CITY for facilities subject to such conveyance shall be based upon the annexed customer's pro-rated share of the PUD's outstanding water system bonded indebtedness, including any bonded indebtedness relating

to the JOA-1 Pipeline, as determined by the revenues derived by the PUD from the annexed customers compared to the total rate revenues of the PUD water system."

B. The purchase price to be paid by the City for the Transferred Facilities shall be based upon the fair market value of the facilities and service area to be conveyed, to be negotiated and mutually agreed upon as set forth herein,

C. Establishment of final purchase price. The City and PUD have agreed to retain the firm of FCS Group to perform an analysis and determine a fair market value or range of fair market value for the facilities and service area to be conveyed. The contracted-for amount for such analysis shall not exceed a total of $49,530. Each party agrees to share the cost of such analysis equally whether the sale from the PUD to the City closes or not. While this analysis shall serve as a guide regarding the fair market value of the facilities and service area to be transferred to the City, neither party shall be bound thereby unless the fair market value established by FCS Group or a different value for the purchase price is mutually agreed upon. In the event the City and PUD are unable to agree upon the final purchase price for the facilities and service area described in Section II(A) and **Exhibit 5(A)**, the parties agree to the establishment of the final purchase price through the dispute resolution process set forth in Section IX of the 2003 Agreement, or in the alternative, but only by mutual agreement, through final binding arbitration pursuant to Chapter 7.04A, RCW.

5. **Flow Control Valve and Meters.** Prior to the closing referenced in Section 8 below, the City will move the flow control valve on the JOA Pipeline referenced in Section V(B) of the 2003 Agreement to a point mutually agreed upon north of Soper Hill Road. PUD agrees to pay Marysville $10,000 toward the cost of moving said flow control valve. There are presently two meters at the Hewitt location. The master meter used for the City of Everett billing information will remain in its present location. The mag-meter owned by the City of Marysville at the same location will be removed at the City's expense.

6. **Operation and Maintenance Charge**. Section VI of the 2003 Agreement requires PUD to compensate the City for its operation and maintenance costs of the JOA-1 Pipeline. Prior to the closing referenced in Section 8 below, PUD agrees to pay Marysville past due operation and maintenance charges for the time period of 2003 to 2010 in the amount of $115,626.54. Said amount shall be exclusive of any other operation and maintenance charges due and owing by PUD under the 2003 Agreement for the period of January 1, 2011 to the date of closing.

7. **Pending Legislation**. Except as provided in Section 4(C) above with respect to the third party fair market value analysis, this First Amendment to the 2003 Agreement shall be subject to and conditioned upon an amendment to RCW 54.16.180, in substantially the form attached hereto as **Exhibit 4(A)**, becoming law. Provided, however, in the event such an

amendment to RCW 54.16.180 does not become law and this Agreement does not become effective, neither party hereto waives any rights or remedies it may have under the 2003 Agreement or in law or equity.

8. **Closing**. The conveyance by PUD to the City of the Transferred Facilities shall be closed by the firm of Weed, Graafstra and Benson, Inc., P.S. upon the satisfaction of each of the events referenced in Sections 1, 2, 3, 4(C), 5, 6 and 7 and **Exhibit 2(A)** of this Agreement. The parties anticipate closing on or before December 31. 2013, but may upon mutual agreement extend the closing date. The costs associated with closing shall be divided equally.

9. **2003 Agreement**. Except as provided herein, all provisions of the 2003 Agreement shall remain in full force and effect, unchanged. In the event of any inconsistency between this First Amendment and the 2003 Agreement, this Amendment shall control.

10. **Entirety**. Except as provided in the JOA between the parties, and the 2003 Agreement as specifically modified herein, all prior negotiations and agreements between the parties hereto relating to the subject matter hereof are merged into and superseded by this First Amendment to the 2003 Agreement, and shall constitute the entire final and exclusive agreement between the PUD and the CITY.

11. **Equal Bargaining.** This agreement has been drafted by the mutual efforts of the parties. City and PUD acknowledge and represent that each of them is fully competent to negotiate and to enter into this agreement with the other and that they have freely entered into it with adequate opportunity for prior consultation with legal counsel of their choosing. All terms and provisions shall be given their fair and reasonable interpretation without reference to which party, or its counsel, drafted any particular term or provision in question.

This Agreement shall be executed in two duplicate counterparts, each of which shall be deemed an original, but both of which together shall constitute one and the same instrument.

DATED this ____ day of __________________, 2011.

PUBLIC UTILITY DISTRICT NO. 1
OF SNOHOMISH COUNTY

By:________________________________ ______________
________________________________ Date

W/M-09-140/1st amend 2003 PUD water supply ag.F. 5.13.11

APPROVED AS TO FORM:

By:____________________________________
Anne Spangler, General Counsel for PUD

CITY OF MARYSVILLE

By:________________________________ ______________
Jon Nehring, Mayor Date

Attest:______________________________
April O'Brien, Deputy City Clerk

APPROVED AS TO FORM:

By:________________________________
Grant K. Weed, City Attorney

CITY OF Marysville WASHINGTON

CITY OF MARYSVILLE

PUD Distribution Facilities and Utility Customers Purchase

Exhibit 1(A) Overlap Area

PUD Water

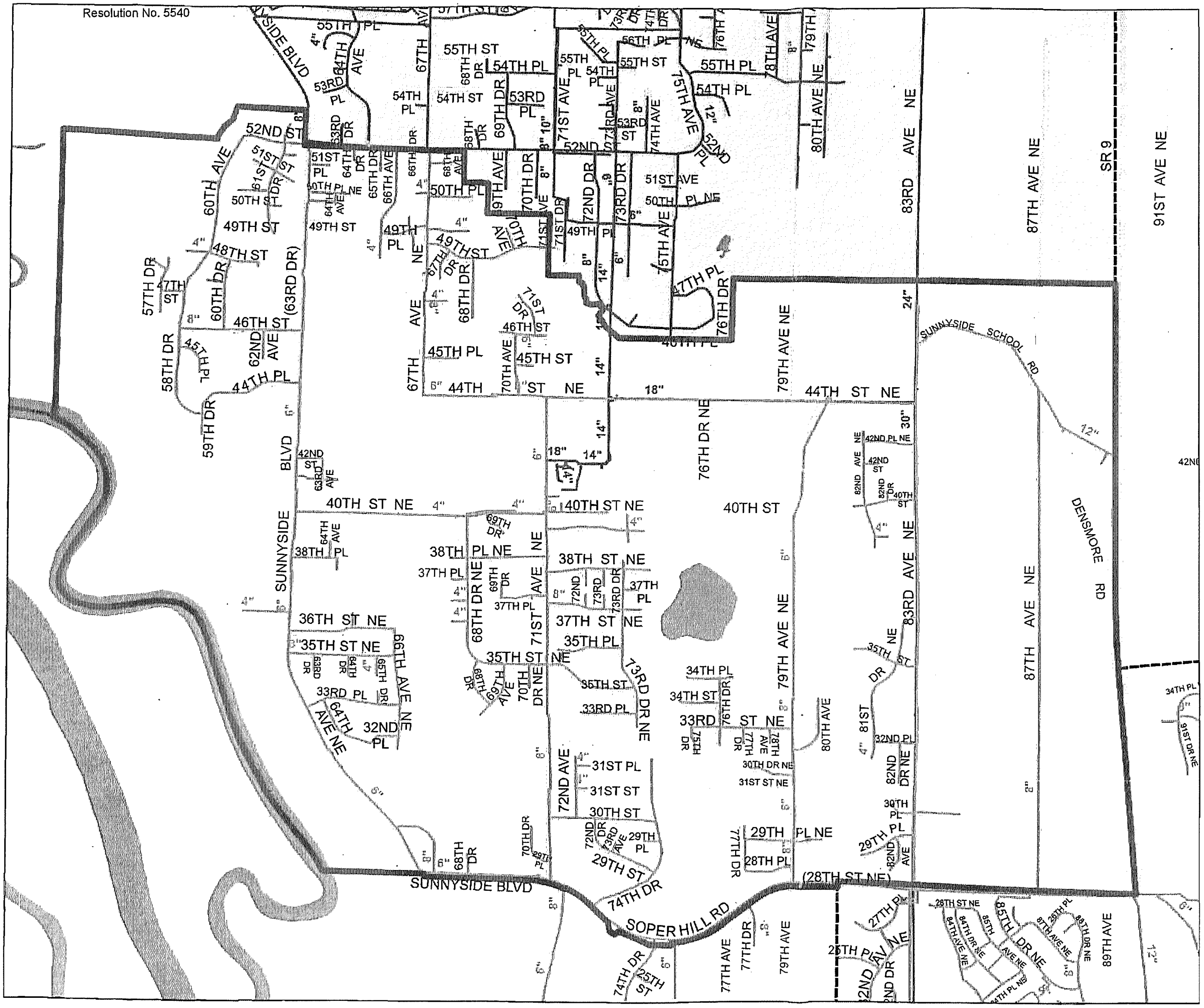
Marysville Water

City Limits

Marysville Water Service Area

Marysville/PUD Overlap Area

Feet 0 500 1,000 2,000



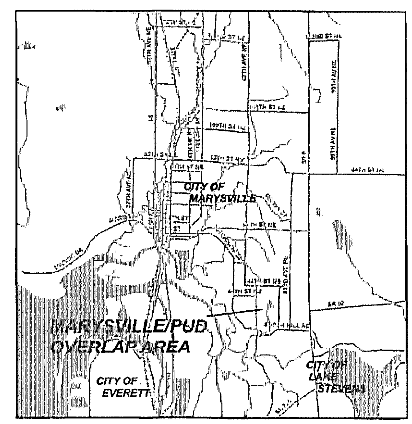


EXHIBIT 1B

Legal Description
(January, 2011)
page 1 of 2

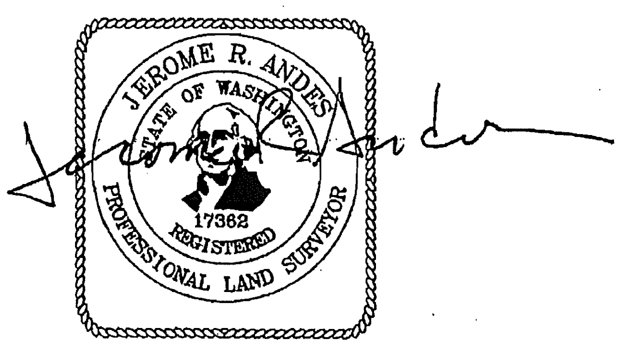
That portion of Section 1, all of Section 2, that portion of Section 3 and that portion of Section 11, Township 29 North, Range 5 East, WM;
TOGETHER WITH those portions of Sections 34, 35 and 36, Township 30 North, Range 5 East, WM; described as follows:

Commencing at the southeast corner of Section 3, Township 29 North, Range 5 East, WM; thence westerly, along the south line of said Section 3, to the centerline of Ebey Slough, being the true point of beginning; thence easterly, along said south line to the southwesterly right-of-way line of Sunnyside Boulevard; thence easterly, along the south right-of-way line of said Sunnyside Boulevard and along the south right-of-way line of Soper Hill Road, to the west line of SOPERWOOD, recorded under Auditor's File Number 9402025003, records of Snohomish County, Washington; thence northerly, along the northerly projection of the west line of said SOPERWOOD, to the north right-of-way line of said Soper Hill Road; thence easterly, along said north right-of-way line, to the west right-of-way line of State Highway 9; thence northerly, along said west right-of-way line, to the north line of Tract 149, SUNNYSIDE FIVE ACRE TRACTS, recorded under Auditor's File Number 122901, records of Snohomish County, Washington; thence westerly, along the north line of said Tract 149 and along the north line of Tract 150, to the northwest corner of said Tract 150; thence westerly to the northeast corner of Tract 151 of said Plat; thence westerly, along the north line of said Tract 151 and along the north line of Tract 152 of said Plat, to the northwest corner of said Tract 152; thence westerly to the northeast corner of Tract 153 of said Plat; thence westerly, along the north line of said Tract 153 and along the north line of Tract 154 of said Plat, to the northwest corner of said Tract 154; thence westerly to the northeast corner of Tract 155 of said Plat; thence westerly, along the north line of said Tract 155, to the northwest corner of said Tract 155, also being the northeast corner of SUNNYSIDE WEST, recorded under Auditor's File Number 9711075002, records of Snohomish County, Washington; thence southerly, along the east line of said Plat, to the southeast corner of said Plat; thence westerly, along the south line of said Plat, to the southwest corner of Lot 1 of said Plat; thence westerly to the southeast corner of Lot 26, JEFFERSON HILL, recorded under Auditor's File Number 200008115001, records of Snohomish County, Washington; thence westerly, along the south line of said Plat, to the most southeasterly corner of Tract 999 of said Plat;

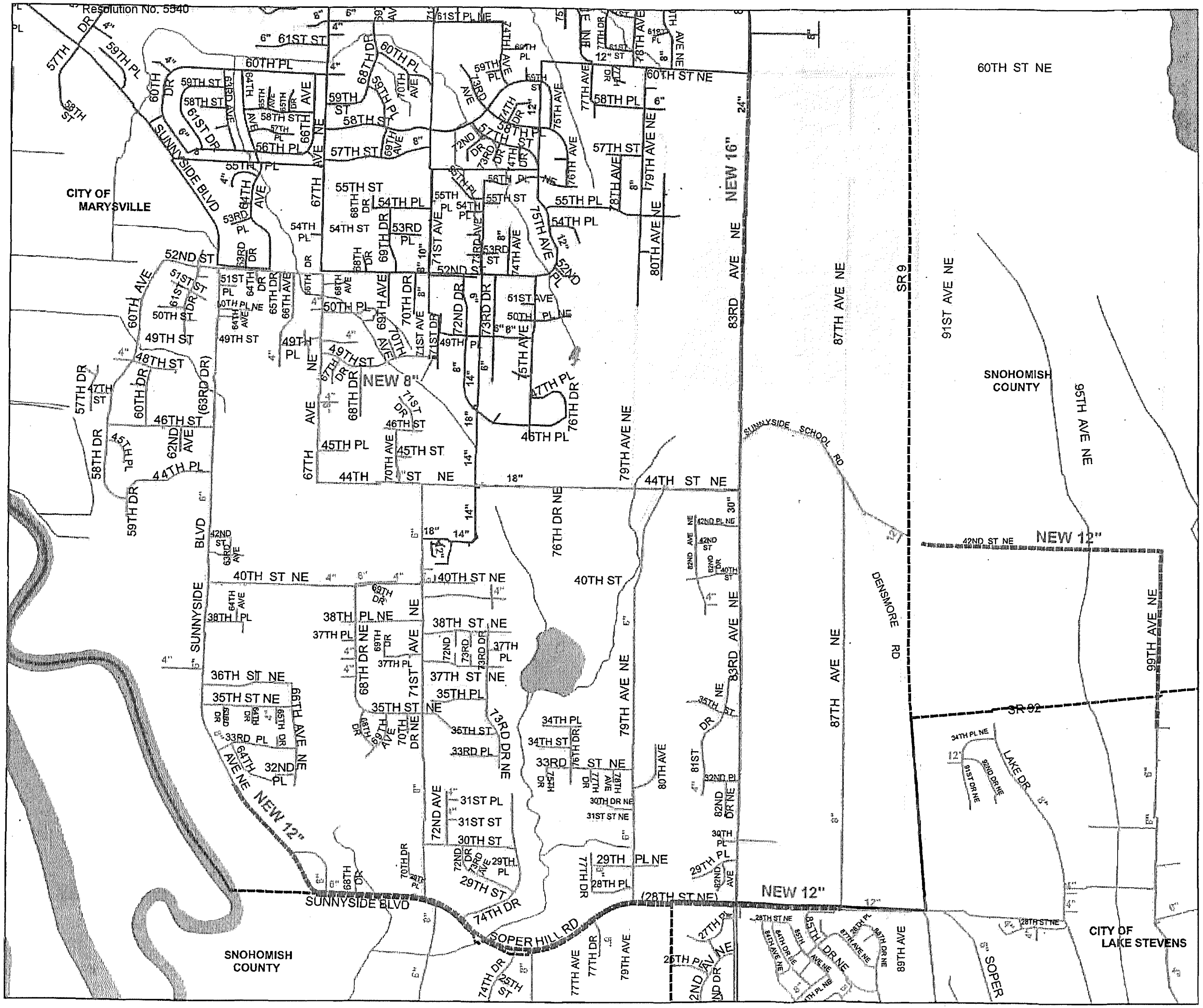
EXHIBIT 1B

page 2 of 2

thence northwesterly, along the northeasterly line of said Tract 999, to the north line of said Tract 999; thence westerly, along said north line to the northwest corner of said Tract 999, also being the southeast corner of EASTWOOD HILLS, recorded under Auditor's File Number 9209225003, records of Snohomish County, Washington; thence northerly, along the east line of said Plat, to the northeast corner of said Plat; thence westerly, along the north line of said Plat, to the northwest corner of said Plat, also being the southeast corner of EASTWOOD HILLS 4, recorded under Auditor's File Number 9412285001, records of Snohomish County, Washington; thence northerly, along the east line of said Plat to the northeast corner of said Plat; thence westerly, along the north line of said Plat, to the east line of HERITAGE PLACE SHORT PLAT Number PA 9809054, recorded under Auditor's File Number 200102065004, records of Snohomish County, Washington; thence northerly, along the east line of said Short Plat, to the southerly right-of-way line of 52ND Street N.E.; thence westerly, along said southerly right-of-way line, to the westerly right-of-way line of Sunnyside Boulevard, according to HARBOR VIEW VILLAGE, recorded under Auditor's File Number 200102065008, records of Snohomish County, Washington; thence northerly, along said westerly right-of-way line, to the northeast corner of said Plat; thence westerly, along the north line of said Plat, to the northwest corner of Tract 994 of said Plat; thence southwesterly, along the northwesterly line of said Tract 994, to the north line of the Southeast Quarter of Section 34, Township 30 North, Range 5 East, W.M.; thence westerly, along said north line and along the north line of the Southwest Quarter of said Section 34, to the northwest corner of the East Half of the Southwest Quarter of said Section 34; thence southerly, along the west line of said East half and along the west line of Government Lot 3, Section 3, Township 29 North, Range 5 East, W.M., to the centerline of Ebey Slough; thence southeasterly, along the centerline of Ebey Slough, to true point of beginning.



1/28/2011



CITY OF Marysville WASHINGTON

CITY OF MARYSVILLE

PUD Distribution Facilities and Utility Customers Purchase

Exhibit 2(A) Future Improvements

- Future Improvements
- PUD Water
- Marysville Water
- City Limits
- Marysville Water Service Area
- Marysville/PUD Overlap Area

0 500 1,000 2,000 3,000 Feet

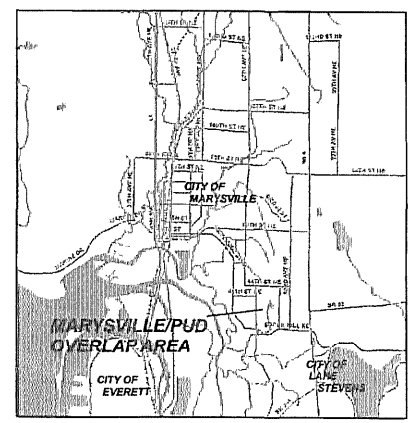


EXHIBIT 3(A)

Form of Bill of Sale

CITY OF MARYSVILLE
1049 STATE AVENUE
MARYSVILLE, WA 98270

Please print or type information

Document Title(s) (or transactions contained therein): BILL OF SALE
Grantor(s) (Last name first, then first name and initials) Additional names on page ___ of document.
Grantee(s) (Last name first, then first name and initials) Additional names on page ___ of document.
Legal description (abbreviated: i.e., lot, block, plat or section, township, range, qtr./qtr.) Additional legal is on page ____ of document.
Reference Number(s) of Documents assigned or released: Additional numbers on page ___ of document.
Assessor's Property Tax Parcel/Account Number Property Tax Parcel ID is not yet assigned Additional parcel numbers on page ___ of document.
The Auditor/Recorder will rely on the information provided on the form. The staff will not read the document to verify the accuracy or completeness of the indexing information provided herein.

EXHIBIT 3A

BILL OF SALE – WATER

THE UNDERSIGNED hereby conveys and transfers to City of Marysville, a municipal corporation, (the "City") the following described personal property:

See Attachment "A"

This conveyance is made in consideration of the First Amendment to 2003 Agreement Between City of Marysville and Public Utility District No. 1 of Snohomish County for Water Supply dated ______________, 2011, which is incorporated by this reference.

The undersigned and its successors and assigns covenants and agrees to and with the City, its successors and assigns, that the undersigned is the owner of said property and has good right and authority to sell and transfer the same and that it will, and does, hereby warrant and agree to defend the sale and transfer of said property to the City, its successors and assigns, against all and every person or persons whomsoever lawfully claiming or to claim the same.

~~The undersigned further guarantees that the property is fit for purposes intended, i.e., as fur use as a water distribution system including distribution and supply lines adequate for the service intended.~~ ALS No warranty

DATED this ____ day of ________________, 2011.

PUBLIC UTILITY DISTRICT NO. 1 OF
SNOHOMISH COUNTY

By______________________________________

____

STATE OF WASHINGTON)
) ss.
COUNTY OF SNOHOMISH)

I certify that I know or have satisfactory evidence that ______________________ is the person who appeared before me, and said person acknowledged that ____________ signed this instrument, on oath stated that ________ was authorized to execute the instrument and acknowledged it as the ___________________________ of Public Utility District No. 1 of Snohomish County to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

DATED this _____ day of ________________, 2011.

____

____
(Legibly print name of notary)
NOTARY PUBLIC in and for the State of
Washington, residing at ______________
My commission expires ______________

ATTACHMENT A

Facilities and Assets to be Transferred

11.823 LF of AC mains sizes 4" to 8"
101.581 LF of D1 mains sizes 4" to 12"
168 fire hydrants
Approximately 1,800 services
Various associated valves and other appurtenances

Exhibit 4(A)

CERTIFICATION OF ENROLLMENT

HOUSE BILL 1407

62nd Legislature
2011 Regular Session

Passed by the House April 14, 2011
Yeas 90 Nays 7

Speaker of the House of Representatives

Passed by the Senate April 4, 2011
Yeas 44 Nays 2

President of the Senate

Approved

Governor of the State of Washington

CERTIFICATE

I, Barbara Baker, Chief Clerk of the House of Representatives of the State of Washington, do hereby certify that the attached is **HOUSE BILL 1407** as passed by the House of Representatives and the Senate on the dates hereon set forth.

Chief Clerk

FILED

Secretary of State
State of Washington

HOUSE BILL 1407

AS AMENDED BY THE SENATE

Passed Legislature - 2011 Regular Session

State of Washington **62nd Legislature** **2011 Regular Session**

By Representatives Ryu, Hope, Dunshee, Angel, and Kagi

Read first time 01/20/11. Referred to Committee on Local Government.

AN ACT Relating to the negotiated sale and conveyance of all or part of water systems owned by a municipal corporation; and amending RCW 54.16.180.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF WASHINGTON:

Sec. 1. RCW 54.16.180 and 2008 c 198 s 5 are each amended to read as follows:

(1) A district may sell and convey, lease, or otherwise dispose of all or any part of its works, plants, systems, utilities and properties, after proceedings and approval by the voters of the district, as provided for the lease or disposition of like properties and facilities owned by cities and towns. The affirmative vote of three-fifths of the voters voting at an election on the question of approval of a proposed sale((~~,~~)) shall be necessary to authorize such a sale.

(2) A district may, without the approval of the voters, sell, convey, lease, or otherwise dispose of all or any part of the property owned by it that is located:

(a) Outside its boundaries, to another public utility district, city, town or other municipal corporation; or

(b) Within or without its boundaries, which has become unserviceable, inadequate, obsolete, worn out or unfit to be used in the operations of the system and which is no longer necessary, material to, and useful in such operations, to any person or public body.

(3) A district may sell, convey, lease or otherwise dispose of items of equipment or materials to any other district, to any cooperative, mutual, consumer-owned or investor-owned utility, to any federal, state, or local government agency, to any contractor employed by the district or any other district, utility, or agency, or any customer of the district or of any other district or utility, from the district's stores without voter approval or resolution of the district's board, if such items of equipment or materials cannot practicably be obtained on a timely basis from any other source, and the amount received by the district in consideration for any such sale, conveyance, lease, or other disposal of such items of equipment or materials is not less than the district's cost to purchase such items or the reasonable market value of equipment or materials.

(4) A district located within a county with a population of from one hundred twenty-five thousand to less than two hundred ten thousand may sell and convey to a city of the first class, which owns its own water system, all or any part of a water system owned by the district where a portion of it is located within the boundaries of the city, without approval of the voters, upon such terms and conditions as the district shall determine.

(5) A district located in a county with a population of from twelve thousand to less than eighteen thousand and bordered by the Columbia river may, separately or in connection with the operation of a water system, or as part of a plan for acquiring or constructing and operating a water system, or in connection with the creation of another or subsidiary local utility district, provide for the acquisition or construction, additions or improvements to, or extensions of, and operation of, a sewage system within the same service area as in the judgment of the district commission is necessary or advisable to eliminate or avoid any existing or potential danger to public health due to lack of sewerage facilities or inadequacy of existing facilities.

(6) A district located within a county with a population of from one hundred twenty-five thousand to less than two hundred ten thousand

bordering on Puget Sound may sell and convey to any city or town with a population of less than ten thousand all or any part of a water system owned by the district without approval of the voters upon such terms and conditions as the district shall determine.

(7) A district located within a county with a population of from six hundred fifty thousand to less than seven hundred fifty thousand bordering on Puget Sound may sell and convey to any city or town with a population of less than sixty-five thousand which owns its own water system all or any part of a water system owned by the district without approval of the voters upon such terms and conditions as the district shall determine.

(8) A district may sell and convey, lease, or otherwise dispose of, to any person or entity without approval of the voters and upon such terms and conditions as it determines, all or any part of an electric generating project owned directly or indirectly by the district, regardless of whether the project is completed, operable, or operating, as long as:

(a) The project is or would be powered by an eligible renewable resource as defined in RCW 19.285.030; and

(b) The district, or the separate legal entity in which the district has an interest in the case of indirect ownership, has:

(i) The right to lease the project or to purchase all or any part of the energy from the project during the period in which it does not have a direct or indirect ownership interest in the project; and

(ii) An option to repurchase the project or part thereof sold, conveyed, leased, or otherwise disposed of at or below fair market value upon termination of the lease of the project or termination of the right to purchase energy from the project.

((~~(8)~~)) (9) Districts are municipal corporations for the purposes of this section. A commission shall be held to be the legislative body, a president and secretary shall have the same powers and perform the same duties as a mayor and city clerk, and the district resolutions shall be held to be ordinances within the meaning of statutes governing the sale, lease, or other disposal of public utilities owned by cities and towns.

--- **END** ---

EXHIBIT 5(A)

Facilities and Assets to be Transferred

11.823 LF of AC mains sizes 4" to 8"
101.581 LF of DI mains sizes 4" to 12"
168 fire hydrants
Approximately 1,800 services
Various associated valves and other appurtenances

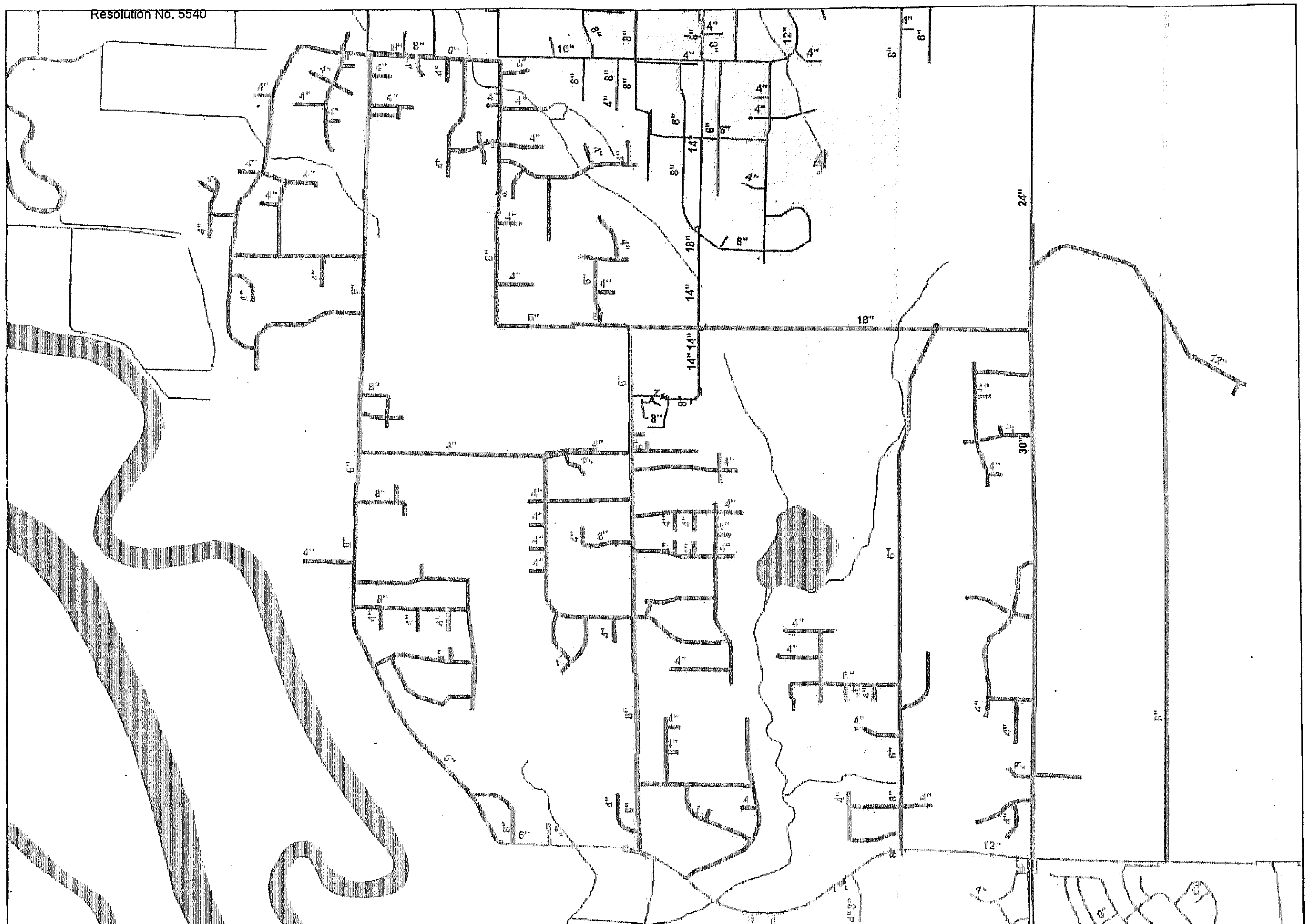
CITY OF Marysville WASHINGTON

CITY OF MARYSVILLE

PUD Distribution Facilities and Utility Customers Purchase

Facilities

EXHIBIT 5A



FEET OF PURCHASE MAINS:																									
	MATERIAL																								
	IN SERVICE YEAR																								
	AC				AC Total	DI																		DI Total	Grand Total
SIZE	1955	1956	1970	1993		1955	1956	1984	1988	1989	1992	1994	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008			
4	1369	1422			2791		1596		434		1564	1145	210	2037	310	2083	1144	1347		1956	407	718		14950	17740
6	3274	2664	2594		8533	24	674					1133						15	32	19	25	53		1975	10508
8				500	500	319	16308	1670		3984	2913	1199	255	7917	4191	8123	4080	8351	4730	9565	4436	5359		83401	83901
12								1233											22					1255	1255
Total	4643	4086	2594	500	11823	343	18579	2904	434	3984	4477	3477	464	9954	4502	10206	5223	9714	4784	11540	4867	6129		101581	113404

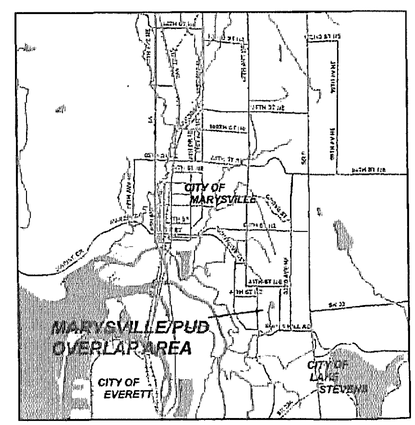
PUD Water

Marysville Water

Marysville Water Service Area

Marysville/PUD Overlap Area

Feet: 0 500 1,000 2,000



RESOLUTION NO. 5544

A RESOLUTION Adopting the District's 2011 Water System Plan and Re-Establishing Water Use Efficiency Goals

WHEREAS, Washington State Department of Health regulations require that Water System plans be reviewed and updated every six years; and

WHEREAS, the Water Use Efficiency Rule requires that municipal water suppliers establish at least one goal to use water efficiently and re-establish water use efficiency goals through a public process every six years and anytime a Water System Plan is submitted to Department of Health for approval; and

WHEREAS, the previous District Water System Plan was approved by the Washington State Department of Health in December 2002; and

WHEREAS, two water use efficiency goals were adopted by the Commission on January 8, 2008, at a public meeting held as part of the District's regularly scheduled Commission meeting; and

WHEREAS, a water planning process is required by law, and the Water System Plan has been prepared in compliance with Washington State Department of Health regulations and includes the water use efficiency goals established in 2008; and all statutory and procedural requirements of the law and the processes have been met; and

WHEREAS, the Commission finds that it is in the public interest to adopt this Water System Plan and to re-establish the water use efficiency goals that were adopted in 2008.

NOW, THEREFORE, BE IT RESOLVED by the Commission of Public Utility District No. 1 of Snohomish County, Washington, that the 2011 Water System Plan of the District is hereby adopted, and the water use efficiency goals set forth therein are hereby re-established. Subsequent to its adoption by the Commission, the Water System Plan will be reviewed and approved by the Washington State Department of Health.

PASSED AND APPROVED this 19th day of July, 2011.

President

Vice President

Secretary

Snohomish County PUD Public Utility District No. 1

WATER SYSTEM PLAN

FINAL JUNE 2011

PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY

2011 Water System Plan Update

Final
June 2011

Snohomish County PUD Board of Commissioners
Adopted by Resolution No. 5544

PUD No. 1 of Snohomish County
PO Box 1107
2320 California
Everett, WA 98201

Contact: Brant Wood, PE
(425) 397-3003
bewood@snopud.com

Karen Heneghan, PE
(425) 397-3037
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Certificate of Engineer

PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY

2011 Water System Plan Update

CERTIFICATION

This 2011 Water System Plan Update for Public Utility District No. 1 of Snohomish County has been prepared under the direction of the following registered professional engineer.

EXPIRES 03/04/2013

6/13/11

Karen S. Heneghan, P.E.

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00-2 SEPA Documentation

00-3 Comments and Response

01-1 Policies and Procedures Manual

01-2 Satellite Management Program

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Acronyms and Abbreviations

AC	*Asbestos Cement*
ADD	*Average Day Demand*
A/G	*Air Gap*
AMCL	*Alternative Max Contaminate Level*
AMG	*Alternate Monitoring Guidelines*
ANSI	*American National Standards Institute*
APWA	*American Public Works Association*
ASA	*American Standards Association*
ASME	*American Society of Mechanical Engineers*
ASTM	*American Society for Testing and Materials*
AVB	*Air Vacuum Breaker*
AWWA	*American Water Works Association*
AWWD	*Alderwood Water District*
BAT	*Backflow Assembly Tester*
BFA	*Backflow Prevention Assembly*
BMP	*Best Management Practices*
BPS	*Booster Pump Stations*
C	*Copper*
CAR	*Critical Area Regulation*
CCR	*Consumer Confidence Report*
CCS	*Cross Connection Specialist*
CEU	*Continuing Education Unit*
cf	*Cubic Feet*
CF	*Commercial Forest*
CF-FTA	*Commercial Forest-Forest Transition Area*
CFP	*Capital Facilities Plan*
CI	*Cast Iron*
CIS	*Customer Information System*
CIP	*Capital Improvement Program*
CMM	*Concrete Masonry Unit*
CMMS	*Computerized Maintenance Management System*
CMP	*Coliform Monitoring Plan*
CMR	*Chemical Monitoring Reform*
County	*Snohomish County*
CT	*Concentration Time*
CWP	*Comprehensive Water Plan*
CWSP	*North Snohomish County Coordinated Water System Plan*
CWSSA	*Critical Water Supply Service Area*

DBP	*Disinfection By-Products*
D/DBP	*Stage 2 Disinfection By-Products*
DEA	*Developer Extension Agreement*
DI	*Ductile Iron*
District	*PUD No. 1 of Snohomish County*
DOH	*Washington State Department of Health*
DOT	*Washington State Department of Transportation*
DPO	*Development Phasing Overlay*
DSC	*Distribution Service Charge*
EL	*Elevation*
EOC	*Emergency Operations Center*
EPA	*Environmental Protection Agency*
ERP	*Emergency Response Plan*
ERU	*Equivalent Residential Unit*
ESA	*Endangered Species Act*
ESWTR	*Enhanced Surface Water Treatment Rule*
EWUC	*Everett Wholesale Utilities Committee*
FCC	*Fully Contained Communities*
FERC	*Federal Energy Regulatory Commission*
FORUM	*Water Supply Forum*
FPS	*Foot per Second*
FT	*Foot*
G	*Galvanized*
GAL	*Gallons*
GFBPS	*Granite Falls Booster Pump Station*
GFC	*General Facilities Charge*
GIS	*Geographic Information System*
GMA	*Washington State Growth Management Act*
gpd	*Gallons Per Day*
gpm	*Gallons Per Minute*
GPP	*General Policy Plan*
GPTRAC	*General Particle Tracking Module*
GSA	*Getchell-Snohomish Aquifer*
GWMP	*Groundwater Management Plan*
HAA5	*Haloacidic Acid 5*
HGL	*Hydraulic Grade Line*
HP	*Horsepower*
HPC	*Heterotrophic Plate Count*
IDSE	*Initial Distribution System Evaluation*

IESWTR	*Interim Enhanced Surface Water Treatment Rule*
IN	*Inch*
IOC	*Inorganic Contaminate*
JOA	*Joint Operating Agreement*
LT2	*Long-Term 2 Enhanced Surface Water Treatment Rule*
L&I	*Washington State Department of Labor & Industries*
LA	*Lake Aquifer*
LF	*Linear Foot*
LUD	*Local Utility District*
MCL	*Maximum Contaminate Level*
MCLG	*Maximum Contaminate Level Goal*
MBR	*Membrane Bioreactor*
MDD/ADD	*Maximum Day Demand to Average Day Demand*
MG	*Million Gallons*
MGD	*Millions Gallons per Day*
MMM	*Multi Media Mitigation*
MUTCD	*Manual Uniform Traffic Control Devices*
MWL	*Municipal Water Law*
NEMA	*National Electric Manufacturers Association*
NFPA	*National Fire Protection Agency*
ODW	*Office of Drinking Water*
OFM	*Washington Office of Financial Management*
OUTLOOK	*2009 Regional Water Supply*
pCi/L	*Pico Curies Per Liter*
PDD	*Peak Day Demand*
PE	*Polyethylene*
pH	*a measurement of hydrogen ion concentration*
PHD	*Peak Hour Demand*
Policy Manual	*Policies and Procedures Manual for Administration of Water Services*
ppb	*Parts per Billion*
ppm	*Parts per Million*
PRV	*Pressure Reducing Valve*
PSAPCA	*Puget Sound Air Pollution Control Agency*
PSI	*Pounds Per Square Inch*
PSRC	*Puget Sound Regional Council*
PUD	*Public Utility District No. 1 of Snohomish County*
PVC	*Polyvinyl Chloride*
PWTF	*Public Works Trust Fund*

RCS	*Rural Cluster Subdivision*
RCW	*Revised Code of Washington*
RPBA	*Reduced Pressure Backflow Assembly*
RPM	*Revolutions per Minute*
SCADA	*Supervisory Control And Data Acquisition*
SCC	*Service Connection Charge*
SDWA	*Safe Drinking Water Act*
SF	*Square Foot*
SIRC	*Stillaguamish River Impediment Committee*
SkA	*Skykomish Aquifer*
SMA	*Satellite Management Agency*
SOC	*Synthetic Organic Contaminate*
SPS	*Supply Pump Stations*
STL	*Steel*
SWTR	*Surface Water Treatment Rule*
TCR	*Total Coliform Rule*
TDH	*Total Dynamic Head*
THM	*Trihalomethanes*
TTHM	*Total Trihalomethanes*
TOT	*Time of Travel*
TuA	*Tulalip Aquifer*
UBC	*Uniform Building Code*
UCMR	*Unregulated Contaminate Monitoring Rule*
UGA	*Urban Growth Area*
ULID	*Utility Local Improvement District*
USRP	*Utility Service Review Procedure*
UV	*Ultraviolet*
VA	*Vulnerability Assessment*
VFD	*Variable Frequency Drive*
VOC	*Volatile Organic Contaminate*
VSS	*Very Small System Waiver*
WAC	*Washington Administration Code*
WDM IV	*Water Distribution Manager IV*
WDS	*Water Distribution Specialist*
WFI	*Water Facilities Inventory*
WHPA	*Wellhead Protection Area*
WHPP	*Wellhead Protection Program*
WSP	*Water System Plan*
WRIA	*Water Resource Inventory Area*

WRSA	*Water Right Self Assessment*
WTPO-IT	*Water Treatment Plant Operator In-Training*
WUCC	*North Snohomish Water Utility Coordinating Committee*
WUA	*Water Utility Administrator*
WWTP	*Wastewater Treatment Plant*
WARN	*Water/Wastewater Agency Response Network*

ES Executive Summary

There have been many changes to the District's water systems since completion of the 2002 Water System Plan, including several new facilities to accommodate relatively strong growth. The District prepared this 2011 Water System Plan (WSP) to provide policies and guidance for the utility to maintain a high level of service for existing customers while meeting the needs of planned growth. The WSP fulfills Washington Department of Health (DOH) requirements and is a summary of the manner in which the District fulfills its mission, "*safely providing quality products and services in a cost-effective and environmentally sound manner*;*"* its business strategy, *"ensuring adequate, high quality and reliable water supplies and distribution systems that meet the needs of existing and future customers, while continuously pursuing increased customer service levels and cost efficiencies;"* and its obligation as a public water utility.

Major changes in the District's water system since the 2002 Plan include:

- Constructed the new Glenwood pump station to provide additional source capacity to the District's Lake Stevens water system and redundant capacity to the District's Hillcrest boosted zone.
- Upgraded the Granite Falls, Machias, Skylite Tracts, and May Creek pump stations.
- Acquired the Kayak water system and constructed a new reservoir, treatment plant, and necessary distribution system improvements.
- Constructed a new Water Operations Facility which, for the first time, allowed the combination of the Engineering, Administration, and Operations and Maintenance Groups in a single location and will accommodate future growth of water utility staff.
- Constructed a new 3.0 M.G. reservoir at the Hillcrest tank site.
- Continued emphasis on the importance of replacing aging infrastructure and improving the hydraulic capacity of the water systems. Since 2002, over 62 miles of new water mains were installed and over 14 miles of aging water mains were replaced.
- Worked with the state Department of Ecology (Ecology) and DOH to transfer water rights to the Sunday Lake water system. This effort will allow the District to connect an additional 92 customers to the public system with no further capital expenditures and minimize the number of non-regulated exempt wells being built in the area.

The following sections summarize the content of each chapter in this WSP.

ES-1 MANAGEMENT, HISTORY AND GENERAL DESCRIPTION

Authority. The Snohomish County PUD No. 1 (District) is a municipal corporation of the state of Washington with authority to provide water utility service to all portions of Snohomish County and Camano Island not served by other municipal water utilities or districts. Public Utility Districts (PUDs) are organized to provide electric and/or water utility service to their customers on a non-profit, cost of service basis. By special voter approval, PUDs can also provide sewer utility service. Local, publicly-owned utility systems are based on the initiative law passed in 1930 by a majority vote of the people of the entire state. PUDs were originally formed to combat high electric rates charged by private utilities, provide electricity to rural areas where such service had been denied, and to provide utility water service to otherwise un-served areas. The District has been providing water utility service in Snohomish County since 1946.

Administration. The District's water systems are administered according to RCW 54.16.030, municipal codes, and policies and procedures set forth in the Policies & Procedures Manual for Administration of Water Services adopted by the District's Board of Commissioners by Resolution No. 4848-J in April 1999 and last amended and approved on March 1, 2010 under Resolution No. 5484. It is under this authority that the District provides water service to its retail and wholesale water customers.

Overview of Systems. The District owns and operates 12 separate public water systems located throughout the county and serving approximately 20,000 customers. The District's largest system is its Lake Stevens Integrated water system which serves approximately 17,000 customers and provides wholesale service to the city of Granite Falls and the city of Arlington. Other standalone systems include the Dubuque, Lake Roesiger, May Creek, Kayak, Storm Lake Ridge, Sunday Lake, Skylite Tracts, Creswell, Pilchuck 10, 212 Market and Deli, and Otis water systems.

Regional Coordination. The District actively participates as a member of the Everett Water Utilities Committee (EWUC), the North Snohomish County Water Utility Coordinating Committee (NSWUCC), and the Washington Water Utility Council (WWUC).

ES-2 SERVICE AREAS AND POLICIES

Regulatory Requirements for Water Service Areas. The District's 2011 Water System Plan is consistent with requirements of the Public Water System Coordination Act, Growth Management Act, and 2003 Municipal Water Law.

District Water Service Areas. The District's water service areas were refined to be consistent with requirements of the Municipal Water Law and Snohomish County's Comprehensive Plan. This WSP distinguishes between the District's existing service areas, retail service areas where expansion is anticipated within the next six years, and a future service area.

Service Area Policies. The Plan clarifies the District's processes to provide water service in a "timely and reasonable" manner and also outlines the format of the District's Water Policies & Procedures Manual.

ES-3 ADJACENT SYSTEMS, RELATED PLANS AND AGREEMENTS

Related Plans. The District works hard to coordinate water system planning issues with other regional planning documents such as the City of Everett's Comprehensive Water Plan, the Snohomish County Comprehensive Plan, the Growth Management Act, and the North Snohomish County Coordinated Water System Plan (CWSP). Concurrence with county and local land-use plans and policies, surrounding purveyor's water system plans, wholesale customer plans (Arlington and Granite Falls), and supplier plans, is critical in the evaluation of long-term adequacy of the water system.

Service Area Agreements. A list of relevant interlocal agreements that the District has entered into with cities and other water utilities is incorporated into Chapter 3. The agreements include the Sultan River Agreement, North Snohomish County Joint Operating Agreements, Everett Water Supply Contract, Emergency Interconnect Agreement with Gold Bar, and the Arlington, Granite Falls, Sudden View, and Twin Falls wholesale water Agreements. Also included are various CWSP service boundary area agreements.

ES-4 EXISTING FACILITIES

The District's 12 water systems include over 382 miles of pipelines, 15.3 million gallons of storage, 2 water treatment plants, 11 booster pump stations, 6 water supply pump stations, 12 wells, and 41 pressure zones. Each of these facilities is integral to the operation of the District's water systems.

ES-5 PLANNING DATA AND DEMAND FORECASTING

Retail Service Area Demand. The District's retail service area includes Lake Stevens (and the greater Arlington and Granite Falls areas), and four additional satellite systems served by water purchased from the city of Everett: Dubuque, Lake Roesiger, Storm Lake Ridge, and Creswell. The service area also includes an additional seven systems served with groundwater sources: May Creek, Kayak, Sunday Lake, Skylite Tracts, Two Twelve Market & Deli (Moa/Holbeck), Pilchuck 10, and Otis.

Based on projections found in the county's 2005 Comprehensive Plan and historical data provided by the District's utility billing records, the population in the District's integrated service area (Lake Stevens) is predicted to increase approximately 3.4 percent annually over the next 20 years. The projected growth results in approximately 16,395 new single-family connections, 210 new multi-family connections, and 391 new non-residential connections within the District's retail service area in the next 20 years.

Wholesale Demands. The District serves two major wholesale customers, the cities of Arlington and Granite Falls. Wholesale water sales have remained fairly constant during the past five years with wholesale purchases representing approximately 17 percent of the District's total water sales. Arlington is expected to gradually increase its wholesale purchases from the District over the next several years up to a total purchase limit of 1.44 million gallons per day. Granite Falls purchases all of its water from the District, and the Granite Falls UGA is expected to grow at an annual rate similar to the rest of the District's Integrated Service area over the next twenty years.

ES-6 CONSERVATION / WATER USE EFFICIENCY

The District has engaged in water conservation planning and promotion of educational programs for a number of years. As a wholesale customer of the city of Everett, the District participates in a regional conservation program established by the Everett Water Utilities Customers' conservation subcommittee in 1999.

The District has proposed the following supply-side and demand-side goals to be consistent with the Water Use Efficiency Rule which became effective January 2007:

Supply-side goal: The District shall maintain its distribution leakage below the state 10 percent standard, and shall strive to progressively achieve lower percentages of lost water, where possible.

Demand-side goal: The District shall actively participate in the EWUC regional conservation program to reduce the 2012 regional demand for water by 3 percent (1.97 MGD), while implementing additional water use efficiency measures for the District's water systems.

ES-7 FACILITY ANALYSIS

The District's water systems are designed and constructed to provide long-term, reliable service. The systems are generally robust, with adequate supply and service pressures under most conditions. Recommended improvements in this section are designed to meet or exceed the District's level of service standards for existing customers while meeting needs for planned growth.

This chapter evaluates the condition and capacity of the District's pump stations, water distribution, transmission, and storage. Where deficiencies are identified, specific improvements are recommended to address those deficiencies. The specific improvements are identified in Chapter 11 – Improvement Plan.

ES-8 SOURCE OF SUPPLY

Water Rights. The District purchases the majority of its supply from the city of Everett. The principal source of water is Sultan Basin water, which has been filtered, treated, chlorinated, and flouridated by Everett. Existing water rights on the Sultan River are sufficient to meet forecast demands for Everett and its wholesale customers beyond 2050.

The District also holds groundwater rights for its Lake Stevens, May Creek, Kayak, Skylite Tracts, Sunday Lake, Pilchuck 10, Two Twelve Market & Deli (Moa/Holbeck), and Otis water systems. Treatment provided for water systems supplied by wells varies, depending on the characteristics of the water supply. The District also has two emergency interties with the city of Marysville and the city of Gold Bar. For the most part, the District's existing water rights are sufficient to meet the foreseeable needs of the individual satellite systems and the District has no need to apply for new water rights.

Wellhead Protection. Individual wellhead protection plans have been developed for each of the District's active Group A water systems, including conducting a Susceptibility Assessment Survey for each system. As required by the state's Wellhead Protection Program, the District has notified owners of property with potential contaminant sources of their presence. All federal, state, and local regulatory agencies with jurisdiction over the water systems have been advised regarding the delineated wellhead protection areas and potential contaminant sources. Contingency and emergency response plans have been developed for each system to ensure availability of safe drinking water in the event contamination occurs within or near a wellhead protection area.

ES-9 OPERATIONS AND MAINTENANCE OVERVIEW

The District utilizes established goals and procedures to maintain reliability, performance and water quality under routine and emergency conditions. The goals and procedures are reviewed periodically to respond to new or revised regulations, updated best management practices and system modifications, and revisions in tools, equipment and techniques. Guidelines and manuals are retained at the District's Water Operations Facility and at the sites of specific equipment or treatment facilities. In addition, operations and maintenance manuals required by DOH are on-site and updated as necessary to remain in compliance with all regulations.

Personnel Certification. The District is in compliance with all laws and regulations regarding staff certification and training. All water crew employees, including three foremen, possess DOH certifications. The levels of certification of all water field crews and the District's management is included in Table 9-1. All personnel are actively encouraged to achieve the highest levels of certification possible.

Routine Operations and Preventive Maintenance. The District's goal is to follow a routine schedule of operating, monitoring and maintaining facilities within its water systems. The schedule considers the features, use and critical role of each component, the number of customers served, failure or breakdown history, availability of staff resources and industry standards for maintenance. In addition to visits by crew members, the SCADA system electronically monitors the status at key pump stations, master meters and reservoirs.

Vulnerability Assessment and Emergency Procedures. The District has conducted a Vulnerability Assessment of its water systems and developed an Emergency Response Plan. The Emergency Response Plan includes operating procedures, emergency alert rosters, equipment suppliers/technical representatives, adjacent facilities/utilities, and a contingency plan.

ES-10 WATER QUALITY AND COMPLIANCE

The District is responsible for monitoring and compliance with all Safe Drinking Water Act (SDWA) and Washington Administrative Code (WAC) regulations. Because the District purchases the bulk of its water from the city of Everett, the District is not responsible for documenting compliance with regulations that apply to source water. Everett is responsible for maintaining and documenting compliance with all requirements covering source water monitoring, maximum contaminant levels for specific compounds, filtered water quality, and disinfection contact times. The District complies with regulations pertaining to finished water impacts associated with disinfection in the distribution system. Since the water received from Everett is subsequently re-chlorinated, the District conducts chlorine residual monitoring.

The water quality requirements for the District vary depending on the source of water for the specific system. The District's water quality monitoring program meets all state and federal requirements.

Consumer Confidence Reports. The District provides an annual water quality report to its retail customers informing them of test results, including any violations of maximum contaminant levels. As a wholesale supplier, the District also provides its wholesale customers with the necessary water quality data and other related information needed to prepare their own consumer confidence reports each year.

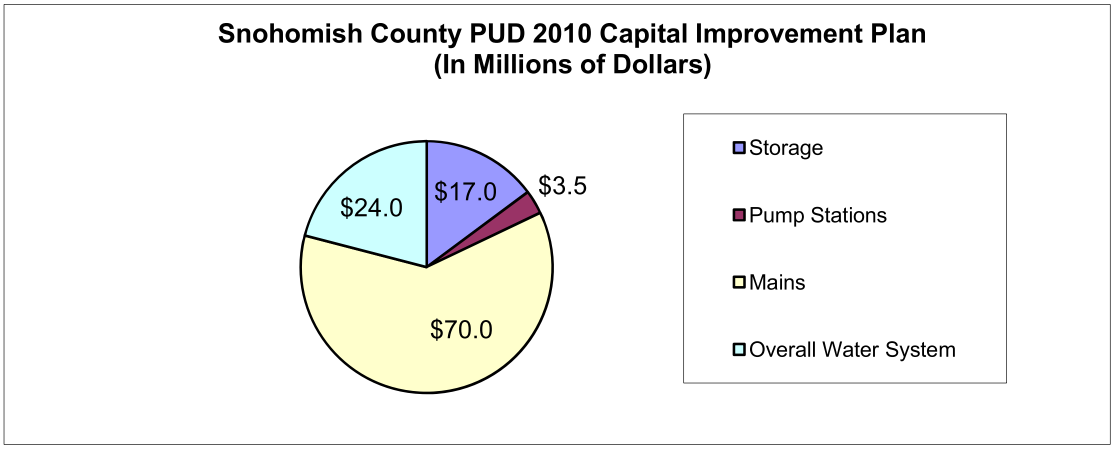
Emerging Water Quality Regulations. Several new or revised SDWA regulations are on the horizon. District staff continues to anticipate and track development of these regulations.

ES-11 IMPROVEMENT PLAN

The District's water system was designed and constructed to provide long-term, reliable service. The system is generally robust, with sufficient capacity to provide adequate supply and service pressures under most conditions. Improvements are needed over the next 20 years to repair and rehabilitate existing facilities and to add new capacity to meet the needs of planned growth.

Major planned system improvements and the estimated costs (in year 2010 dollars) include:

- **Storage.** The existing Hillcrest, Walker Hill, Granite Falls, and Bosworth reservoirs will be repainted (if necessary), and two new reservoirs are planned for the Getchell Road, and Burn Road sites. (Estimate: $17M)
- **Pump Stations.** The plan includes the construction of a new Getchell Pump Station and retrofits and additional capacity made to the District's existing East Hewitt, Hillcrest, Walker Hill, and Machias Pump Stations. It also includes the upgrades to the District's Lake Stevens wells to provide treatment. (Estimate: $3.5M)
- **Distribution Mains.** There are approximately 382 miles of pipeline in the Integrated System. When analyzing the needs of the distribution system, pipe projects were grouped into three categories: CIP-Funded, Developer-Funded, and Miscellaneous Main Replacement. Funding for developer projects comes solely from those developers requiring water service from the District. CIP and Miscellaneous Main Replacements are estimated to cost $70M over the next 20 years.
- **Overall Water System.** Recommended projects that will benefit the overall water system total $24M million over the next 20 years and include SCADA hardware and software upgrades, meter replacement, and new / replacement vehicles and equipment.



ES-12 FINANCIAL PLAN

In developing the 2010-2030 financial forecast, three cost components were reviewed:

- Operation and maintenance expenses,
- Taxes and debt service, and
- Capital improvement projects.

The Water Utility Financial Model provides various financial scenarios and was used to develop the Financial Plan. Projections for future years were obtained by applying an annual escalation factor dependent on the type of revenue or expense being reviewed. Rate revenues and miscellaneous revenues are projected to increase approximately 3 percent per year based on growth. General operating expenses, such as materials, professional service contracts and outside services were increased 3 percent per year, and a 3 percent escalation factor was used for staff salaries and benefits.

Retail, wholesale, and other water sales revenues are projected to be $10 million in 2011, which includes a retail rate increase of 13 percent effective January 1, 2011. In addition, a retail rate increase of 13 percent has been established for 2012. Connection fees are projected to be about $1.8 million in 2011.

A summary of the planned capital improvement projects and their funding sources is presented in Table ES-1. Table ES-2 shows a summary of the District's six-year financial plan for the water utility.

The Financial Plan shows that revenues are sufficient to fund the anticipated capital needs of the water system for 2010-2015. A $13,085,000 revenue bond borrowing completed in 2009 will fund capital projects for 2010 through 2014. An additional borrowing is not anticipated until the 2014-2015 timeframe.

Debt service coverage is a financial measurement of an entity's ability to repay debt. The District's bond rate covenants state the utility must maintain the debt service coverage ratio above 1.25. The calculated debt service coverage ratio for the water utility is above the minimum requirement of 1.25.

Table ES-1: 2010-2015 Water Capital Improvement Costsand Funding Sources ($1000's)

	2010	2011	2012	2013	2014	2015
Uses of Funds						
Capital Expenses						
General	2,526	1,666	735	675	919	1,241
Pipe	2,451	4,853	6,178	2,697	2,901	2,668
Pump Station	74	728	--	--	--	--
Reservoir	189	--	--	--	--	--
Total Annual Expended	**$5,240**	**$7,247**	**$6,913**	**$3,372**	**$3,820**	**$3,909**
Sources of Funds						
2009 Bond Proceeds	4,510	--	2,756	771	--	--
GFCs	730	3,945	2,181	290	1,269	1,623
Other Revenue	--	--	--	2,311	2,551	2,286
PWTF	--	3,302	1,976	--	--	--
Total Sources of Funds	**$5,240**	**$7,247**	**$6,913**	**$3,372**	**$3,820**	**$3,909**

Table ES-2: Summary of the District's Six-Year Financial Plan ($1000's)

	2010	2011	2012	2013	2014	2015
Operating Revenues						
Retail Water Sales[1]	$8,418	$9,653	$11,069	$11,226	$11,385	$11,547
Wholesale Water Sales	474	559	591	625	662	711
Facilities/Connection Fees	1,712	1,785	1,861	1,939	2,022	2,109
Non-Cash Contributions & Other	246	167	171	177	182	186
Total Operating Revenues	**$10,850**	**$12,164**	**$13,692**	**$13,967**	**$14,251**	**$14,553**
Operating Expenses[2]						
Purchased Water	$2,211	$1,687	$1,796	$1,937	$2,090	$2,255
Operations & Maintenance	3,443	3,094	3,783	4,161	4,361	3,539
Taxes	431	542	616	627	638	650
Total Operating Expenses	**$6,085**	**$5,323**	**$6,195**	**$6,725**	**$7,089**	**$6,444**
Net Income	**$4,765**	**$6,841**	**$7,497**	**$7,242**	**$7,162**	**$8,109**
Interest and Other	328	328	328	328	328	328
Balance Available for Debt Coverage	5,093	7,169	7,825	7,570	7,490	8,436
Debt Service Paid from Revenues	2,184	2,749	2,744	2,781	2,582	2,532
Debt Service Coverage	2.83x	3.38x	3.56x	3.39x	3.58x	3.99x

[1] Projected retail sales revenues include rate increases of 13% effective January 1, 2010 through 2012 as approved by the Board of Commissioners on December 6, 2008.

[2] Excludes depreciation.

1 Management, History and General Description

1.1 AUTHORITY AND MANAGEMENT

Public Utility District No. 1 of Snohomish County ("District") is a municipal corporation of the State of Washington created by a county-wide vote in 1936. The District is authorized to provide electric and water service to all portions of Snohomish County and Camano Island not served by other municipal water utilities or districts.

PUDs are organized to provide utility service to their customers on a non-profit, cost of service basis. The authority to create municipal corporations to own and operate utilities outside of city limits began with approval of State Initiative No. 1 in the 1930 general election. PUDs were originally formed to combat high electric rates charged by private utilities, to provide electricity in rural areas where service had been denied, and to provide water service in otherwise unserved areas.

The legal responsibilities and powers of the District, including establishment of rates and charges for services rendered, are exercised through a three-member Board of Commissioners elected from separate commissioner districts for staggered six-year terms. The District's water utility is administered according to RCW 54, municipal codes, applicable state codes, and the *Policies and Procedures Manual for Administration of Water Services* (Policy Manual) adopted by the Board of Commissioners and included in this plan as Appendix 1-1.

The District is also an approved Satellite Management Agency (SMA) authorized by the Washington Department of Health (DOH) to serve Snohomish County. State rules require any new water system to be owned and operated by a SMA if one is available and willing to provide service. Furthermore, the current edition of the North Snohomish County Coordinated Water System Plan (CWSP) recognizes the District as the SMA with first right of refusal to provide water service to new developments in unclaimed parts of the county's Critical Water Supply Service Area (CWSSA) or where other water purveyors are unable or unwilling to serve in a timely and reasonable manner. The District's Satellite Management Program is described in Appendix 1-2.

The District's management and organizational structure is summarized in Figures 1-1 through 1-3 at the end of this chapter. The water utility is part of the District's Water, Generation & Corporate Services Division. Figure 1-3 shows all current water utility staff. Further detail about the water utility's organizational structure can be found in Chapter 9.

Copies of DOH Water Facility Inventory (WFI) forms and DOH Operating Permits are provided in Appendices 1-3 and 1-4. WFIs summarize facility information and contain contact names, addresses and phone numbers for DOH records. Operating Permits are a DOH compliance tool linked to annual performance evaluations of the water systems. A "Green" permit category means a water system is substantially in compliance with drinking water requirements.

1.2 HISTORY AND FUTURE

The District began water operations in 1946 with the acquisition of the Beverly Park water system and construction of the Lake Stevens water system. The District sold the Beverly Park system to the city of Everett in 1960 when a large portion of that service area was annexed. The Lake Stevens system subsequently expanded through a combination of new facilities and mergers with adjacent water systems. The District also became responsible for various satellite water systems over the years.

Today, the District owns and operates 12 water systems throughout the county, which are listed in Table 1-1 and illustrated in Figure 1-4. The number of water services and population in Table 1-1 were reported to DOH in November 2010.

The Lake Stevens, Dubuque, Lake Roesiger, Storm Lake Ridge, Creswell, and Pilchuck 10 water systems will gradually grow and be integrated into a single "Integrated Water System." The District plans to construct water mains in 2011 that will merge the Lake Roesiger and Pilchuck 10 water systems with the Lake Stevens system. The Dubuque water system will be the next system to merge with the Lake Stevens system in the following few years. The Storm Lake and Creswell systems will be integrated with the other systems as growth occurs over the next 20 years. Figure 11-1, in Chapter 11, shows the master plan to merge these systems. Merging the water systems will have no impact on the external boundary of the future service area, illustrated in Figure 2-2 in the next chapter.

Table 1-1: Current District Water Systems

Water System Name	WFI #	Reported Connections	Reported Population
Systems that will merge into a single Integrated Water System			
Lake Stevens	80907 1	17,262	43,155
Dubuque	20150 F	1,007	2,517
Lake Roesiger	01612 4	460	1,150
Storm Lake Ridge	44431 6	156	390
Creswell	06325 V	18	45
Pilchuck 10	03338 F	10	25
Satellite Systems			
May Creek	52105 0	427	1,067
Kayak	23111 5	363	907
Sunday Lake	85205 D	153	382
Skylite Tracts	80220 1	151	377
212 Market & Deli	04515 Q	1	25
Otis	06956 X	4	10

1.3 ACCOMPLISHMENTS SINCE THE 2002 WATER SYSTEM PLAN

As shown in Tables 1-2 and 1-3, the District's water division has been very productive since the 2002 edition of this Water System Plan (WSP). Table 1-2 summarizes the length of pipe installed and Table 1-3 describes the District's major water projects since the 2002 WSP.

Table 1-2: Length of Water Mains Constructed since 2002

Year In Service	Pipe Extensions			Pipe Replacement* (feet)
	By Developers (feet)	By District* (feet)	Total New Pipe (miles)	
2002	42,183	8,089	9.5	8,170
2003	24,256	38,800	11.9	9,110
2004	23,795	**0**	4.5	8,400
2005	33,624	1,525	6.7	11,170
2006	51,953	**0**	9.8	5,300
2007	50,744	**0**	9.6	4,240
2008	34,080	**0**	6.5	21,200
2009	19,236	**0**	3.6	7,200
Total	279,871	48,414	62.1	74,790

* Description of District-constructed water mains is in Table 1-3

Table 1-3: District Projects since 2002

Project Name (File #)	Description	Completed
Projects to Support Population Growth		
Machias Pump Station & Water Main (WE-421)	New pump station, plus approx 2,948 ft of 30" DI pipe along S Machias Rd & approx 5,141 ft of 12" DI pipe along Division St and 135th Ave SE.	April 2002
Sultan River Bridge & Main Extension (WE-471)	Constructed a transmission pipeline from Everett's 5-Line across the Sultan River to the city of Sultan's filter plant, consisting of ~5,300 ft of 16" and ~7,200 ft of 12" DI pipe.	Sep 2003
Machias Rd Main Extension (WE-466)	Approx 17,500 ft of new 24" diameter water main along Machias Rd from Division St in Machias to 28th St NE in Lake Stevens.	Oct 2003
2005 Pump Station Improvements (WE-578)	(1) Constructed new Glenwood Pump Station, (2) added a pump in the Machias Pump Station, and (3) replaced two pumps with larger pumps in the Granite Falls pump station.	Nov 2005
OK Mill Bridge (WE-530)	Installed approx 775 ft of 16" DI pipe and about 750 ft of 12" HDPE pipe in conjunction with a county bridge replacement project.	Feb 2006
Hydraulic Model	Created and calibrated an InfoWater hydraulic model with a goal to integrate it into the District's GIS system. Includes steady state and extended period simulation scenarios.	June 2007
Sunday Lake Water Right	Increased the amount of water available from the Sunday Lake well by transferring water rights from systems that merged into the Lake Stevens integrated system.	May 2009

Table 1-3: District Projects Since 2002 (cont.)

Name of Project (File #)	Description	Completed
Projects to Support Population Growth (continued)		
Water Operations Facility (WE-754)	New office, warehouse, and vehicle storage facility to address overcrowding and improve efficiency.	July 2010
Hillcrest Reservoir 2 (WE-728)	New 3 MG water storage tank in the Lake Stevens Integrated water system.	Aug 2010
Satellite Water System Projects		
System Integration Pipelines (WE-474)	Approx 8,800 ft of new 8" DI pipe to merge the West Machias, Joywood, Tom Marks & Kla-Ha-Ya water systems into the District.	Feb 2003
Skylite Tracts and May Creek (WE-660)	For the Skylite system - upgraded pumps, generator & chlorination equipment & integrated controls into SCADA. For the May Creek system - created a contained chlorine room & upgraded chlorination equipment.	Oct 2007
Kayak Water System Acquisition	Conducted public process and completed purchase of the Kayak Water System at the request of affected customers.	Oct 2006
Kayak Water System Improvements (WE-675, WE-676, & WE-677)	Constructed new tank, treatment & distribution improvements for the Kayak water system.	June 2009
Facility Relocation Projects		
Lundeen Roundabout (WE-765)	Relocated 8” & 12” main for road project.	June 2010
20th Street SE Relocations (WE-748 & WE-755)	Relocated existing water pipes to accommodate city of Lake Stevens road widening project.	July 2010
Granite Falls Alternate Route (WE-729)	Relocated existing main to accommodate SR92 highway relocation project.	Aug 2010
Replacement of Aging Water Facilities		
20th St NE Pipe Replacement (WE-473)	Replaced approx 2,500 ft of old 6"-diameter asbestos cement (AC) pipe with 8"-diameter ductile iron (DI) pipe along 20th St NE between Cedar Rd and 116th Ave NE.	Mar 2002
Sunnyside 8" & 4" Mains (WE-486)	Installed approx 4,200 ft of 8" and approx 1,470 ft of 4" DI pipe to replace aging AC and galvanized iron pipes.	Dec 2002
Main St Pipe (WE-489)	Replaced about 710 ft of old 6" AC pipe with 8" DI pipe along Main St (124th Ave NE).	May 2003
2003 Pipe Replacements (WE-494)	Replaced old AC pipe with approx 3,900 ft of 8" DI pipe along E Lakeshore Dr and approx 1,500 ft of 8" DI pipe along Vernon Rd and Maple Lane.	Oct 2003
117th Ave NE & 22nd St NE (WE-502)	Replaced ~3,000 ft of old AC pipe with 8" DI pipe along 117th Ave NE and 22nd St NE.	Nov 2003
Pump Station Roof Replacements (WE-528)	Replaced roofs on the Hillcrest, Walker Hill & May Creek pump stations.	Summer 2004
Pilchuck 10 (WE-174)	Replaced failing well and added storage.	2004
2004 Pipe Replacements (WE-512)	Replaced about 8,400 ft of old AC pipe with 16", 12", and 8" DI pipe along 20th St SE and 99th Ave SE.	Nov 2004

Table 1-3: District Projects Since 2002 (cont.)

Name of Project (File #)	Description	Completed
Replacement of Aging Water Facilities (cont.)		
N. Lakeshore Dr pipe replacement (WE-534)	Replaced approx 2,750 ft of old AC pipe with 8" DI pipe along N Lake Shore Dr.	May 2005
North Davies pipe replacement (WE-559)	Replaced approx 620 ft of old 6" AC pipe with 8" DI pipe along North Davies Rd.	June 2005
South Lake Stevens pipe replacements (WE-585)	Replaced approx 2,500 ft of old 6" AC pipe with 12" DI pipe along S Lake Stevens Rd.	July 2005
2005 Pipe Replacements (WE-587)	Replaced ~5,300 ft of old AC pipe with primarily 12" & 8" DI pipe along Soper Hill Rd & Sunnyside Blvd.	Sept 2005
2006 Pipe Replacements (WE-629)	Replaced approx 5,300 ft of old AC pipes along 20th St SE with 8" and 4" DI pipe.	Nov 2006
Dutch Hill main replacements (WE-645)	Replaced approx 3,400 ft of old 4" AC main with ~2,100 ft 8" and ~1,300 ft 12" DI pipe & rehabilitated a pressure reducing station.	April 2007
15th Street NE (WE-651)	Replaced about 840 ft of old 2" galvanized iron pipe with ~610 ft 8" ductile iron pipe and ~230 ft of 2" HDPE pipe.	Nov 2007
2007 Dubuque-Dutch Hill main replacement (WE-666)	Replaced more than 4 miles of aging AC pipe with 12" ductile iron pipe in the Dubuque/Dutch Hill area.	Oct 2008
East/South Lake Stevens Road Main Replacement (WE-659)	Replaced about 7,200 ft of pipe originally installed in 1946 (mostly 2.5" galvanized and 6" asbestos cement pipe) with 8" ductile iron pipe.	Feb 2009
44th St Pump Station (WE-714)	Replaced booster pumps in the Dubuque water system.	Feb 2009

1.4 OVERVIEW OF EXISTING WATER SYSTEMS

As mentioned earlier, the District provides water through 12 regulated water systems located throughout the county. Current water service spans an area generally from Stanwood to Gold Bar and from Everett to Arlington. Most of the systems are classified as "Group A Community" water systems because they serve 25 or more year-round residents. The 212 Market is a "Group A Transient Non-Community" system because it serves an average non-residential population of 25. Otis is a "Group B" water system because it serves less than 25 residents. The Jackson hydroelectric plant purchases potable water from the City of Everett, for use by District employees at the plant. The Jackson potable water system is considered a commercial customer of the city (not a regulated public water system) because the potable water used at the plant is not resold to any District customers.

All of the District's water systems are continuously chlorinated with the exception of water delivered to four customers on the Otis system. Water supply purchased from the Everett filter plant is also fluoridated. The Sunday Lake and Kayak systems have filtration treatment to remove manganese, iron, and a trace of hydrogen sulfide, which occur naturally in the well water. Water from wells serving the Skylite and Pilchuck 10 water systems is aerated as it enters the storage tanks to raise the pH and reduce the degree of corrosiveness toward copper plumbing.

Following is further description of each water system. Detailed information on the water facilities is provided in Chapter 4.

Lake Stevens (Integrated System) – Lake Stevens is the District's largest water system supplying water to the Lake Stevens and Granite Falls areas. Currently, all water for this system is obtained from the Everett filter plant. The Lake Stevens system is supplied by five taps on the city of Everett No. 3 pipeline (3-Line) and one tap on a transmission line shared with Marysville (the JOA Line), which is also connected to the 3-Line. In an emergency, several of these taps can be switched to Everett's 2-Line. Further emergency backup supply is available from the Lake Stevens wells. The Lake Stevens system contains 21 pressure zones, serving a wide range of elevations from almost sea level to over 700 feet. About 90 percent of the purchased water is pumped into the system. The remaining 10 percent is delivered by gravity flow from Everett's transmission mains. The Lake Stevens system also has 13.7 million gallons of water storage in six tanks located on four sites throughout the system.

Dubuque – The Dubuque system serves the District's Dubuque/Dutch Hill area, southeast of Lake Stevens on the east side of the Pilchuck River. Dubuque is supplied by gravity flow from one tap on Everett's 3-Line and two taps on the 5-Line. There are two small pressure zones within the system that are served by booster pumps. The Dubuque system has no water storage, but this will be resolved when it merges into the Lake Stevens system.

Lake Roesiger – The Lake Roesiger system supplies water to the Lake Roesiger community and surrounding area. This is the District's easternmost system receiving water from the Everett filter plant. Water is pumped into the distribution system from one tap on Everett's 3-Line at the south end of the lake, which can be switched over to the 2-Line in case of emergency. Two concrete tanks are located at the north end of the lake.

May Creek – The May Creek system, located east of Gold Bar, supplies water to the May Creek community and surrounding area. The system has a main well and a backup well which supplies water to the distribution system and two concrete reservoirs. An emergency intertie connects May Creek to the city of Gold Bar water system.

Kayak – Kayak is the most recent addition to the District's water systems. It is located near Puget Sound, just north of the Tulalip Reservation and about three miles south of Stanwood. Kayak has two active wells that pump through treatment to the distribution system. A concrete tank is located at the highest ground elevation on the east side of the system, and pressure reducing stations control water pressure to lower elevations on the west side of the system.

Storm Lake Ridge – The Storm Lake Ridge system supplies water to the Storm Lake Ridge community and surrounding area approximately three miles east of Machias and five miles north of Monroe. The system is supplied by a tap on Everett's 5-Line from which water is pumped into the distribution system and then to a concrete reservoir. There is a small "boosted" pressure zone served by pumps in the vicinity of the storage tank.

Skylite Tracts – The Skylite Tracts system is located south of Highway-2 between the cities of Sultan and Gold Bar and south of the Skykomish River. The system is supplied by a single well equipped with two pumps which fill an adjacent concrete tank. Water is then pumped from the tank into the distribution system.

Sunday Lake – The Sunday Lake community is supplied by a single well located west of the lake. The water is treated before it is sent to the distribution system and a concrete storage tank. A booster pump station serves a newer development northwest of the original Sunday Lake subdivision.

Creswell Water System – The Creswell water system (formerly known as Butterfield) is supplied by gravity flow from a tap on Everett's 3-Line at the northwest corner of Dubuque Road and Creswell Road. There is also a connection from Everett's 2-Line as a backup. Like the Dubuque system, Creswell does not have a storage tank, but will eventually be integrated with the District's adjacent systems that do have storage.

Pilchuck 10 – The Pilchuck 10 water system is approximately three miles north of Lake Roesiger on Robe Menzel Road. Water is pumped from two wells into concrete tanks, and is boosted from the tanks to the distribution system. Pilchuck 10 is approved by DOH to serve 11 connections, and is currently serving 10 customers. The 11^{th} service is reserved for Lot 9.

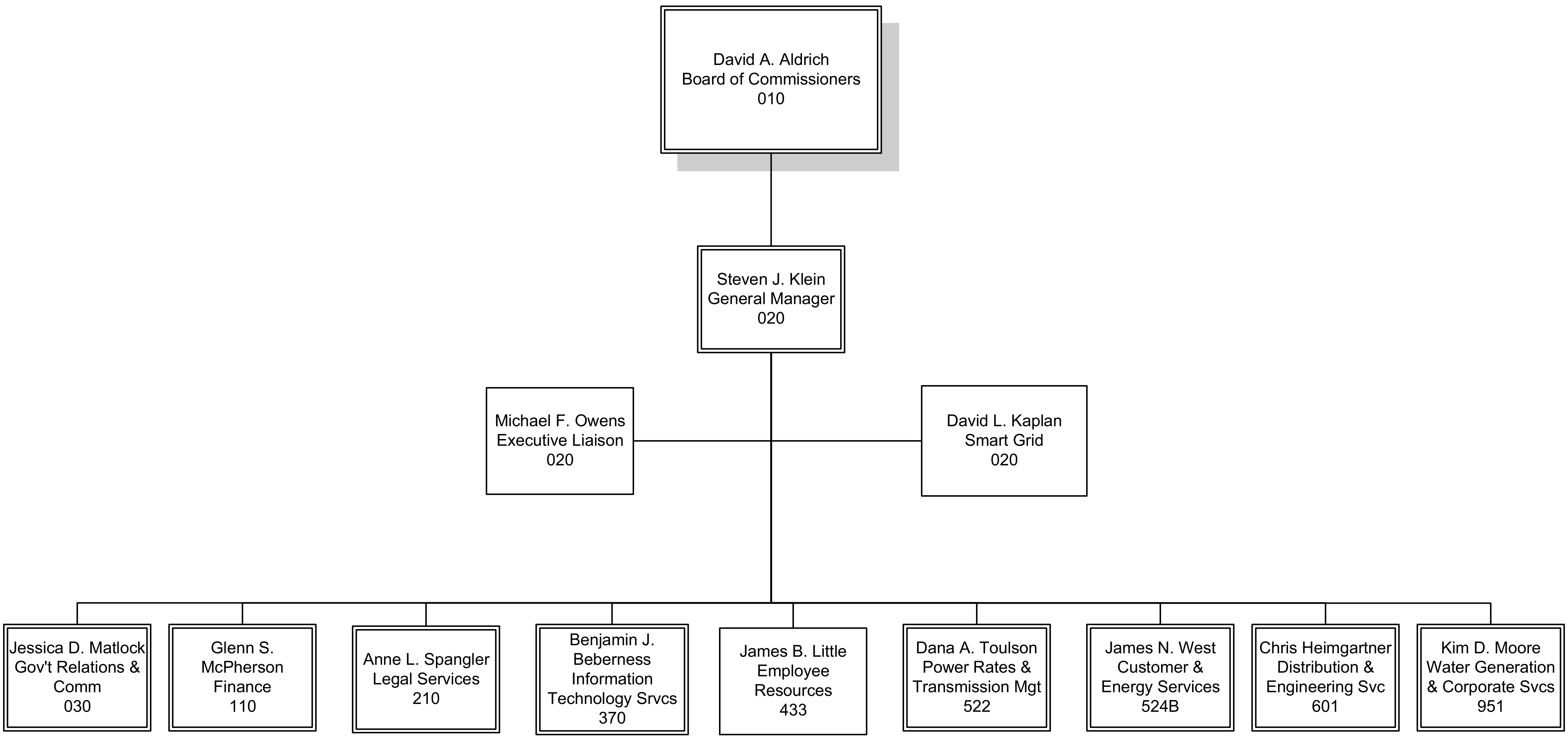
Two Twelve Market and Deli – The Two Twelve Market and Deli system (formerly known as Moa/Holbeck) supplies water to a gas station and convenience store near Exit 212, southwest of the intersection of I-5 and Highway 532. The system is supplied by a well which pumps water to a small concrete storage tank. Water is then pumped from the tank to the store.

Otis Water System – The Otis system is designed to serve five lots and currently supplies water to four homes north of 196^{th} Street NE on Burn Road. A single well supplies water directly to the homes.

Jackson – The District's Jackson hydroelectric plant has a tap on the Everett 5-line for its drinking water supply. Because the District does not sell this water, Jackson is considered a commercial customer of the city of Everett. The District also shares ownership of a separate transmission main from the Everett 5-line to the city of Sultan in the vicinity of the power plant. The District currently has no customers on this transmission main and the city of Sultan pays Everett directly for the water that it consumes.

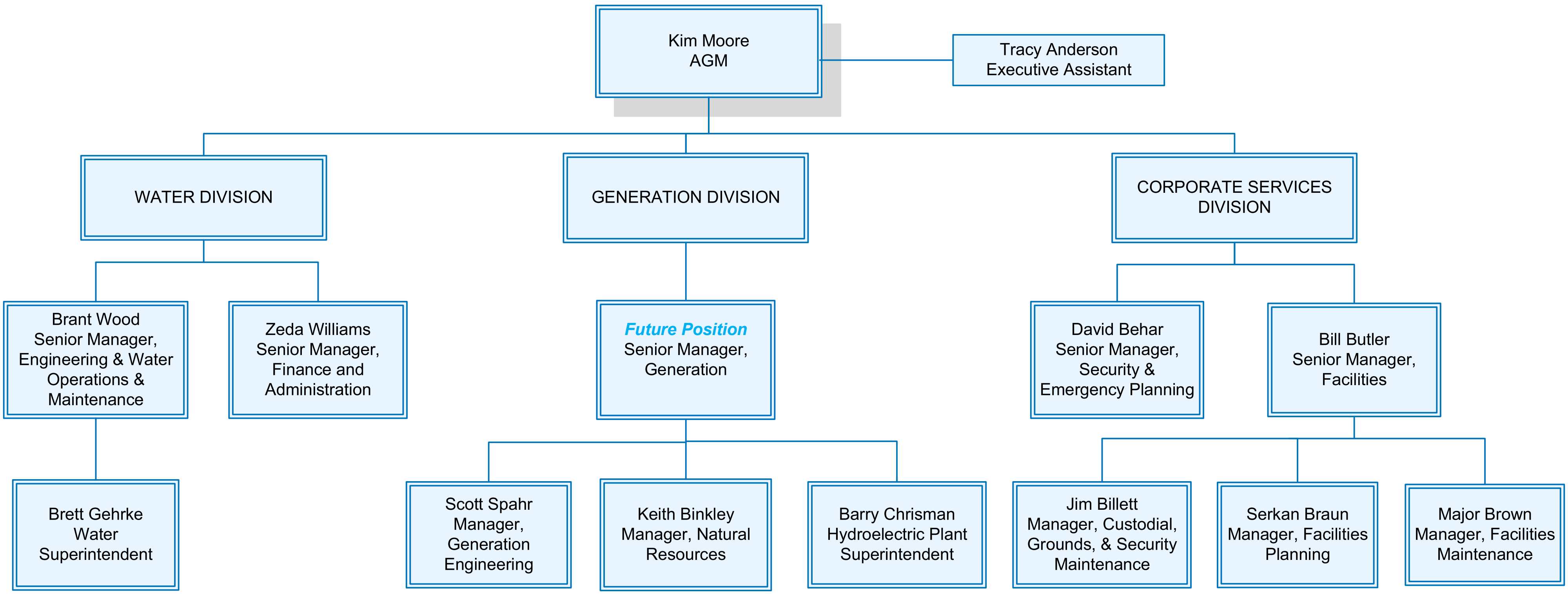
Leadership Team

04/16/2011



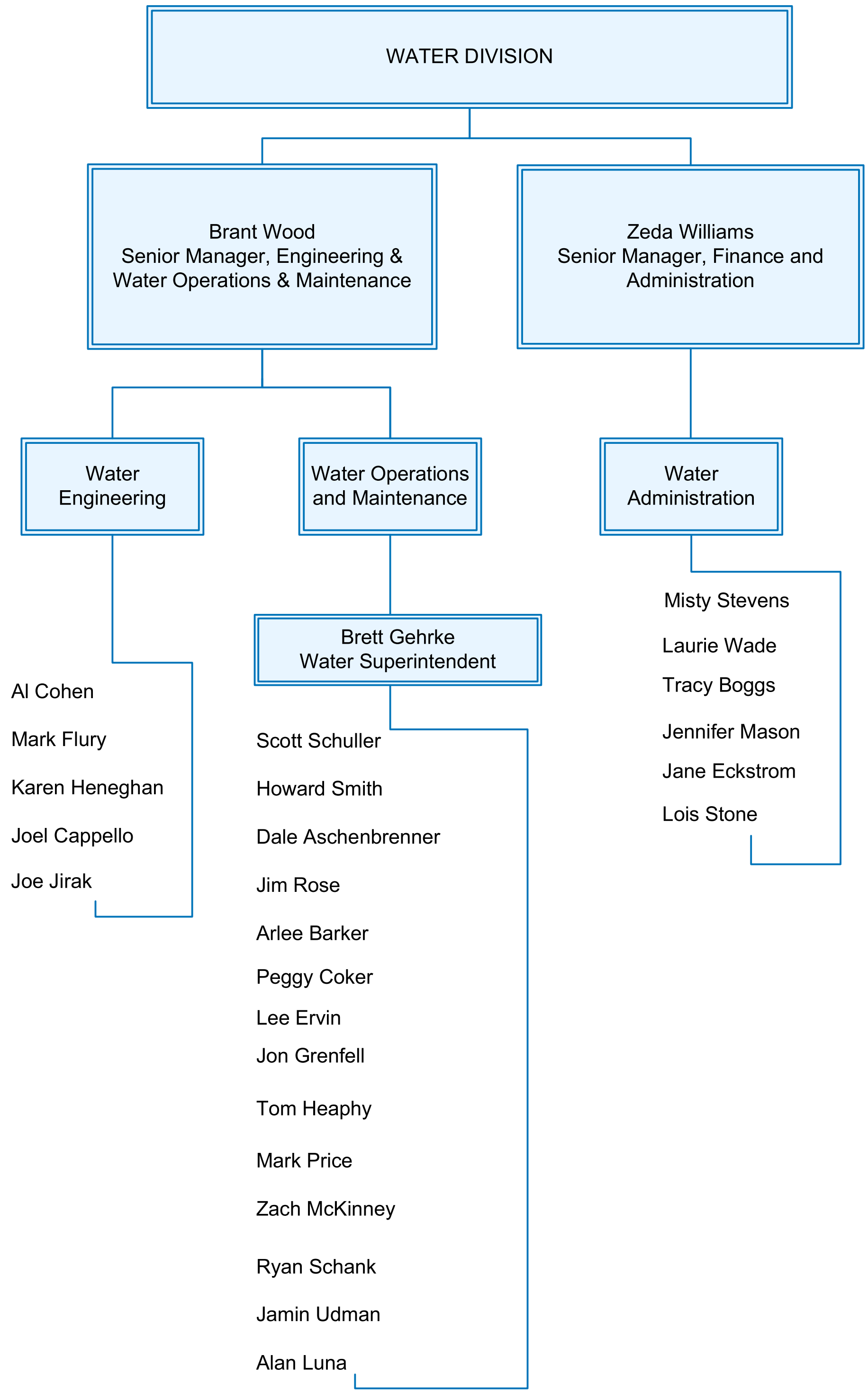
Water, Generation and Corporate Services Organizational Chart

12/01/2010



Water Organizational Chart

06/2011



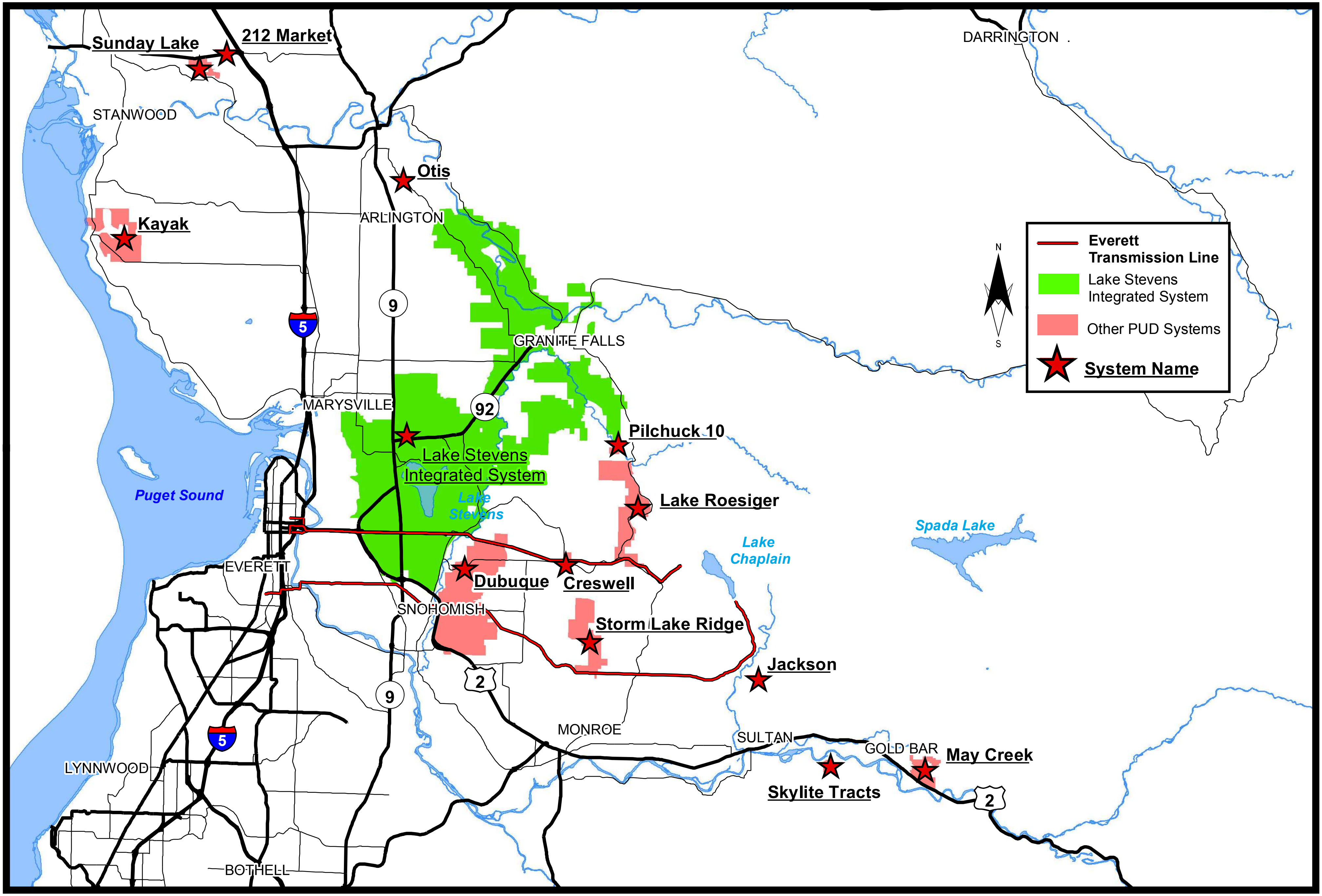


Figure 1-4: Vicinity Map

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Vicinity_Map.mxd

2 Service Areas and Policies

This chapter summarizes regulatory requirements for water service areas, describes current and proposed service area boundaries and summarizes the District's policies in relation to these requirements and boundaries.

2.1 REGULATORY REQUIREMENTS FOR WATER SERVICE AREAS

Two state laws set requirements for water system service areas: (1) the 1977 Public Water System Coordination Act; and (2) the 2003 Municipal Water Law (MWL). In addition, Water System Plans must support the planning of county and city governments under the Growth Management Act (GMA). The following sections describe how criteria set by these laws affect the District's water service areas and policies.

2.1.1 Coordinated Planning in Snohomish County

The Coordination Act of 1977 applies where a county declares a Critical Water Supply Service Area (CWSSA). By declaring a CWSSA, the local government determines that coordinated planning among water purveyors within the area is essential for orderly development.

Snohomish County Council declared North Snohomish County to be a CWSSA on October 19, 1988. As the next step, the North Snohomish Water Utility Coordinating Committee (WUCC) was formed to implement Coordination Act requirements. WUCC membership consists of systems with 50 or more services in the CWSSA and representation from the county, Snohomish Health District, DOH, and the Tulalip Tribes. The first WUCC action was to define the external boundary of the CWSSA, which is illustrated in Figure 2-1. This boundary was ratified by the County Council on July 5, 1989 and remains unchanged to this day.

Members of the WUCC worked together to create the North Snohomish Coordinated Water System Plan (CWSP), which was completed in 1991. The CWSP sets minimum standards that must be followed by all water systems in unincorporated parts of the CWSSA. It also designates service area boundaries for each system to prevent overlapping or redundant water service. For this effort, the proposed service areas of participating systems were combined on a base map and efforts were made to resolve conflicting boundaries. Then, each system signed a Service Area Agreement and returned it with their individual WSP to demonstrate responsibility for their designated area. The District's agreement can be found with Resolution 4590 in Appendix 2-1.

The WUCC also established a Utility Service Review Procedure (USRP) to identify water service for new developments, with a goal to minimize creation of new public water systems. As administrator of the USRP, the County refers each subdivision to the closest water utility in this order of precedence: (1) public water supplier in a designated water service area; (2) adjacent water utilities that intend to expand; (3) Snohomish County PUD; or (4) other approved SMAs. If water service is not "available" from these purveyors, the subdivision can proceed with individual wells, or a new water system can be created to serve the project under certain conditions.

In its designated service area, a water purveyor can exercise the following options in order of priority:

- Provide direct service by extending facilities;
- Own and operate a remote system until the two systems are connected;
- Enter into an agreement for a remote system, specifying operational and financial obligation of owners of the system;
- Deny the provision of service and relinquish that portion of its service area.

In 2001, the WUCC amended the USRP to clarify that a public water supply is “available” for a proposed development when:

- A distribution line of adequate size is across a frontage of the property being subdivided; *or*
- The existing public water supplier is planning, at its own expense, to extend water across a frontage of the property within one year from the initial written request; *or*
- The applicant is willing to extend the existing water main to the property at the applicant’s own expense, per the water supplier’s policies and procedures; *and*
- Documentation is provided from the water supplier that any of the above three provisions can be met; *and*
- A Water Availability Letter is provided from the public water supplier; *and*
- Service can be provided in a "timely and reasonable" manner, per RCW 70.116.060.

This process, which is specific to Snohomish County, gives the developer an option to drill individual wells for each newly created lot only if a water main does not already front property that is being subdivided. If a water main does not front a property, and the developer proposes a new water system (such as a well serving more than one lot), the last bullet allows the designated purveyor to require that water facilities be extended to the project or to specify conditions for the new system. It should be noted that the above process does allow individual wells to be drilled on existing lots that are not being subdivided, even if a water main already fronts the lots. Developers can appeal water service decisions using the process described in Section XI of the CWSP.

The exact wording of RCW 70.116.060 for “timely and reasonable” (referenced in the above definition of “available” water service) is:

> “No other purveyor shall establish a public water system within the area covered by the plan, unless the local legislative authority determines that existing purveyors are unable to provide the service in a timely and reasonable manner, pursuant to guide-lines developed by the secretary. An existing purveyor is unable to provide the service in a timely manner if the water cannot be provided to an applicant for water within one hundred twenty days unless specified otherwise by the local legislative authority.”

A DOH guidance document for preparing CWSPs points out there is no specific timeframe for which a purveyor must plan to provide service under the Coordination Act, but that a 20-year planning horizon is recommended when establishing service areas for consistency with the GMA. When a purveyor requires an applicant to hook up to a system, then it must make sure this can be accomplished in a “timely and reasonable manner.” Under the Coordination Act, a water purveyor may decline to provide water service if they cannot or will not provide the new service in a timely and reasonable manner.

A DOH guideline on “timely and reasonable water service” points out that, although the Coordination Act defines “timely” as 120 days, the Act does not state when this begins and ends. If the CWSP does not specify actions for completion within this timeframe, then water systems must adopt their own procedures for “timely” provision of service. The DOH guideline also suggests water service is “reasonable” if conditions of service are consistent with:

- Local land use plans and development regulations
- Conditions of service and costs in the system’s approved WSP
- The system’s standard of practice experienced by other applicants requesting similar water service

In summary, with respect to the Coordination Act, a water purveyor should select a service area for which it can reasonably plan its facilities; the water purveyor has first right of refusal to provide service in its designated area; and, the purveyor should describe its policies for deciding whether a water service request can be processed in a timely and reasonable manner.

2.1.2 Municipal Water Law

The MWL created additional requirements for municipal water suppliers. According to DOH guidance on the MWL, municipal suppliers must now identify the following more specific components of their service areas in planning documents:

- **Existing Service Area:** Where a water system already serves customers and within which direct or retail water service connections are currently available.
- **Retail Service Area:** Where a municipal water supplier will commit to a “duty to serve” new customers. (This must include the existing service area and may include where new service is planned.)
- **Future Service Area:** Where the water purveyor plans to provide water service in the future. (This matches the service area in the CWSP. The future service area may or may not be the same as the retail service area.)

It is also recommended that purveyors identify **Wholesale Service Areas,** where their system provides water to other water systems.

A key difference between the two laws is that the MWL imposes a “duty to serve” on municipal suppliers in their retail service area, while the Coordination Act simply grants a “right of first refusal” throughout the entire service area. A municipal supplier’s “duty to serve” in its retail service area applies if these four conditions are met:

1. The system has sufficient capacity to serve water in a safe and reliable manner;
2. The water system has sufficient water rights to provide service;
3. The service request is consistent with local plans and development regulations;
4. The water system can provide service in a timely and reasonable manner.

With regard to the “duty to serve” conditions 1 and 2, this WSP evaluates District water facilities, water sources, and water rights to assure that planned improvements are at least sufficient to support projected growth in the retail portion of the water service areas over the six-year planning period.

Condition 3 is satisfied by assuring this WSP is consistent with applicable county and city land use comprehensive plans and policies. This condition is also satisfied through ongoing coordination with local jurisdictions as they process permits in the District's service areas.

Condition 4 is addressed by conducting business in accordance with District procedures for providing timely and reasonable water service, as described later in this chapter.

The MWL uses the term "timely and reasonable" differently than the Coordination Act. The Coordination Act compels an applicant to use water services that a purveyor determines to be timely and reasonable. The MWL has the opposite point of view, in which the purveyor is compelled to fulfill the request of the applicant if the service can be provided in a timely and reasonable manner. DOH decided not to define "timely and reasonable" in relation to the MWL because each water system and each application for service is unique. However, DOH has provided guidance regarding elements to consider when developing service area policies, which will be discussed later in this chapter.

2.1.3 Satellite Management Agency Rules

The concept of SMAs was introduced with the 1977 Coordination Act. SMAs can own or operate more than one water system on a regional or countywide basis without the necessity for a physical connection between such systems. The District developed and began implementation of its Satellite System Management Program in 1980. DOH formally approved the District as a SMA in 1995. A copy of the DOH approval letter is included in Appendix 1-2.

The Coordination Act was amended in 1991 to require counties to identify SMAs to serve in areas where no water purveyor is designated. When a new water system is proposed in an area not claimed by an existing system, local agencies must refer it to one or more qualified SMAs, to explore the possibility of the SMA either owning or operating the new system.

In 1995, Senate Bill 5448 further tightened requirements by specifying that new public water systems must be owned by a SMA, rather than just requiring that the option be explored. If a SMA is not "available," the new system can be approved with a condition that it will be owned or managed by a SMA in the future if such management or ownership can be made with reasonable economy and efficiency. A 1995 guidance memo from DOH to local government jurisdictions emphasized that these provisions apply to any new water system, down to the smallest systems serving only two houses.

2.1.4 Receivership Law

A factor to consider when becoming a SMA is that such purveyors may be asked to take responsibility for other water systems that have failed. When DOH and the local health jurisdiction have exhausted all other options to bring a system into compliance, they can petition the court to place the system into receivership. The petition must identify one or more candidates consenting to assume operation of the system. If no entity is named, the county becomes the receiver by default.

In Snohomish County, the Service Area Agreements signed by water purveyors under the CWSP contain a statement that that the purveyor agrees to be named as the receiver in such actions initiated in their service area. Outside of claimed service areas, the District will most likely be asked to serve as the receiver on behalf of the county, or to at least assist the county in its receivership role.

2.1.5 Growth Management Act

The GMA was enacted to ensure a continuation of the state of Washington's high quality of life. The GMA originally passed in 1990 and has been amended several times since. The basic objective is to encourage local county and city governments to develop and implement 20-year Comprehensive Plans that incorporate their vision of the future within the framework of the broader needs of the state.

Under the GMA, municipalities must complete their own Comprehensive Plans while coordinating planning efforts with those of the county and surrounding municipalities. Likewise, water service provided by expanding public water systems must be consistent with land uses established in the Comprehensive Plans, as well as with water service areas established in CWSPs or other state approved planning processes.

The GMA requires water purveyors to provide evidence of adequate water service before the county will issue a permit for new development in unincorporated areas. Therefore, the District must anticipate the location of future development and plan for construction of water distribution systems sufficient to meet future demands.

The District serves water customers within the Urban Growth Areas (UGA) of five cities (Lake Stevens, Granite Falls, Gold Bar, Marysville, and Snohomish). The District's water service areas have been developed to be consistent with the land use plans of the jurisdictions it serves.

2.2 CURRENT DISTRICT SERVICE AREAS

As described in Chapter 1, the District's water service authority covers all of Snohomish County and Camano Island where service is not already provided by other purveyors. In the CWSP process, the District had to be more specific about where it was actively planning to provide water service. To address the Coordination Act, the District's 1995 WSP divided its authorized service area (all of Snohomish County and Camano Island) into five sub-areas:

1. An Integrated System Area to ultimately be served by a single system as multiple water systems gradually merge together
2. A Remote System Area, to be served by individual remote water systems,
3. A Satellite System Area, consisting of all areas of the county not claimed by other water purveyors
4. Camano Island, where the District does not plan to provide service
5. Areas claimed by other water utilities where the District would not provide service unless specifically asked by the systems' owners and/or customers

The District's Integrated System Area, Remote System Area, and Satellite Water Systems are shown on the CWSP service area map (Figure 2-1). Only minor modifications to the District's service areas have occurred between 1995 and the present. Changes were made to adjust boundaries with adjacent purveyors and to add systems that became owned by the District.

Water systems in Figure 2-1 are identified as "expanding" or "nonexpanding." Expanding systems intend to install or alter facilities to increase their existing service areas and/or their number of approved connections. Non-expanding systems are mainly planning to serve customers from existing facilities up to their approved number of connections.

2.2.1 Current Integrated System Area

Geographic features that delineate boundaries of the Integrated System Area are:

- To the north: the north fork of the Stillaguamish River
- To the south: service areas of adjacent water systems
- To the east: foothills of the Cascade Mountains
- To the west: the Snohomish River flood plain, State Route 2, and the Arlington and Marysville water service areas

Half of the District's water systems are in the Integrated System Area, including: (1) Lake Stevens, (2) Dubuque, (3) Lake Roesiger, (4) Storm Lake, (5) Creswell, and (6) Pilchuck 10.

2.2.2 Current Remote System Area (Includes Sunday Lake & 212 Market)

The Remote System Area is shown with an "expanding system" boundary northwest of the Integrated System Area. Geographic limits of the Remote System Area are

- To the north: the Skagit County Line,
- To the south: the Stillaguamish River Valley,
- To the east: foothills east of State Route 9, and
- To the west: the city of Stanwood water service area.

When the District defined the Remote System Area in 1995, it was envisioned to be served by individual remote water systems, which would be connected when economically feasible. No specific improvements were proposed at the time. Water service for new developments would be reviewed on a case-by-case basis. If feasible, the new systems would be constructed to District standards and owned by the District. The 1995 WSP stated the District was committed to act as the receivership agency in the remote area.

Little has changed in fifteen years. Sunday Lake and 212 Market are still the District's only systems in the Remote System Area. District responsibility started for Sunday Lake in 1994 and for 212 Market in 1995. In 1999 and 2000, the District entered into service agreements with Thomas Water Company to operate the Meadow Ridge system and with the Kackman Creek Homeowners Association to run the Kackman Creek system. As more homes were built, the homeowners decided to take a more active role in managing their own water systems and terminated their contracts with the District.

2.2.3 Current Satellite System Area

The Satellite System Area is the entire area outside of claimed water service areas in the county. The District is approved to serve as a SMA throughout the county. Within the CWSSA boundary, the CWSP gives the District first priority as the SMA. If the District decides a proposed water system is not feasible to serve, the county will refer the project to another approved SMA.

The manner in which the District provides water service in the Satellite System Area is similar to the provision of service in the Remote System Area. The primary difference is the level of responsibility accepted by the District. The 1995 WSP took an approach that the District *will* own or accept any system in the Remote Area, but that it *may* own new systems and will *consider* acting as the receiver in the Satellite System Area.

The District's current satellite systems consist of the Kayak, May Creek, Skylite, and Otis water systems.

2.2.4 Current Kayak Service Area

The District acquired the Kayak system in 2006 and completed improvements in 2009. The service area was claimed by the previous Kayak system owners when the CWSP was first drafted. The service area transferred to the District with the change in ownership. The current boundaries are defined by the place of use descriptions of the conveyed water rights which correspond to the subdivisions that the water system was intended to serve.

2.2.5 Current May Creek Service Area

The May Creek service area is delineated:

- To the north: by the Cascade foothills and Wallace River
- To the south: by Highway 2 and the Skykomish River
- To the east: by the CWSSA boundary and Gold Bar Nature Trails
- To the west: by the city of Gold Bar service area.

The May Creek service area boundary changed slightly in 2001 when the District agreed to accommodate portions of the city of Gold Bar's proposed expansion.

2.2.6 Current Skylite Service Area

The Skylite system is not shown in Figure 2-1 because it is outside the CWSSA. Skylite is located in Sections 2 and 11 of Township 27 N, Range 8 E, south of the Startup water system and south of the Skykomish River. Its service area consists mainly of lots in the Skylite Tracts subdivision.

2.2.7 Current Otis Service Area

Otis is a non-expanding system designed to serve five lots in the Arlington area. When Otis was created, Arlington declined to operate it as a remote system, so the District agreed to own and operate it as a satellite system.

2.2.8 Camano Island (Unserved Area)

Camano Island is located west of the city of Stanwood in Island County. The District has provided electric service to the Island since 1949. Island residents voted to be annexed to the District in 1984.

Water supply for Camano Island is provided from numerous groundwater systems and private wells. Groundwater studies in the mid-1980's revealed 25 percent of the wells were experiencing signs of salt water intrusion. The same studies estimated that groundwater recharge is only adequate to serve the projected island population over 50 years in the "best case" scenario.

In the past, several small Camano Island systems approached the District for assistance. After an initial evaluation, the District concluded that feasible solutions would be difficult to develop because of uncertainty regarding available groundwater. In June 1995, the District and Island County proposed an integrated aquifer utility study to develop a water resource management and supply plan. An informational ballot was prepared and mailed to property owners on the island, explaining the proposal which included levying a property tax to fund the study. When ballots were counted, a majority of responding property owners did not favor the proposal. As a result, the District's current policy is to not provide water service on Camano Island.

Camano Island purveyors continue to work on managing water resources through the Camano Water Systems Association, representing systems ranging from several hundred to fewer than ten customers. The Association sponsored the Camano Drinking Water Forum in 2010, which brought together water purveyors, single-party well owners, system operators, and well drillers in eight weekly sessions to facilitate how the community can monitor and collect aquifer data and become involved in expressing concerns for future drinking water use. The Association is also developing a web site where each member system will have their own page for notices and community information.

2.3 PROPOSED DISTRICT SERVICE AREAS

Because the District is a municipal water supplier in terms of the MWL, it must now identify its *retail service area*, which includes its *existing service area* and may include areas where future service is planned. The retail area is where the District has a "*duty to serve.*" Service areas in Figure 2-1, described in the previous section, are *future service areas.*

Figure 2-2 shows the District's proposed service areas, developed to consider MWL requirements and to reflect development trends. These proposed revisions to the District's service area boundaries are being submitted to adjacent water purveyors for review. A more detailed version of Figure 2-2 can be found on the CD that accompanies this plan.

2.3.1 Proposed Integrated System Area

The District is updating the eastern boundary of its Integrated System Area to match the edge of the Commercial Forest-Forest Transition Area (CF-FTA) in the County Comprehensive Plan. The county's 2005 General Policy Plan intended to allow partial development in the CF-FTA at one dwelling per 10 to 20 acres, but only if adjacent land use restricts normal forest practices. Otherwise, the minimum lot size is 80 acres. Excluding the CF-FTA at the eastern edge of the service area simply indicates that the District does not foresee that it would be cost effective to extend water mains to lots greater than 10 acres in size. If the District receives a request for water service consistent with land use, the service area boundary can be adjusted with the agreement of other water purveyors if provision of water service is feasible.

The proposed future service area also includes adjustments along rivers and highways and minor modifications with adjacent utilities. The affected adjacent water systems were contacted in the process of preparing Figure 2-2. Modification of boundaries with the city of Snohomish and Three Lakes Water Association are discussed in the next chapter. The District is also in process of drafting an agreement with the Roosevelt, Meadow Lake, and Three Lakes water associations that resolves service area gaps and overlaps common to these multiple systems.

The District has planned water facilities for at least 20 years of population growth in the Integrated System Area, including water mains that will connect the water systems to each other. In the rural areas, water extensions are typically for rural cluster subdivisions, which allow groupings of lots while preserving tracts of land for open space. Water extensions to rural clusters promote water conservation by use of metered water services compared to the alternative of larger lots with individual wells.

Figure 2-2 shows the existing service area and the retail service area within the future service area. The existing service area outlines currently defined pressure zones surrounding existing water mains. The retail service area covers where water main extensions could reasonably happen in the next six years. To determine the retail area, a distance of about a half mile from existing water mains was examined. This area was pulled back around water mains smaller than 8-inch diameter and in areas where geologic features make expansion more involved than simple water main extensions. The retail area was expanded beyond a half mile in the vicinity of planned water main extensions and where there are known requests for service.

2.3.2 Proposed Lake Goodwin Service Area

The District has been approached by a developer interested in extending water from the Lake Stevens Integrated System to a project on the north side of the Seven Lakes Water Association. In the course of discussions with Seven Lakes, it appears the Association does not have capacity to serve the project, although they have not formally declined to serve.

At the request of the developer, the District issued a letter of water availability stating that water can be provided from the Lake Stevens system if facilities are extended at the developer's expense. This would include pumping and storage in addition to a properly sized water main. The District is showing this project as the Lake Goodwin future service area in Figure 2-2, which overlaps the Seven Lakes claimed service area. The District does not oppose Seven Lakes serving the project. However, if the Association is unable to serve, this portion of their service area will be relinquished according to Coordination Act and CWSP procedures. Lake Goodwin is only shown as a future water service area because improvements to serve the project are not fully defined. If the developer moves forward, the District will require an amendment to this WSP to specify the improvements.

2.3.3 Proposed Wholesale Service Areas

The District currently sells water to the Granite Falls, Arlington, Sudden View, and Twin Falls water systems on a wholesale basis. These wholesale service areas are outlined in Figure 2-2. Although Arlington only uses District-provided wholesale water in part of its system, the entire Arlington service area is described in the District's wholesale service area because the District's agreement with Arlington does not limit where the water can be used. The other three systems use District wholesale water as their sole source of supply.

The District sells water to several mobile home parks and to Lake Conner Park, a private camping club with about 200 sites. These systems are billed as commercial customers and are not classified as wholesale because they are not regulated public water systems.

The District has emergency interties with the cities of Gold Bar and Marysville and is planning to add an emergency intertie for the city of Snohomish. Because these interties are not routinely used as sources of supply, these systems are not counted in the District's wholesale service areas.

2.3.4 Removing the Remote System Area

The District proposes to remove the Remote System Area because it no longer distinguishes practices between the Remote and Satellite areas. By removing the Remote Area from the CWSP map, this area will become part of the Satellite System Area. Because the District is the SMA with first right of refusal in the Satellite Area, it will still have an option to serve any proposed water system in the former Remote System Area. If the District declines to own and operate a proposed water system, it will be referred to another approved SMA or certified contract water system operator.

The proposed service areas for the District's satellite systems are shown in Figure 2-2 and are described below. The District recommends that all areas in the county outside the claimed service areas continue to be recognized as the Satellite System Area.

2.3.5 Proposed Sunday Lake Service Area

The "future service area" shown for Sunday Lake in Figure 2-2 represents a distance that might be reasonable for extension from the system. For instance, the District received an inquiry from a developer who was considering extending water from Sunday Lake to property near I-5. Although this project has not materialized, an extension for a similar distance might be possible. The proposed service area for Sunday Lake extends north by about 4,000 feet; south to the top of the steep slope above Pioneer Highway; east to I-5; and west to the city of Stanwood's water service area.

The Sunday Lake water system is currently approved for 278 Equivalent Residential Units (ERUs) and the District has made commitments for 186 connections. This leaves 92 available single-family hook-ups. The "existing service area" is an outline of lots currently served by the system. The "retail service area" represents an area that could consume the remaining approved water services if every lot connects to the system and subdivides to the maximum allowed potential under current zoning.

In reality, full build-out of the Sunday Lake retail service area is not likely, because many existing lots are already developed with houses served by wells. If a request is received in the future service area and it looks like the project will move forward, then the District will prepare a WSP amendment to adjust the retail service area within the future service area. In this way, the retail area will always represent the maximum area that can be supported by the system, while leaving options in the future service area as the true direction of development unfolds.

2.3.6 Proposed 212 Market and Otis Service Areas

The 212 Market and Otis will remain non-expanding water systems. 212 Market will only serve the gas station, market, and deli that it was originally designed to serve. If the Sunday Lake system extends to the 212 Market, then the two systems will be connected. Similarly, Otis will only serve the five residential lots that it was designed to serve. It is unlikely that Otis will ever merge with any of the District's other water systems.

2.3.7 Proposed Kayak Service Area

In July 2009, DOH restored the Kayak water system approval to 481 ERUs after the District completed improvements to bring the system into compliance. The District has commitments for 390 services in the existing area. This leaves 91 available ERUs that could be used in existing or future service areas.

A June 2008 project report prepared for the Kayak system is attached as Appendix 2-2. The report projects a build-out of 395-444 connections in the existing service area depending on whether lots are subdivided to their full potential under current zoning. Most of the remaining lots are large enough to have an option to drill their own well if they do not subdivide.

Until recently, the Kayak service area was restricted by its water rights to the "existing service area" shown in Figure 2-2. The District is now proposing a "retail service area" expansion as well as a "future service area" extending to Puget Sound and to the boundaries of adjacent expanding systems.

Kayak Retail Service Area Expansion

The Kayak Point retail service area expansion would involve altering the place of use of two of its Kayak Point water rights (G1-22415, G1-25989C) so they may serve the Kayak Point Golf Course Clubhouse and Kayak Park restroom facilities via a water line extension. This retail service area expansion was requested by Snohomish County.

The District's Kayak water system surrounds the Kayak Point Golf Course which has its own wells for domestic water and irrigation. Estimated water use by the Clubhouse based on fixture units is equal to about five residential services (ERUs). The county also manages the Kayak Point County Park west of the golf course and has requested service for its various restroom facilities. Estimated water use by these facilities is not expected to exceed five ERUs and is intended to supplement supply from the park's existing well sources.

After review of Snohomish County's 2005 Comprehensive Land Use Plan (Plan) applicable zoning regulations, and related population allocation for this area, the District has determined that the proposed retail service area/water right place of use expansion is not inconsistent with the County Plan and applicable development regulations. The District has also determined that the new retail service connections fall well within the number of available ERUs for the Kayak Point water system, as well as the quantities (i.e., 300 gpm (Qi) and 156 afy (Qa)) authorized by the two Kayak Point Water Rights cited above. Consequently, the proposed retail service area expansion may occur upon approval of this water system plan update in accordance with RCW 90.03.386(2).

Kayak Future Service Area

If a request is received involving property and/or a development located within the Kayak Point future service area, the District will prepare a WSP amendment to adjust the retail service area within the future service area. In this way, the retail area will always represent the maximum area that can be supported by the system, while leaving options in the future service area as the true direction of development unfolds.

When evaluating the Kayak system to determine a "retail service area," the Clubhouse and county park are the only locations beyond the existing service area where the District foresees potential water service in the next six years. Water main extensions would be necessary to reach the remaining residential lots in the future service area. However, these lots are mostly already subdivided with homes on wells, so such extensions may not be cost effective.

2.3.8 Proposed May Creek Service Area

The proposed future service area for May Creek is identical to Figure 2-1. The existing service area in Figure 2-2 includes lots currently served by the system. The retail service area extends beyond the existing service area to a ground elevation of 300 feet, which can be served by gravity from the storage tanks. A booster pump station would be needed to deliver water to any proposed subdivision to the east.

2.3.9 Proposed Skylite Service Area

A service area for the Skylite system has been added to Figure 2-2. As stated earlier, this system is outside the CWSSA. Skylite is a non-expanding water system. So, the existing, retail, and future service areas are identical.

2.3.10 Proposed Camano Island Unserved Area

The District proposes to continue its policy of not providing water service on Camano Island. If new information justifies a re-evaluation of this policy, the District will do so if requested by Island County officials or a majority of property owners on the island.

2.4 SERVICE AREA POLICIES

The District has attempted to define retail water service areas in a manner that assures it can fulfill its duty to serve. The District will strive to serve all applicants in its retail water service areas, provided all District policies related to service can be met and the project is consistent with applicable statutes, rules, and guidance.

All proposed connections and extensions within the retail water service areas shall be allowed unless deemed unfeasible by the District at the time of request due to water supply and/or system capacity constraints. Furthermore, the District will state that water service is available anywhere in the county, as long as the applicant is willing to design and construct the necessary facilities at their own cost to deliver water to their project in accordance with District standards and applicable laws. In all cases, projects that do not front an existing water main have an option to drill individual wells for each single-family residential lot, even if the District issues a statement that water is available from one of its water systems.

It is important to recognize that the District's function is not to plan land uses within its boundaries, but to respond to land uses under applicable land use plans. The District's facilities are not to be used as tools for implementing changes in the character or timing of planned land uses.

2.4.1 Timely and Reasonable Water Service

Despite the best efforts, it is impossible to define retail service areas in which all scenarios for water service can be fulfilled. Table 2-1 has been developed to illustrate how the District determines when it is "reasonable" to provide water service. A basic tenet of District policy is that growth pays for growth, or that existing water customers do not subsidize system expansions. District policies are designed to ensure that each new connection or facility extension will be paid for by the individuals that are benefitted.

As mentioned earlier, the Coordination Act defines "timely" as providing service within 120 days unless otherwise specified by the local legislative authority. However, the Act does not state when the 120-day period begins and ends. Furthermore, the CWSP does not specify actions to be completed in this timeframe. Therefore, the District has developed the following documentation of routine procedures for timely provision of service. Because time associated with design, permitting, and construction is outside the District's control, these are not counted in the timeline. The goals for District turnaround times are underlined. When added together, the combined District turnaround times are less than 120 days. There is no guarantee that all service requests can be processed in these timeframes. Large or complex projects might take more time.

(1) Typically, an owner, representative, or potential purchaser of a property will call the District in the early stages of investigating options for water service. The District's goal is to initially respond to such requests within <u>two working days</u>. Some projects may necessitate meetings and further exchange of information. This WSP and related Policy Manual govern the determination of water improvements. Each project is evaluated in relation to the existing water system and the applicant is informed of any facilities that would need to be constructed and the related fees. The District does not consider such inquiries to be official requests for service until an agreement is signed to extend facilities or until all fees are paid to install an individual service.

(2) The District will write water availability letters for applicants that pay a $25 fee or upon the request of applicants that have paid all fees for service installation. The requested service will be evaluated by District staff to determine system capacity, fire flow availability, meter size and/or other improvements necessary to provide adequate water pressure, fire flow, and water quality. In many cases, this has already been done during an initial inquiry, so

Table 2-1: General District Criteria for Timely and Reasonable Water Service Decisions

Scenario	**Distance from existing water main inside District Retail Service Area** (1)			
	Water main Fronts Property	Within 1/4 mile (2)	1/4 to 1/2 mile (2)	Greater than 1/2 mile (2)
Standard Subdivision (5 or more lots)	Required to hook up (a)	Water available if willing to extend at own expense per District standards (a) (3)	Water available if willing to extend at own expense per District standards (a) (3)	Water available if willing to extend at own expense per District standards (a) (3)
Short Subdivision (4 or fewer lots outside a UGA; 9 or less lots in a UGA)	Required to hook up (a)	Water available if willing to extend at own expense per District standards (a) (3)	Water available if willing to extend at own expense per District standards (a) (3)	Water available if willing to extend at own expense per District standards (a) (3)
Rural Cluster Subdivision	Required to hook up (a)	Required to extend District facilities (c)	Water available if willing to extend at own expense per District standards (a) (3)	Water available if willing to extend at own expense per District standards (a) (3)
Proposed Group A water system	Required to hook up (b)	Required to extend District facilities (b) (3)	Required to extend District facilities (b) (3)	Evaluate on case by case basis (b) (3)
Proposed Group B water system	Required to hook up (b)	Required to extend District facilities (b) (3)	Evaluate on case by case basis (b) (3)	Evaluate on case by case basis (b) (3)
Proposed "two-party" water system	Required to hook up (b)	Consider interim connection agreement (b)	Water available if willing to extend at own expense per District standards (a) (3)	Water available if willing to extend at own expense per District standards (a) (3)
Individual service request for existing lot	District agrees to serve	Consider interim connection agreement	Water available if willing to extend at own expense per District standards (a) (3)	Water available if willing to extend at own expense per District standards (a) (3)
Proposed individual well on existing lot (not subdividing)	Not required to hook up (a)	Not required to hook up (a)	Not required to hook up (a)	Not required to hook up (a)

Notes
(1) Measured along existing or proposed roads to the project site.
(2) Applies if existing water main is 8-inch diameter or larger. For smaller existing water main, scenario will be evaluated on a case by case basis.
(3) Individual wells are an allowed alternative for each residential lot, if lots are 1 acre or larger and can meet septic system setback requirements.

Authority
(a) North Snohomish County Coordinated Water System Plan (Per CWSP Section V.1, use of individual wells allowed only when public water does not meet the criteria of "available" in subsection V.7. Water for houses on existing lots is exempt from this procedural policy.)
(b) Coordination Act, RCW 70.116.060 (No new public water system shall be created in the CWSSA unless existing purveyors are unable to provide service in a timely and reasonable manner.)
(c) Snohomish County Code (SCC 30.41C.070(3)(e) for rural clusters within 1/4 mile of existing water mains)

availability letters can usually be issued within one week. After the letter is issued, it is up to the applicant to determine their schedule to proceed with installation (by paying the remaining fees or, for larger projects, designing and constructing facilities in accordance with District procedures). Water availability letters expire after five years, but can usually be renewed if requested.

(3) For proposed subdivisions where all lots will front an existing water main, the District collects its Distribution System Charge (DSC) in addition to the $25 fee before issuing a water availability letter because there is no county mechanism to assure that future lot owners will actually hook up to the water main after the county approves the subdivision. Remaining hook-up charges are collected for each service connection when the developer or future lot owner applies to install service lines and meters.

(4) In addition to the District's water availability letters, the county may send a Preliminary Certificate of Water Availability for the District to complete and return within 30 days. This occurs when the county receives a land use application and determines that the District is the appropriate purveyor following the Utility Service Review Process. The District's goal is to complete and return these certificates within one week.

(5) If the District declines to provide service in its retail area, the potential customer can appeal through the dispute resolution procedure described in the District's Policy Manual. In addition, an appeal to the WUCC under the CWSP can occur if the District *requires* an applicant to hook up to District facilities and the applicant does not like the District's terms.

(6) For individual service connections, after all fees are paid, the service line and water meter can usually be installed within three weeks. Priorities for construction crews are: 1) emergencies; 2) critical maintenance and operation projects; and 3) new service installation. Unexpected conditions or events can delay installation of new water services, but timeframes will not exceed the 120-day clock of the Coordination Act.

(7) To extend water facilities or create a new satellite system, the applicant starts the process by submitting three copies of water construction drawings along with an Information Request form. The District drafts a Developer Extension Agreement (DEA) and sends it for signature with the first design review. The signed DEA and review fees should be returned with the applicant's first response, but at least before the District approves the project for construction. District engineers typically review the drawings in a timeframe consistent with the applicant's schedule. Applicants and design engineers are encouraged to communicate with District engineers as they prepare their drawings and to submit their plans well in advance of their anticipated construction start date. At minimum, applicants should be prepared for a 30 day turnaround for the initial review and a two week turnaround for each subsequent review, until comments are satisfactorily addressed. Large or complex projects can experience longer review times. Design and review can occur concurrently with city and county review of the plat, so that the project can start construction when development approval is received. After drawings are approved, remaining steps for construction include:

- Any off-site easements are drafted

- Right of way permit application is submitted to county or city, if applicable
- Contractor provides certificate of insurance
- Contractor applies for a meter and cross-connection control assembly to use during construction
- A pre-construction meeting is held
- The District inspector monitors the project throughout construction
- Final disinfection, pressure, and bacteria tests are conducted until passed
- A District engineer signs the Certificate of Construction Completion form
- All remaining fees and charges are collected
- If requested, an agreement is drafted to defer GFC charges to future lot owners
- The applicant's engineer provides as-built water drawings
- The applicant provides a two-year maintenance bond or assignment of funds for 10 percent of installed cost
- Bill of Sale is executed to transfer ownership to the District
- The District reviews the draft "final plat" drawing to confirm that on-site water easements will show on the face of the recorded plat
- District sends a plat acceptance letter to the agency with jurisdiction (county or city)

2.4.2 Policy and Procedures Manual

The District's *Policies and Procedures Manual for Administration of Water Services* (Policy Manual) is included as Appendix 1-1. This manual is also posted on the District's web site. District staff keeps copies of the manual at their desks for frequent reference when responding to water service inquiries. The copies are updated whenever there is a change to the manual. Copies of the extension policies, standards, and specifications sections of this manual are also kept readily available to distribute to applicants, design engineers, and construction contractors.

The District's service policies are established under RCW Title 54, governing public utility districts, and by the District's elected Board of Commissioners through the adoption of written resolutions at regularly scheduled public meetings. Copies of pertinent District resolutions can be found in Appendix 2-1. The general public is free to address the Commission on any issue regarding the District's responsibilities of providing potable water service.

This WSP, which contains statements of District policy, will be adopted by resolution following a public process to address any comments. Any amendments to this WSP or changes to the policies must also be reviewed and adopted by the Commission through the public process.

Following is a summary of the structure of the Policy Manual:

<u>Policy Manual Section 1: Introduction</u>

- Goal is to provide a helpful guide for customers, building trades, and representatives of the District
- The goal is also to provide safe and reliable service at the most economical cost possible
- Improvements and incremental extensions of the District's water systems must be consistent

with the WSP, whether they are carried out by the District or a third party

Policy Manual Section 2: General Terms, Conditions, and Policies for Water Service

Describes the District's routine procedures for water service, including:

- Guidelines to initiate or terminate water service
- Service equipment requirements and responsibilities, including cross-connection control
- Meter reading, billing, and collections procedures
- Dispute resolution
- Description of rates, fees, and charges
- District action for violations
- Guidelines to process applications for fire protection only
- Special arrangements for short-term water use

Policy Manual Section 3: Extension Policies

Describes the process for projects requiring an extension of water facilities, including:

- Procedures to apply for extension or improvement of a District water system
- Responsibility for preparation, review, and approval of design drawings
- Requirement to execute a Developer Extension Agreement
- Responsibilities for permits and easements
- Responsibility to submit as-built drawings and other conditions for final acceptance
- Description of fees and options to finance
- Design and construction procedures
- Provisions for interim connections

Policy Manual Section 4: Satellite System Management

Communicates the steps involved and service options to prospective clients of District's satellite system services, including:

- Direct Service for a system that will be owned and operated by the District
- Contract Services, including operation, maintenance, monitoring, billing, and other tasks for a system not owned by the District
- Support Assistance on a more limited scale, with charges determined in advance on a time and materials basis

Policy Manual Appendix A: Standards and Specifications for Design and Construction

- Can be used as a free-standing document to communicate with engineers and contractors
- Specifies design and performance standards for source, transmission, storage, and distribution, including material and construction specifications and detail drawings
- This part of the manual is updated regularly by the District's Water Resources Standard Committee to keep pace with changing technology and issues encountered in the course of design and construction

Policy Manual Appendix B: Rates, Charges, and Fees

- Contains a series of tables listing all of the District's current charges and fees for water customers and projects

- Adjusts annually, effective on January 1 of each year, based upon the change ratio of the Engineering News Record Construction Cost Index for the Seattle area as reported for on a November to November calendar year

2.4.3 Other Key Service Area Policies

A DOH fact sheet lists elements that water systems should consider when developing service area policies. The following text describes how the District approaches these issues or where they can be found in the Policy Manual.

Possibility for cost recovery through latecomer agreements: See Section 3.3.9 of the Policy Manual.

Surcharges for areas outside a corporate boundary: The District does not distinguish its charges inside or outside of corporate boundaries. The District does have surcharges to recover costs of system improvements, as shown in Tables B-6, 7, and 8 of the Policy Manual.

Differences between service within or outside an Urban Growth Area: The District does not distinguish its service inside or outside of UGAs.

Cost for up-sizing facilities: See Section 3.3.11 of the Policy Manual for upsizing extension projects. Also, for an individual customer to increase the size of a service or to add a second meter, see Section 2.3.19 of the Policy Manual.

Wholesaling water: The District negotiates agreements to deliver wholesale water on a case-by-case basis. These agreements are described in Chapter 3.

Wheeling water: Water purchased from the city of Everett is re-sold through the wholesale water agreements described above.

Procedures for granting or requesting project time extensions: Water availability letters are good for five years, but can usually be renewed. Other than this, applicants set their own schedule based on the specific needs of their project.

Guiding principles for "first-come, first served" policies: When a system begins to approach its capacity limit based on facilities or water rights, the District tracks service commitments to assure that it does not promise service that would exceed available capacity.

Annexation: The District's preference is to continue serving where it has existing water facilities, even if an area becomes annexed by a city. Public Utility District laws protect District facilities from condemnation. The District will consider adjusting service area boundaries for areas not yet receiving District water service as long as this does not adversely affect future water service or cost recovery for the District's overall water systems. District agreements with Marysville, Granite Falls, and Gold Bar contain sections that discuss annexation issues. If a city insists that it wants to purchase District water facilities in an annexed area, the District will consider negotiations on a case-by-case basis. However, as a general rule, the District will not agree to give up service areas where it has existing or planned facilities.

2.4.4 Satellite System Management Program

The District clearly has a role as a SMA because it is authorized to provide water service throughout the county. The District's first policy to implement a Satellite Water System Management Program was adopted on August 5, 1980 under Resolution 2409.

In 1994, DOH finalized its guidance and sent letters to purveyors already recognized as SMAs, inviting them to prepare submittals and become approved. The District completed this task by providing required information in its 1995 WSP. With its 2002 WSP, the District created a free-standing Satellite Management Program to describe how it manages the program and meets state requirements. The document can be found in Appendix 1-2.

In addition, Section 4 of the Policy Manual describes options to potential satellite system applicants. The District offers three options: (1) direct service, in which the District owns the water system; (2) contract services, in which the District performs routine operation and maintenance for systems that are not owned by the District; and (3) support assistance, consisting of one-time or long-term support to systems requiring assistance on a more limited scale. If an extension of the District's system is feasible, then satellite system ownership or management is not an option.

2.5 SERVICE AREA PHYSICAL & ENVIRONMENTAL CHARACTERISTICS

A general description of the physical environment in the water service areas is provided in the following sections. A working description of the service area is useful in identifying the constraints that may affect the implementation and development of the District's water systems.

2.5.1 Climate and Precipitation

The climate of west central Snohomish County is dominated by marine influences bringing moist air into the interior of the county from Puget Sound and the Pacific Coast. The Cascade Mountains force the moisture laden clouds upward with a resultant release of moisture. The mountains also act as a barrier against extreme continental influences which occur east of the Cascades. The prevailing winds are from the southwest in winter and the northwest in the summer. The winds have a modifying effect on the climate. As a result of these conditions, the climate in the District's area is characterized by high rainfall and low evaporation rates in winter, while summers are cool and relatively dry.

In general, the District's easternmost water systems, Skylite and May Creek closest to the Cascade Mountains, experience the highest average annual rainfall. The District's westernmost systems (Kayak, Sunday Lake, and 212 Market) have the least amount of rainfall, experiencing the rain shadow effect of the San Juan Islands. This trend of increasing rainfall from west to east across the county is illustrated by data in Table 2-1, obtained from the Western Regional Climate Center. Thunderstorms are rare and approximately 70 percent of the precipitation falls during October through March. The driest months are typically July, August, and September. Late fall and winter can produce potentially damaging flood flows in the rivers, while low flow conditions are common in the summer.

Temperatures in the region rarely exceed the 80s, in degrees F, and only occasionally fall below freezing. As can be seen in Table 2-2, average temperatures are relatively consistent throughout the region. The mean average annual temperatures in the county are about 60 degrees maximum and 40 degrees minimum.

Table 2-2: Weather Station Statistics from East to West

Weather Station Location	Average Annual Rainfall (inches)	Avg Max Temperature (F)	Avg Min Temperature (F)
Mount Vernon	32.30	59.1	41.8
Everett Junior College	36.72	59.1	42.6
Arlington	46.34	not available	not available
Monroe	48.43	60.6	42.2
Startup	65.40	60.8	41.4
Darrington Ranger Station	79.48	59.3	38.9

2.5.2 Topography and Elevation

The District's water systems serve a wide range of elevations. For instance, the Integrated System serves customers ranging from 65 to 742 feet in elevation. To maintain service pressures within the level of service standards, the District's systems are split into many pressure zones which are described in Chapter 4. The *Soil Survey of Snohomish County Area, Washington,* published in 1983, describes the area as follows:

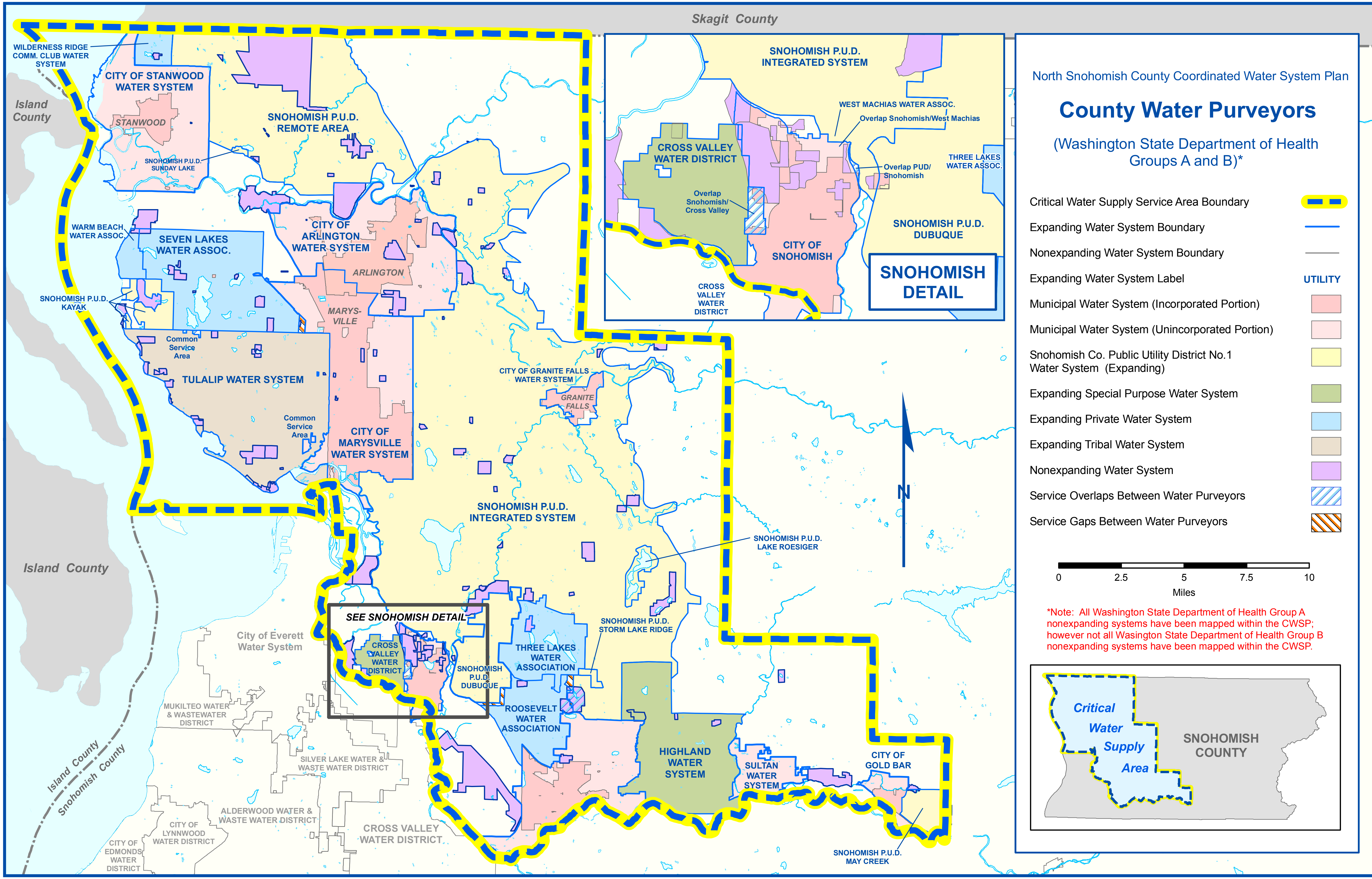
> The physiography of the survey area is characterized by: (1) nearly level alluvial deposits along the major river valleys; (2) glacial till plains, outwash plains, and terraces in the middle part of the area; and (3) mountainous areas in the eastern part of the area. The basic drainage flow is from the mountains in the east to the Puget Sound in the west. The North Fork of the Stillaguamish River, along the northern edge of the survey area, begins at the town of Darrington and drains into the Puget Sound. The South Fork, which is in the center of the area, begins at Granite Falls and joins the North Fork at the town of Arlington. The Skykomish River begins at the town of Index in the southern part of the area, flows westerly through the towns of Sultan and Monroe, and joins the Snoqualmie River near the town of Snohomish to form the Snohomish River. The Snohomish River flows northwesterly through Everett to the Puget Sound.

2.5.3 Geology and Soils

Because the District's water service areas cover a large part of western Snohomish County, the full range of the region's geologic and soils conditions can be encountered in the construction of District water facilities. In the 1983 Snohomish County Soil Survey, soil scientists determined there are about 40 kinds of soil in the survey area, differing widely in texture, natural drainage, and other characteristics. Chapter 8, Source of Supply, describes the geologic history and hydrogeology of the area and includes a detailed discussion of how these influence the District's groundwater sources.

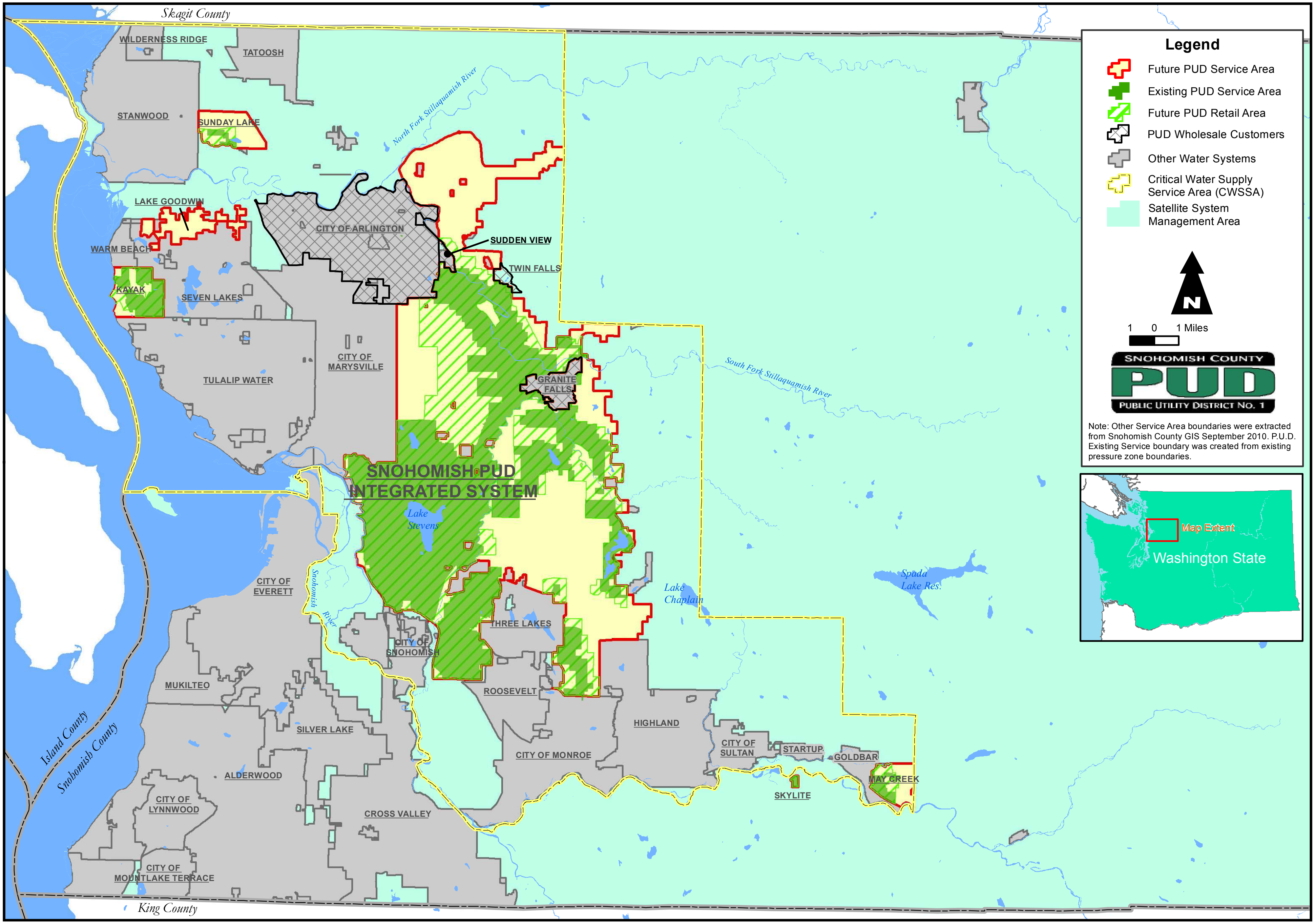
2.5.4 Critical Areas

Critical areas include fish and wildlife habitat conservation areas, wetlands, geologic hazard areas, critical aquifer recharge areas and frequently flooded areas. Every seven years, local governments are required to review and, if necessary, revise their critical areas regulations to assure that they reflect "best available science" related to the protection and management of these areas. The county updated its Critical Area Regulation (CAR) in 2007. The CAR can be found in County Code Title 30, Chapter 30.62. Maps for a variety of critical areas categories can be downloaded from the county's web site. These maps are useful for a general sense of critical areas on a regional planning level. Detailed critical area mapping occurs during development review. Increased setbacks and other measures in the 2007 CAR resulted in significant changes for subdivision proposals in the District's service areas. The District also examines and considers critical areas when designing and constructing its water facilities.



Produced by Snohomish County Planning & Development Services, Cartography/GIS 1-2011

Figure 2-2 Proposed PUD Water Service Areas



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3 Adjacent Systems, Related Plans and Agreements

This Water System Plan (WSP) was developed in coordination with other existing local WSPs, the CWSP, and with planning projections from county and city governments. The District intends to continue its cooperative relationship with local, state, tribal, and federal governments toward effective management of water resources in the county.

3.1 ADJACENT WATER PURVEYORS

Table 3-1 lists adjacent expanding water systems, including systems that have wholesale arrangements with the District. The locations of these systems can be seen in Figures 2-1 and 2-2 in the previous chapter. Many additional non-expanding water systems exist inside the District's water service areas. These small existing systems (not shown in Table 3-1) are assumed to remain independent during the planning period.

Table 3-1: Adjacent Water Purveyors

Adjacent System Name	Residential Population[1]	# of Services[1]	Adjacent to	Receives Everett water?
Wholesale Water Provider:				
Everett [2]	103,000	26,141		
District Wholesale Customers:				
Arlington [2]	14,153	6,233	Lake Stevens	Partially
Granite Falls [2]	3,080	1,368	Lake Stevens	Yes
Sudden View	60	21	Lake Stevens	Yes
Twin Falls	2	1	Lake Stevens	Yes
Other Adjacent Expanding Systems:				
City of Marysville	56,000	19,555	Lake Stevens	Partially
City of Snohomish	8,920	3,011	Lake Stevens & Dubuque	Partially
Roosevelt Water Assoc	2,401	1,053	Dubuque & Storm Lake	Yes
Three Lakes Water Assoc [2]	1,968	824	Dubuque & Storm Lake	Yes
City of Monroe [2]	16,710	6,478	Storm Lake	Yes
Highland Water District	3,000	1,157	Storm Lake	Yes
Seven Lakes Water Assoc [2]	5,512	2,213	Kayak	No
Tulalip Tribes	unknown	unknown	Kayak	Partially
Warm Beach Water Assoc	940	580	Kayak	No
City of Stanwood [2]	7,017	3,049	Sunday Lake	No
City of Sultan [2]	4,500	1,915	Jackson	Partially
City of Gold Bar [2]	2,200	734	May Creek	No

1 Based on DOH Water Facility Inventory records as of December 2010.

2 Water system reports multifamily services as number of living units in the buildings. (Other systems count one service for each multifamily customer water meter.)

3.2 RELATED PLANNING DOCUMENTS

Concurrence with land-use policies and with plans of other water purveyors is critical in evaluating the long-term adequacy of District water systems. The District maintains a library of WSPs from other water systems and tries to stay abreast of city and county comprehensive plans. Table 3-2 lists planning documents considered by the District when preparing this plan.

Table 3-2: Related Planning Documents

GMA Comprehensive Plans:	Year of Full Update*
Snohomish County	2005
City of Lake Stevens	2006
City of Granite Falls	2005
City of Marysville	2005
City of Gold Bar	2005
City of Snohomish	2005
Water System Plans:	Plan Year
Arlington	2010
Everett	2007
Granite Falls	2006
Gold Bar (update in process)	2002
Highland Water District	2008
Marysville	2009
Monroe	2008
Roosevelt Water Association	2004
Seven Lakes Water Association	Update in process
City of Snohomish	2010
Stanwood	2010
Sultan	2005
Three Lakes Water Association	2005
Warm Beach Water Association	2002
Other Relevant Plans:	Plan Year
North Snohomish County Coordinated Water System Plan (CWSP)	2010
Snohomish County Groundwater Management Plan (GWMP)	1999
Snohomish River Basin Salmon Conservation Plan	2005
Lake Stevens Sewer District, Wastewater Facilities Plan	2006
Regional Water Supply Outlook	2009

* Comprehensive Plans are frequently amended in years between full updates.

3.2.1 Service Area Consistency

The MWL requires municipal water suppliers to describe how they have considered consistency with local plans and regulations. Table 3-3 lists local planning elements that must be examined and where they can be found in this document.

Local governments in the District's service areas include Snohomish County and the cities of Lake Stevens, Marysville, Granite Falls, Gold Bar, and Snohomish. The District mailed a copy of this plan and a review checklist to each of these jurisdictions. A representative of the local government is asked to sign and return the checklist, certifying that the elements are consistent with adopted local plans and development regulations. The signed forms are in Appendix 00-1.

Table 3-3 Consistency with Local Plans and Regulations

Local Government Consistency Element	Location in this Document
The water system service area is consistent with the adopted land use and zoning within the applicable service area.	Section 2.3 and 3.2.2 Figures 2-2 and 3-1 through 3-10
The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	Section 5.2 and Table 5-4
Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.	Not Applicable
Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area [cities, county].	Section 2.4 Appendix 1-1
Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area Management plans, and Capital Facilities Element of Comprehensive plans.	Section North Snohomish CWSP 2.1.1 County/City Comprehensive Plans 3.2.2 Other Water System Plans 3.2.3 Groundwater Management Plan 3.2.4 Wastewater/Reclaimed Water Plans 3.2.4 Watershed Basin Planning 8.10

3.2.2 Land Use Plans and Zoning

County and city comprehensive plans and policies focus primarily on compliance with the GMA, which requires local jurisdictions to define urban growth area (UGA) boundaries separating urban and rural areas. The GMA calls for phased development in urban areas to balance growth with transportation, infrastructure, employment, and economic development. The GMA also requires a rural element in county comprehensive plans to permit land uses compatible with rural character and to provide a variety of rural densities.

Snohomish County Comprehensive Plan

The county finalized its first GMA Comprehensive Plan in June 1995 and completed a 10-year update in 2005, extending planning projections through 2025.

The *General Policy Plan* (GPP) within the county Comprehensive Plan establishes a framework of goals, objectives, and policies for more detailed planning and implementation that will occur in unincorporated UGAs and rural areas. District planning for water service in these areas is restricted to densities shown on the *Future Land Use Map* in Figure 3-1, with allowances for rural cluster developments. (Rural clusters allow a greater number of smaller lots than underlying zoning in exchange for preserving open space.)

The *Capital Facilities Plan* (CFP) within the Comprehensive Plan establishes level of service standards, prioritizes needed facilities, and contains an inventory of county public facilities. The CFP also includes a *Countywide Utility Inventory Report*, which presents water system information and projected water facility needs compiled from the WSPs of major water systems in the county.

Table 3-4 summarizes the currently effective Snohomish County 2025 population growth targets within rural areas (non-UGA) and within the UGAs that influence District water system growth. These growth projections are considered when developing water demand projections in Chapter 5.

Table 3-4 City and County Population Growth Targets

Area	2002 Population	2008 Population	Target 2025 Population	Annual Growth Rates		
				2002-2008	2008-2025	Target 2002-2025
Arlington UGA	13,920	17,544	27,000	3.93%	2.57%	2.92%
Gold Bar UGA	2,817	3,013	3,500	1.13%	0.88%	0.95%
Granite Falls UGA	2,909	3,446	6,970	2.86%	4.23%	3.87%
Lake Stevens UGA	26,828	30,664	46,125	2.25%	2.43%	2.38%
Marysville UGA	50,828	57,771	79,800	2.16%	1.92%	1.98%
Weighted average of annual growth rates for the above UGAs:*				2.43%	2.19%	2.25%
Non-UGA	113,320	123,349	144,634	1.42%	0.94%	1.07%
Countywide	628,000	696,600	909,453	1.74%	1.58%	1.62%

* The weighted average of annual population growth rates for UGAs was determined by multiplying the growth rate in each UGA by the 2002 population within the UGA and then dividing by the sum of the 2002 UGA populations.

The countywide and non-UGA 2024 growth targets at the bottom of Table 3-4 were reduced from the values originally planned in the 2005 County Comprehensive Plan. The original plan was based on the Washington Office of Financial Management (OFM) medium countywide population forecast of 929,314 for 2025, which was released in 2002. In 2007, OFM revised its 2025 medium forecast for Snohomish County down to 898,715. In the next year, the Puget Sound Regional Council (PSRC) adopted an updated regional growth strategy, which called for decreasing the share of the growth in the Snohomish rural areas from fifteen percent to about ten percent of the countywide growth. Also, in 2009, the County Council eliminated Fully Contained Communities (FCC) from the Comprehensive Plan and removed the associated population that had been reserved for FCCs. Considering these factors, the county's August 1, 2010 Comprehensive Plan amendments reduce the countywide 2025 growth target to 909,453. When making this adjustment, the county left the population targets within UGAs unchanged.

The county publishes annual Growth Monitoring Reports to compare actual demographic data with the growth projections. The 2008 population and 2002-2008 growth rates in Table 3-4 were determined from the 2008 Growth Monitoring Report. Growth rates shown for 2008-2025 are the remaining annual growth needed to reach the target populations by 2025.

On average, actual growth in the cities from 2002 through 2008 was slightly ahead of the growth needed to meet the revised 2025 targets. Rural growth was significantly slower than urban growth, which is consistent with goals of the GMA. The remaining growth to meet the combined 2025 targets for these UGAs allows for a slight slowdown over the next 17 years.

Figures 3-2 through 3-5 (at the end of this chapter) are selected graphs from the 2008 Growth Monitoring Report, which notes that 2008 marked the start of a considerable slowdown. Population continued to increase in 2008, but at a slower pace than the previous two decades.

The 2008 Growth Monitoring Report discusses three groups of subdivisions:

- The numbers of new residential lots created in "formal plat subdivisions" and "segregated lot condominiums" are presented in Figure 3-2. The 4,680 lots created in 2007 set a record, whereas the 1,809 lots created in these types of subdivisions in 2008 were the smallest number recorded since monitoring began in 1992.
- The new residential lots created in "short plats" are illustrated in Figure 3-3. Short plats can contain nine or less lots when located inside a UGA, and four or less lots outside of UGAs. After a peak of 700 recorded lots in 1998, the number of new lots in short plats declined steadily to 313 lots in 2002, then back to 577 in 2005. The 447 new lots in short plats in 2008 represents only a modest decline from previous years.
- Applications for new lots in "rural cluster subdivisions" (RCS) and the number of RCS lots actually recorded are shown in Figure 3-4. There was a pronounced peak in applications in 2005 to 2007 (886 proposed lots in 2005, 1,804 in 2006, and 786 in 2007). The 78 proposed RCS lots in 2008 was more typical of earlier years. The number of completed lots is much less than the number of proposed lots. Only 315 RCS lots were actually recorded in 2007 and 126 in 2008.

Lastly, the Growth Monitoring Report discusses new home construction. Figure 3-5 compares single-family and duplex building permits with the number of new lots created each year. Home construction peaked in 2005, whereas the pace of new lot creation countywide did not peak until 2007. The report notes that the current lower volume of housing construction is now happening on the backlog of lots created in 2006-2008.

City Comprehensive Plans

The District provides retail water service in the entire city of Lake Stevens and wholesale water service to the entire city of Granite Falls. District water mains pass through Granite Falls to deliver water to rural areas north of the city. The District also serves retail water customers in a portion of the cities of Gold Bar, Marysville, and Snohomish. Figures 3-6 through 3-10 are copies of land use maps for all of these cities. Figures 3-8 through 3-10 show where the District's water service areas overlap UGAs of cities where the District only partially serves. The District sells a limited amount of water to the city of Arlington, but has no facilities in Arlington's UGA. Therefore, a land use map for Arlington is not included with these figures.

Anticipated Zoning and Land-Use Changes

The county and cities periodically review zoning and land use in response to proposals, which may be adopted as changes to their Comprehensive Plans. No further land use or zoning changes that would significantly affect the District's planning are currently anticipated.

3.2.3 Related Water System Plans

Because the District purchases water from Everett and Marysville, the District communicates projected water demands for inclusion in their planning processes. Similarly, because the District provides wholesale water to the cities of Granite Falls and Arlington, the District verifies that its water supply plan reflects the projected demands of these systems. The plans of other adjacent water purveyors should also be taken into account.

City of Everett 2007 Water System Plan

The city of Everett is the predominant water supplier in the county. An analysis conducted for Everett's WSP estimated that, in 2005, 504,630 people out of 645,545 people in the county received Everett water either directly or indirectly. This works out to 78 percent of the county population receiving Everett water. The WSP counted 33 Group A and 25 Group B water systems purchasing Everett water directly, and eight Group A systems purchasing indirectly through other systems.

The city examined the plans of its wholesale customers for historic water demands, peaking factors, and demand forecasts. Water demand forecasts were developed for each wholesale customer and for Everett's retail service area. These were summed to determine the total forecasted demand for Everett water. The city concluded its surface and groundwater rights can meet average day water demands until about 2036 and maximum day demands until about 2046. A yield analysis concluded that climate change has potential to reduce Everett's safe yield by about 10 percent. Everett's WSP identifies alternative water sources that can be developed for longer-term water supply needs, including the Snohomish Regional Water Authority water right, additional reclaimed water, and unused groundwater rights.

Chapter 5 of Everett's WSP includes a water conservation plan developed by the Everett Water Utilities Committee (EWUC). The District is an active participant in this committee, and this conservation plan plays a crucial role in the District's Water Use Efficiency Program.

City of Marysville 2009 Water System Plan

Under a Joint Operating Agreement (JOA) with Marysville, the District and the Tulalip Tribes are entitled to a share of water delivered from a transmission main that conveys water from the Everett 3-line. The city's WSP observed that water purchased by the District from this shared transmission line increased 18 percent annually from 2004 to 2006. The city projected future District usage by increasing the purchased water an additional 18 percent each year until reaching the District's allotment of 3.42 MGD in 2019.

Marysville's WSP projects its retail customer demands with the following water use factors, determined as an average of the city's 2004-2006 records.

- 188 gallons per day (gpd) per single-family household,
- 160 gpd per multi-family household (85% of single-family demand),
- 90 gpd per employee, and
- A maximum day to average day demand (MDD/ADD) ratio of 1.7

Marysville would like to purchase District water facilities located inside its annexed city limits, which can be seen in Figure 3-9. The District and city have hired a consultant to determine the value of the facilities, including consideration of impact to the District's water revenue. The District will require that customers in the area experience no reduction in level of service and that the transfer not inhibit the District's ability to deliver water north to its future service area. The state legislature recently authorized moving forward with the purchase once the District and city reach an agreement on this matter.

City of Granite Falls 2006 Water System Plan

The District sells wholesale water to Granite Falls through four master meters and provides water storage for the city. Granite Falls paid for its share of transmission and storage for existing customers as part of the Granite Falls Regional Project. Source and storage for new city customers is assured as the city forwards a portion of its water connection fees to the District to pay for the additional transmission and storage impacts.

The city's wells are equipped with pumps, but are disconnected from the system. The city occasionally uses its wells to supply non-potable bulk water to nearby quarries and for other non-potable purposes.

Water use factors in the Granite Falls WSP are:

- 200 gpd per single-family service (186-204 gpd/ERU in 2002-2004),
- 92.2 gpd per capita (including unaccounted for water averaging 7.4% in 2002-4), and
- 2.0 MDD/ADD (a conservative assumption).

As summarized in Table 3-5, the city projected the amount of water it expects to purchase from the District by combining the 92.2 gpd per capita water use factor with population projections from its Comprehensive Plan.

Table 3-5 City of Granite Falls Projected Water Needs

Year	Projected year end population	Projected Avg Day Requirements (gpd)	Projected Max Day Requirements (gpd)	Projected Peak Hour Requirements (gpm)
2005	3,124	288,044	576,089	676
2006	3,238	298,567	597,133	701
2007	3,352	309,089	618,178	726
2008	3,467	319,611	639,223	750
2009	3,581	330,134	660,267	775
2010	3,695	340,656	681,312	800
2015	4,626	426,531	853,063	1,001
2020	5,798	534,583	1,069,165	1,255
2025	6,970	642,634	1,285,268	1,508

The city's population in 2004 was 3,010. The city had 1,005 service connections at that time, breaking down into 852 single-family services, 102 multi-family services, and 106 non-residential services. In 2010, the city reports 1,203 service connections, including 1,051 single-family, 44 multi-family (with 209 units), 10 recreational, and 98 commercial/institutional services.

City of Arlington 2010 Water System Plan

Because Arlington is another expanding water system that purchases water from the District, it is important to consider their projected water needs. The District's contract to supply water to Arlington is limited to a maximum flow rate of 1,000 gpm. Because it appears Arlington will not need additional purchased supply, the District will focus on assuring it can continue to meet the 1,000 gpm contractual commitment at the master meter location.

According to Arlington's 2010 draft WSP, the city plans to increase the capacity of its wells to match its water rights. When these improvements are constructed, the city expects to have sufficient water supply until about 2045. The city also plans to obtain additional water rights.

The District's agreement with Arlington does not include storage. Arlington's WSP appears to adequately identify its storage needs, considering water demands from its existing and future customers. Arlington's capital improvement program shows the city will make a reasonable effort to construct identified storage projects.

Arlington's WSP points out that the District's Otis water system is adjacent to a proposed subdivision and that the city might want to acquire the Otis system in the future. The Otis system is located just outside of the Arlington UGA boundary.

Water use factors in Arlington's WSP are:

- 90 gpd/capita in 2008, including distribution system leakage,
- 171 gpd per single family residence (163-185 gpd/ERU in 2004-2008), and
- 2.02 MDD/ADD.

City of Snohomish Water System Plan and Potential Emergency Intertie

Figure 3-6 shows two areas in the Snohomish UGA that are served by the District. The CWSP map (Figure 2-1 in the previous chapter) shows these lots inside the city's claimed water service area. The District contacted the city while preparing Figure 2-2, which proposes to update the CWSP map to show these properties in the District's existing service area.

One of the District water customers in the Snohomish UGA is the Snohomish School District bus barn. The District met with the city and the School District when the bus barn was proposed in 1992. A decision was made that the District would provide the water service through a 12" diameter ductile iron (DI) water main extended across SR-2. The water service area boundaries should have been adjusted when the city declined to serve the project.

The District also serves nine residential services inside the Snohomish UGA that were formerly known as the Tom Marks water system. Before proceeding with the project, the District called the city to confirm that they declined to be involved in this provision of water service. The Tom Marks system was integrated into the District's water system in 2001-2002, when its 4"-diameter AC pipe was connected to a 12" DI pipe under the highway. These customers are paying a surcharge of $30/month until August 1, 2028 to reimburse for these improvements.

The District and the City of Snohomish are in the early stages of discussing a potential emergency intertie agreement between the two water systems. Should such an agreement be reached, the District would provide water from its Lake Stevens water system on an emergency basis to the City in the event its filtered Pilchuck River water source becomes unavailable. The emergency intertie would tap a planned extension of the District's Lake Stevens water main. Because discussions regarding the emergency only recently commenced, it is not possible at this time to determine the specific location where the intertie connection would actually occur, the capacity of the intertie, or other related design issues. Should an emergency intertie agreement be executed, the District and/or City will prepare appropriate project report documents for DOH review and approval, as well as a copy of the agreement.

Water System Plans of Other Adjacent Purveyors

WSPs of other adjacent purveyors have been reviewed. The District is not aware of anything in the remaining plans that would impact the District's WSP.

Previous Editions of District Water System Plans

The District has prepared many WSPs since beginning its water utility operations in 1946. The level of detail in the plans increased as regulatory requirements increased. The last update was in 2002. Table 1-3, in Chapter 1, lists the projects completed since the 2002 WSP. For the most part, completed projects are consistent with the improvement plan in the 2002 WSP. Some funds intended for replacing old water mains were used to accommodate unexpected county projects, resulting in some delay to the District's pipe replacement program.

3.2.4 Other Relevant Planning Documents

North Snohomish County Coordinated Water System Plan (CWSP)

The CWSP is described in Chapter 2.

Regional Water Supply Outlook

The 2009 Regional Water Supply Outlook (Outlook) is a regional assessment of municipal water supply and demand throughout King, Pierce, and Snohomish Counties. The Outlook was developed by the Water Supply Forum (Forum) over a three year period. The Forum is a voluntary organization comprised of representatives from water utilities and local governments. District participation occurs through its involvement in the Everett Water Utility Committee, which is a Forum member. As part of this effort, water demand data was gathered from 118 water utilities in the region that serve greater than 500 customers. These utilities provide water to more than 94 percent of the area population.

The Outlook describes how conservation efforts have significantly reduced water demands since 1990. The executive summary of the report states that water use by single-family homes was 276 gpd in 1990 compared to 197 gpd in 2005. The Seattle, Tacoma, and Everett areas use less water today than 40 years ago, despite significant population growth. Reasons include reduction in water use by the region's industries, plumbing code changes, utility conservation programs, efforts to reduce distribution system leakage, and lingering changes in habits from water short years.

Table 3-6 summarizes the weighted average water use factors for single-family, multi-family, and non-residential customer classes in each county and the region for 2004-2006, in addition to sub-area averages determined for Snohomish County. The weighted averages were computed based on usage reported by each utility weighted by the number of households in each utility's service area. Weighted averages for non-residential water use were determined by matching the non-residential usage from the water utility surveys with employment populations from PSRC demographic data.

Table 3-6: Regional Average Water Use in 2004-2006

	Single-family (gpd/unit)	**Multi-family** (gpd/unit)	**Non-residential** (gpd/employee)
King County weighted average	193	124	41
Pierce County weighted average	244	167	78
Snohomish County weighted average	220	131	57
Regional Weighted Average	210	142	65
Range of individual water system data	130-370	40-255	21-265
Snohomish PUD (Lake Stevens Integrated System)	**215**	**70**	**38**
Everett (Retail and Wholesale) weighted average	219	133	57
Rest of Snohomish County weighted average	226	109	60

Data reported for the District in this study is included in Table 3-6 for comparison. The District's single-family water use factor of 215 gpd/unit in 2004-2006 corresponds closely with Snohomish County and Everett regional weighted averages. The low water use factor indicated for the District's multi-family customers may be due to the study's methodology for counting multi-family units in the District's service area. For non-residential usage, the District's result is reasonably close to the weighted averages.

The Outlook also observes that Maximum Day Demand to Average Day Demand (MDD/ADD) ratios in data reported by the water systems ranged from 1.4 to 3.0. The average ratio among the surveyed water providers was 2.2. Generally, larger water systems had lower peak day factors.

Work for the 2009 Outlook included preparation of a Municipal Water Demand Forecast Model (Model) to forecast water needs by decade from 2010 through 2060 and to extrapolate the regional water demand to 2110. The Model tested several scenarios including variations of demographic growth and climate change. Under all scenarios, the Outlook found that existing active water supplies in the region can meet projected demands through 2050, but localized water shortages may exist where infrastructure is unavailable or inadequate to move water where it is needed. In the baseline and the low demographic scenarios, existing drinking water supplies could meet demands until 2060 or beyond.

After 2050, there could be shortages in water supply if climate change materializes as forecasted and/or if population growth is greater than the baseline demographics. Climate change scenarios in the model predict that available surface water supply will decrease and projected water demands will increase. The model predicts that stream flows will be greater in the winter/fall months and lower in the spring/summer months compared to historical conditions, and that this impact widens over time. The model also predicts that customer water demands could be as much as 12 percent greater by 2060 due to the dryer spring and summer months. These computations assume no changes to reservoir operation and management and no new water supplies or additional conservation. Area utilities have adapted to past water supply fluctuations and drought periods through reservoir management, system adaptations, long-term conservation programs, and short-term curtailments. Climate change may increase these challenges, and utilities must be prepared to address such uncertainty in addition to planning for long-term supply availability.

Looking to the future, the Outlook examines potential water supply projects that water utilities have been studying and planning, plus other possible new projects. The projects are categorized into surface water, groundwater, desalination, reclaimed water, and green options. Unit costs of the identified projects ranged from $50 to $43,000 per million gallons of water produced. The Outlook provides information on these potential water supplies, but does not recommend which, if any, should be developed. However, the Outlook does propose a multi-criteria evaluation method that can be used by decision-makers in the region to compare supply options using a consistent and transparent approach.

Watershed Basin Plans

District water facilities are located in two Ecology Water Resource Inventory Areas (WRIAs):

the Stillaguamish Basin WRIA 5 and the Snohomish Basin WRIA 7. Planning efforts for these basins are described in Section 8.10.

Groundwater Management Plan (GWMP)

The county developed its draft Groundwater Management Plan (GWMP) in 1999. The GWMP provides a framework for protection of ground water resources within Snohomish County. The Surface Water Management Division of the County Public Works Department is the lead agency for implementing the GWMP.

The county developed a Ground Water Management Program as a direct result of the GWMP. The program objectives include:

- Providing the public with data on the groundwater resources of Snohomish County by compiling groundwater data and creating an on-line groundwater database.
- Preparing a subarea groundwater study to evaluate groundwater issues and recommend solutions at a local scale.
- Providing stewardship of groundwater in Snohomish County by recommending and implementing actions to protect groundwater quality for residential consumption and groundwater quantity for aquatic ecosystems.
- Providing management, policy, and technical expertise to help protect the quality and quantity of the groundwater resources in Snohomish County.
- Identifying development standards, policies, and regulations that would protect recharge to groundwater, prevent groundwater contamination, and maintain groundwater inputs to stream base flows.
- Coordinating and implementing groundwater management alternatives with purveyors, county departments, state and federal agencies, and interested parties as set forth by the GWMP.

The county's groundwater database has been a useful reference for the District, as it combines information from multiple data sources.

The subarea study mentioned above is the draft Getchell Plateau Groundwater Investigation, published in June 2005. The Getchell Plateau was selected for the study because residents in the area are highly dependent on groundwater for potable water and because groundwater systems beneath the Getchell Plateau are representative of other Snohomish County groundwater systems. The area covered by the investigation extends from the city of Snohomish to the city of Arlington and from the city of Marysville to the city of Granite Falls, which pretty much covers the District's Integrated Water System service area.

This investigation developed a picture of groundwater availability as both a source of potable water and as source of discharge to lakes, streams, and wetlands. The investigation also examined the potential impact of future urban and rural development on groundwater quality.

3.2.5 Review of Reclaimed Water in Other Planning Documents

The 2003 MWL and the amended Reclaimed Water Statute RCW 90.46 require water systems serving one thousand or more connections to evaluate opportunities for the use of reclaimed water. This section describes the District's review of local planning documents to: (1) identify where reclaimed water production facilities and reclaimed water distribution lines exist; and (2) identify where reclaimed water is used or proposed within the District's water service areas. Additional elements to evaluate reclaimed water opportunities are addressed in Chapter 6.

Reclaimed Water and Lake Stevens Sewer District Comprehensive Plan

The District has a close relationship with the Lake Stevens Sewer District, considering that Lake Stevens is the heart of the District's largest water system. The Sewer District is currently constructing its new Sunnyside Wastewater Treatment Plant (WWTP) on a 14 acre site next to SR204. The new plant is expected to be online in 2012. The existing plant, which is located in a flood plain, will be demolished after the new plant is complete.

The Sewer District's 2006 Wastewater Facilities Plan evaluated the potential for wastewater reclamation and reuse. Relevant pages from this plan are attached in Appendix 3-1. The new WWTP will use a Membrane Bioreactor (MBR) process that produces Class "A" reclaimed water, which can be acceptable for reclaimed water reuse if a feasible customer is identified. Reclaimed water was not an essential factor in designing the WWTP. There is no problem discharging into Ebey Slough; and agricultural land in the vicinity does not need additional water supply due to the high groundwater table. MBR was selected as the treatment process because it is expected to be sustainable, space efficient, and cost efficient over comparable technologies as higher levels of treatment become required.

The closest potential irrigation customers for reclaimed water are two schools with 36 acres of property (Skyline Elementary and Lake Stevens Middle School). Based on an irrigation rate of 14 inches per year and a season of five months per year, two schools could use 181,000 gpd and 12.7 MG per year. The primary cost would be the approximately 9,000 feet of 8-inch diameter pipe to deliver the water from the WWTP to the schools. A pump station would also be needed to lift the water from WWTP elevation at about 60 feet to the 400 foot elevation at the schools. The total estimated project cost was $1,164,000 in 2006. The annual cost of the reclaimed water system was estimated to be $72,300 per year, compared to $29,700 to purchase the same amount of water from the District at 2006 water rates, which made the project unfeasible at the time.

The Sewer District also identified that reclaimed water could be used to flush its sanitary sewers. Ideally sewer lines should be jetted on a 4-year frequency. Jetting requires a 4,000 gallon jet truck per 1,000 feet of sewer pipe. So, jetting the 200,000 feet of sewers over a 4-year period could use 200,000 gallons of reclaimed water in a year. Features to access the reclaimed water for sewer jetting and possibly street cleaning could be incorporated into the WWTP as part of the Phase III improvements planned for 2019. The Sewer District would also need to submit required reports to Ecology and DOH and apply for a modification to its NPDES permit.

Reclaimed Water Evaluation by Granite Falls

The city of Granite Falls 2006 WSP mentions its commercial water use decreased due to increased use of non-potable water in its WWTP processes after upgrades in late 2003. Compared to the city's 2004 commercial customer records to previous years, the WWTP improvements have saved about 20,000 gallons per day.

Granite Falls' 2005 Wastewater Facility Plan evaluated reclaimed water as an option when it doubles the capacity of its WWTP in the future. The evaluated facility would process about 0.451 MGD and would irrigate about 84 acres on school property and adjacent land. Storage for one day would be needed, because the irrigation can only be done at night to minimize public contact; and about 6,100 feet of 6" pipe would be needed to deliver the reclaimed water from the plant to the irrigation site. The treatment would be a MBR process, similar to the Lake Stevens WWTP, but on a much smaller scale.

The evaluation determined that the reclaimed water option would cost about $4 million more to construct than other treatment options; and about $5 million more if compared on a 20-year net present value basis. The city determined that the water reclamation and reuse option would only be implemented if the Department of Ecology decides to limit effluent discharges to the Pilchuck River during critical low flow conditions. However, based on a recent conversation with the City Engineer, such limits on discharges seem unlikely based on currently accepted operation methods. With the slowdown in growth in Granite Falls, the WWTP expansion is not expected to be needed for quite some time.

Reclaimed Water Reuse by City of Everett

Reclaimed water use projects by the city of Everett are beneficial to the District because of the shared Sultan Basin water supply. In 2005, Everett began providing reclaimed water for use as single-pass non-contact cooling water in Kimberly-Clark's mill bleach plant heat exchanger. Between November 2005 and January 2006, Kimberly-Clark's use of the reclaimed water ranged from 1 to 3 MGD. It was expected that their use would increase to 3 to 4 MGD during the summer months. This offsets a portion of unfiltered water historically used by the mill from Transmission Line No. 4. During the summer, one gallon of reclaimed water might substitute for a lesser amount of water from the No. 4 Line because of potentially higher temperature.

Improvements to deliver reclaimed water to Kimberly-Clark only cost about $10,000 for minor improvements to an existing pipe known as the "Crosstown Line." The reclaimed water is only treated to a secondary effluent level and is designated as a "Special Class" by the Department of Ecology. Both DOH and Ecology approved the project, which includes cross-connection control measures.

In order for Everett's reclaimed water to be used by other customers, it would need to be treated to a tertiary effluent level, most likely to a Class A reclaimed water standard, and additional permitting would be required. Everett has identified potential customers for reclaimed water including two city-owned golf courses and the private Everett Golf and Country Club. The city's Legion Golf Course is within one mile from the Crosstown Line. Everett does not have plans to provide reclaimed water to other customers in the next six years, due to the high infrastructure cost to treat and deliver the water and the fact that there is not a near-term need for additional water supply.

Reclaimed Water Evaluation by Marysville

The city of Marysville also has a wastewater treatment plant. Marysville's 2009 WSP indicates that significant investments would be needed to install advanced treatment technology and a delivery system to customers that could put the water to use. Marysville does not currently have any plans to implement a reuse strategy, but will periodically evaluate opportunities for reuse in the future.

3.3 AGREEMENTS WITH OTHER WATER SYSTEMS

Table 3-7 lists relevant interlocal agreements that the District shares with cities and other water utilities. Numbers in the table correspond to the order of the agreements in Appendix 3-2. The following summaries are provided for information only. In case of discrepancies, the agreements and their intentions supersede the text of this chapter.

Table 3-7 Relevant Water Agreements

	Agreement	Dated	Effective Through
	Everett Water Supply Agreements		
1	Agreement for Multipurpose Development of the Sultan River	July 21, 1960	The duration of the FERC license, provided that the agreement will be renegotiated after 2031
2	Amended Agreement for Multipurpose Development of the Sultan River	November 17, 1981	The duration of the FERC license, provided that the agreement will be renegotiated after 2031
3	Supplemental Agreement Between the District and the city of Everett	October 16, 2007	Addendum to the 1960 and 1981 agreements
4	Everett Water Rates Ordinance 3096-08	January 1, 2009	No end date.
	North Snohomish County Joint Operating Agreements (JOA)		
5	North Snohomish County Regional Water Supply Joint Operating Agreement (JOA)	January 10, 1991	No expiration date, but requires further agreements to be developed
6	Everett and JOA Participants Water Supply Contract	October 15, 1991	July 1, 2020
7	2003 Agreement between Marysville and PUD for Water Supply	June 23, 2003	The life of the JOA Pipeline subject to review and modification every 10 years
	District Wholesale Water Agreements		
8	City of Gold Bar	March 19, 1991	December 31, 1995 (expired)
9	City of Arlington	July 28, 1998	December 31, 2018
10	Sudden View	April 7, 2010	December 31, 2019
11	Twin Falls	April 7, 2010	December 31, 2019
12	City of Granite Falls	October 8, 2009	December 31, 2026, but may continue beyond 2026 unless terminated by mutual agreement or by 5-year written notice by either party
	Water Service Area Agreements		
13	Agreement for Establishing Water Utility Service Area Boundaries	January 29, 1997	No end date.
14	Settlement and Release Agreement with the City of Gold Bar	June 18, 2001	January 1, 2020
15	Three Lakes Service Area Agreement	2010	No end date.
16	Letter from City of Monroe regarding temporary water service	November 5, 2010	No end date.
	Other Agreements		
17	Tulalip Settlement Agreement regarding May Creek Water Right	November 6, 1999	Binding
18	City of Sultan Water Supply Pipeline Construction, Operation, and Maintenance Agreement	April 25, 2000	
19	Water and Sewer Mutual Aid Agreement	August 15, 2006	Binding until a purveyor revokes its authorizing action and delivers a copy to the Everett Utilities Director
20	Mutual Aid Agreement for Intrastate Water Utilities	September 15, 2009	Termination in its entirety when there are less than two Members

3.3.1 Sultan River Agreement

The *1981 Amended Agreement for Multipurpose Development of the Sultan River* updates an earlier 1960 agreement to build hydroelectric and water supply facilities in the Sultan River Basin, collectively known as the Sultan Project. As will be described in the next chapter, this project increased storage for Everett's primary water source in addition to creating the District's Jackson Hydroelectric Plant. The agreements divide the project costs into Water Costs, Hydroelectric Costs, and Joint Costs and describe how the District and the city will jointly operate the Sultan Project.

The District initially funded and constructed the Stage I facilities, which were completed in 1965. The agreement specified a payment plan for the city to reimburse half of the Joint Costs and all of the Water Costs. For Stage II, the District covered 25 percent of the filter plant costs and the entire cost of raising the dam and associated facilities, because the city did not need additional storage at the time. When Everett's water use reaches 140 MGD as a three-month average, the city will repay half the Stage II joint use facilities up to $10 million over a 30-year period, with interest accruing from the time the city reaches the usage limit.

The 1981 agreement states that water supply will continue to have precedence over power generation up to 225 MGD to the year 2020, but adds a restriction that water distribution is limited to a portion of the county specified by Exhibit A in the agreement. This does not change the fact that Everett's water rights allow the water to be used throughout the county, and long-term planning still supports this use. However, the self-imposed limit will apply until 2020 unless the District and Everett agree to another amendment.

In the article of the 1981 agreement on water rates and service, the city agrees to sell water to the District for re-sale to potential customers, provided that the city has first option to serve previously un-served areas of the county on the same terms that the District would serve. The city also agrees to charge reasonable rates to all city water customers whether such customers are inside or outside the city of Everett. A copy of Everett's current water rate ordinance is included in Appendix 3-2.

In 2007, the District and city entered into a supplement agreement that, subject to a declaratory order by the Federal Energy Regulatory Commission (FERC), the city is not required to be a licensee for any future FERC license for the Jackson Hydroelectric Project following the expiration of the existing FERC license. The city will continue to cooperate with the District with respect to the operation of the project consistent with the requirements of the 1960 and 1981 agreements, as amended in this supplemental agreement. In the supplemental agreement, Article II, Section 2, of the 1981 agreement was amended that the city within the water supply service area would have precedence over any Sultan Project requirement for power generation up to a maximum water requirement equal to the city's existing certificated state water rights as of February 27, 2007, provided the city stays within its service area. The parties agreed that they would cooperate in the storage and release of waters from Spada Lake and from Lake Chaplain so that the water supply requirements of the city would be met.

3.3.2 North Snohomish County Joint Operating Agreements (JOA)

The District shares in the use of a 30-inch diameter pipeline (the JOA Pipeline) that delivers water from the Everett Pipeline-3 to the Sunnyside vicinity of the city of Marysville. Three agreements govern this arrangement, as described below.

North Snohomish County Regional Water Supply JOA

This agreement, executed on January 10, 1991, establishes initial arrangements between Marysville, the District, and the Tulalip Tribes so that construction of the JOA Pipeline could begin. The pipeline is owned by Marysville with each participant paying a proportionate share of the construction cost based on their percentage of a forecasted 2010 peak day demand. Before construction completion, the participants expected to develop more detailed procedures for managing, operating, maintaining, and financing for the pipeline and associated facilities. If water use by a participant exceeds its capacity rights, the remaining participants will lease back their unused rights until additional regional facilities are constructed, as also anticipated by the agreement.

Everett and JOA Participants Water Supply Contract

This 1991 agreement describes how Everett will determine rates and charges for water used by the JOA participants. Everett sends the bill to Marysville, which in turn bills the District and the Tribes. If any of these systems sells the water to a future customer through a connection larger than 12-inches or more than 1 MGD, it must first obtain approval from Everett, which will be based on water supply impacts to the Everett water system. Furthermore, participants are restricted to providing water in the area specified by the Sultan Project agreement between Everett and the District.

Agreement with Marysville for Supply from the JOA Pipeline

This 2003 agreement details arrangements between the District and Marysville, including a charge to compensate Marysville for the operation and maintenance cost of making the water available at the District's point of connection. By the time of this agreement, the District's assigned capacity was determined to be 16.55 percent of the JOA Pipeline capacity, or 3.42 MGD, whichever is greater.

3.3.3 Gold Bar Agreements

The District has an emergency interconnect with the city of Gold Bar. A copy of the expired 1991 agreement is provided in Appendix 3-2 for information. On the few occasions when the intertie was used since expiration of the 1991 agreement, the city called the District before opening the connection, and the District charged its commercial water rate.

Also, a 2001 agreement with Gold Bar modified the service area boundary between the city's water system and the District's May Creek water system. Negotiations for this agreement occurred sporadically from 1992 until the signing of the agreement. The parties agreed to adjust boundaries so that portions of the area where the District did not already have water facilities were transferred to the city's future service area. The District continues to serve an area inside the city limits where District water facilities existed prior to annexation. Until 2020, the parties agree not to "contest" each other's water service area boundaries.

3.3.4 Arlington Wholesale Water Agreement

The District's 1998 agreement with Arlington was designed to provide water to the city through an intertie identified in the District's 1995 WSP. The District agreed to provide up to 1,000 gpm by 2002. Arlington agreed to consume the water in a manner to minimize its peaking factor, determined as a ratio of annual peak day to average day demands. This is accomplished by a flow control valve at the master meter and by Arlington's use of the intertie as a base source of supply with demands in excess of the agreed amount being supplied by Arlington's other sources.

Wholesale water rates paid by Arlington are based on Everett's water rates plus the District's cost of pumping, conveyance, administration, and depreciation. The rate is adjusted annually, effective April 1 of each year, in accordance with cost components listed in Exhibit 2 of the agreement. The District aims to notify the city at least 45 days before each rate change becomes effective.

Arlington paid a General Facilities Charge (GFC) for 1,820 equivalent residential units (ERUs), determined by dividing 1,000 gpm by 0.55 gpm/ERU. The District committed to provide the water between 650 and 726 feet HGL at the master meter location. The agreement says the District's system will have sufficient capacity to supply the water in accordance with the agreement. The City provides its own water storage, as described in its WSP.

3.3.5 Sudden View Wholesale Water Agreement

In 1999, the District entered into a standard Developer Extension Agreement with Iliad, Inc. to extend a water main to resolve capacity issues in the Sudden View system. As construction neared completion, the District and Iliad entered into a Wholesale Water Agreement to define ongoing arrangements for delivery of the water. The agreement was renewed in 2010. Key points in the current agreement are:

- The agreement is intended for 48 residential water connections (ERUs).
- If Iliad wants to connect more than 48 homes or to connect a non-residential customer, it must first contact the District for written agreement.
- The wholesale water rate is the District's Commercial Water Rate.
- Iliad must keep its well disconnected from the system.
- Iliad must annually test the cross-connection control assembly and submit the results to the District.
- Iliad will pay the District's GFC charge for each new connection to the system. To date, Iliad has paid for 22 of the 48 ERUs, and 26 ERUs remain available. If a connection is made without the GFC payment, Iliad will pay 12% annual interest on the amount due from the time the connection was made.
- Iliad must submit an annual report by January 15 each year, listing the current customers. If Iliad fails to submit the report, a 30% surcharge can be added to the water bill after January 15 until the report is submitted.
- If Iliad fails to produce the annual report on more than one occasion or fails to pay a GFC when due, the District can collect all remaining GFC payments for the 48 ERUs.
- Iliad is responsible for maintaining water quality beyond the master meter.

- The District aims to provide the water at a hydraulic grade line above 600 feet, in the absence of a fire flow or water main break event.
- The hydraulic capacity of the Sudden View system does not include fire flow, and the maximum instantaneous flow for 48 ERUs is expected to be 103.1 gpm.
- Iliad is responsible to install and maintain pressure reducing and pressure relief valves to protect the Sudden View distribution system and its water service customers.

3.3.6 Twin Falls Wholesale Water Agreement

Twin Falls is a small water system designed to serve up to 14 homes, with its own booster pump station and equalizing storage. The District preferred to provide water through a master meter, rather than owning and maintaining these water facilities. The District's wholesale agreement with Twin Falls is less detailed than the agreement with Sudden View because all fees were paid up front. Key points of the Twin Falls agreement are:

- The agreement is intended for a maximum of 14 ERUs.
- To serve more than 14 homes or to connect any non-residential customer, Twin Falls must contact the District for written approval. Any capacity not achieved through the 1 ½" meter would require payment of additional GFCs and installation of a larger meter.
- The wholesale water rate is the District's Commercial Water Rate.
- Twin Falls must annually test the cross-connection control assembly at the master meter and submit the results to the District.
- The District aims to provide the water at a hydraulic grade line above 500 feet at the master meter, in the absence of a fire flow or water main break event.
- Twin Falls is advised of potential low chlorine concentrations and high disinfection byproduct concentrations due to its long distribution and service lines and because of possible low water usage patterns. Twin Falls is responsible for any distribution system disinfection and flushing to maintain potable water quality for its customers.

3.3.7 Granite Falls Wholesale Water Agreement

The District's 2009 agreement with Granite Falls replaces a previous 1996 agreement. The updated agreement was necessary to accommodate the city's 2005 UGA and modifies aspects of the previous agreement that were becoming unmanageable.

Key features of the agreement are:

- The four master meters define the point of delivery from the District's system to the city's water system. The master meters are owned and maintained by the District. Additional master meters can be installed at the city's expense.
- The District aims to provide water between 716 and 726 HGL at the master meter locations during normal operation. The regional water supply project can support a maximum flow of 3,000 gpm through the combined master meters for two hours. The city owns and maintains control valves on the downstream of the master meters to regulate pressure.
- The city will retain its wells and water rights for non-potable use. If the city decides to reconnect the wells to its distribution system, it will install backflow prevention measures at the master meters.
- "Direct Service Customers" will be eliminated within ten years. These are city customers billed by the city but connected to a District pipe. Any Direct Service Customers remaining

on the District's mains after ten years will become customers of the District.

- The District will own, locate, and maintain service lines for Direct Service Customers from the District's main to the water meter. This gives the District more control over facilities connected to its pipes.
- The District reads the meters for Direct Service Customers.
- The District bills the city monthly for water passing through the master meters and bimonthly for the Direct Service Customers.
- Calculation of the wholesale rate in Exhibit 2 is similar to Arlington's wholesale water rate, and is modified every April 1 based on the District's costs from the previous year.
- When the city connects a new customer, it passes a portion of the hook-up fees to the District, equivalent to the GFC charge. The GFC covers water supply, transmission, and storage facilities that the District has agreed to provide to support each new city customer.
- For any new Direct Service Customer, the city passes both the GFC and DSC to the District, to cover the cost of the District's pipe fronting the property in addition to the source, transmission, and storage impacts.
- The ERU determination for calculating GFCs is based on tables in Appendix B of the District's Policy Manual.
- The city's retail water service area can expand within the UGA of its 2005 Comprehensive Plan. Any expansion beyond this boundary must be mutually agreed.
- The District can add customers in the UGA, but they must be transferred to city pipes as city limits expand. If a city main is not available when an area is annexed, then these remain District customers. When a city main becomes available, such customers will transfer to the city pipe, and the city will pay to abandon the old services.

3.3.8 CWSP Service Area Agreement

As described in Chapter 2, the District signed the *Agreement for Establishing Water Utility Service Area Boundaries* in 1997. The agreement verifies that the District accepts responsibilities assigned by the CWSP in its claimed water service areas.

3.3.9 Three Lakes Service Area Agreement

The District recently agreed to adjust its service area boundary with the Three Lakes Water Association. The process began with a request for water service that the District agreed would be better provided by the Three Lakes system. Representatives of Three Lakes and the District met to review the entire boundary in relation to the location of existing water mains before presenting the change to the county. The county required evidence of agreement between the water systems before making changes to the CWSP service area map.

3.3.10 Monroe Service Area Letter

The District has one residential customer inside the city of Monroe's claimed service area. This property is located outside of the city's UGA. A letter from the city included in Appendix 3-2 documents the situation. If a city water main becomes available at this location, the city can transfer the service and abandon the District's water service at its own expense.

3.3.11 Tulalip Settlement Agreement for May Creek Water Right

In 1996, the Tulalip Tribes appealed Ecology's approval of a change to the District's May Creek water rights. This 1999 settlement agreement outlines mitigation, in the form of a stream flow augmentation plan, which was satisfactory for the Tribes to drop their appeal.

When water pumped from the wells exceeds 398,880 gallons in a calendar day, the District will divert a "mitigation flow" back to May Creek using a formula and method described in the agreement. The District installed facilities and a control system to implement the agreement, which were inspected and approved by the Washington Department of Fish and Wildlife. As will be seen in Chapter 5, the District is far from reaching the usage limit that would result in these facilities being put to use.

3.3.12 Sultan Water Supply Pipeline Agreement

In 1998, the city of Sultan and the District worked together to fund a Regional Water Supply Alternatives Study relating to the city's UGA and the District's satellite water service area. The study recommended a new pipeline to the city from Everett's 5-line. The route for the pipeline passes through the District's Jackson Hydroelectric Project. The District wanted to be in control of the design, construction, and long-term maintenance of the pipeline on District property due to potential risks and costs associated with crossing the Sultan River in the vicinity of the Jackson Project Powerhouse, the Lake Chaplain Return Line, and high-pressure penstock facilities. The District required that the pipeline be large enough to minimize the likelihood of future related river crossings or construction disturbances.

A 16-inch diameter pipeline (Phase 1) was determined to be sufficient to meet the above criteria from the 5-line connection to the point where the pipe leaves the powerhouse access road and enters the city's easement. A 12-inch diameter water main (Phase 2) was constructed from that point to the city's treatment plant and storage tanks. The city paid the District $200,000 to design and develop plans and specifications for both phases. The District obtained the permits and government approvals, while the city took responsibility for the environmental review process.

The District paid the first $200,000 of the pipeline construction costs and the first $100,000 toward construction of the steel truss bridge carrying the pipe across the river, and the city paid for the rest of the construction expenses. Upon construction completion, the District became the owner of Phase 1 and the city became the owner of Phase 2, except for the master meter owned by Everett.

The District agreed to be responsible for maintaining and repairing the pipeline from where it connects to the 5-line to the point where the powerhouse access road turns eastward to join 116th St SE and to be responsible for any future relocation of the pipeline resulting from improvements to the powerhouse or penstock facility. The District also took responsibility for the steel truss bridge for its useful life.

The city owns 66.7 percent and the District owns 33.3 percent of the pipeline capacity, which is estimated to be between 3.89 and 5.76 MGD. The city is entitled to use the District's capacity share until the District has need for it. At the end of its service life, the cost to replace any portion of the pipeline will be shared by the parties proportional to their share in the capacity ownership. The cost to replace the steel truss bridge at the end of its useful service life will be shared equally by the parties.

3.3.13 Mutual Aid Agreements

In 2006 an agreement was drafted between many water and sewer purveyors in Snohomish County. The agreement enables the purveyors to make requests through their “Designated Official” to other purveyors for personnel, materials, equipment, or other resources to deal with a disaster or emergency. Each utility executed the agreement in accordance with their applicable procedures. The District’s Board of Commissioners authorized its General Manager to sign the agreement through Resolution 5275 in August 2001.

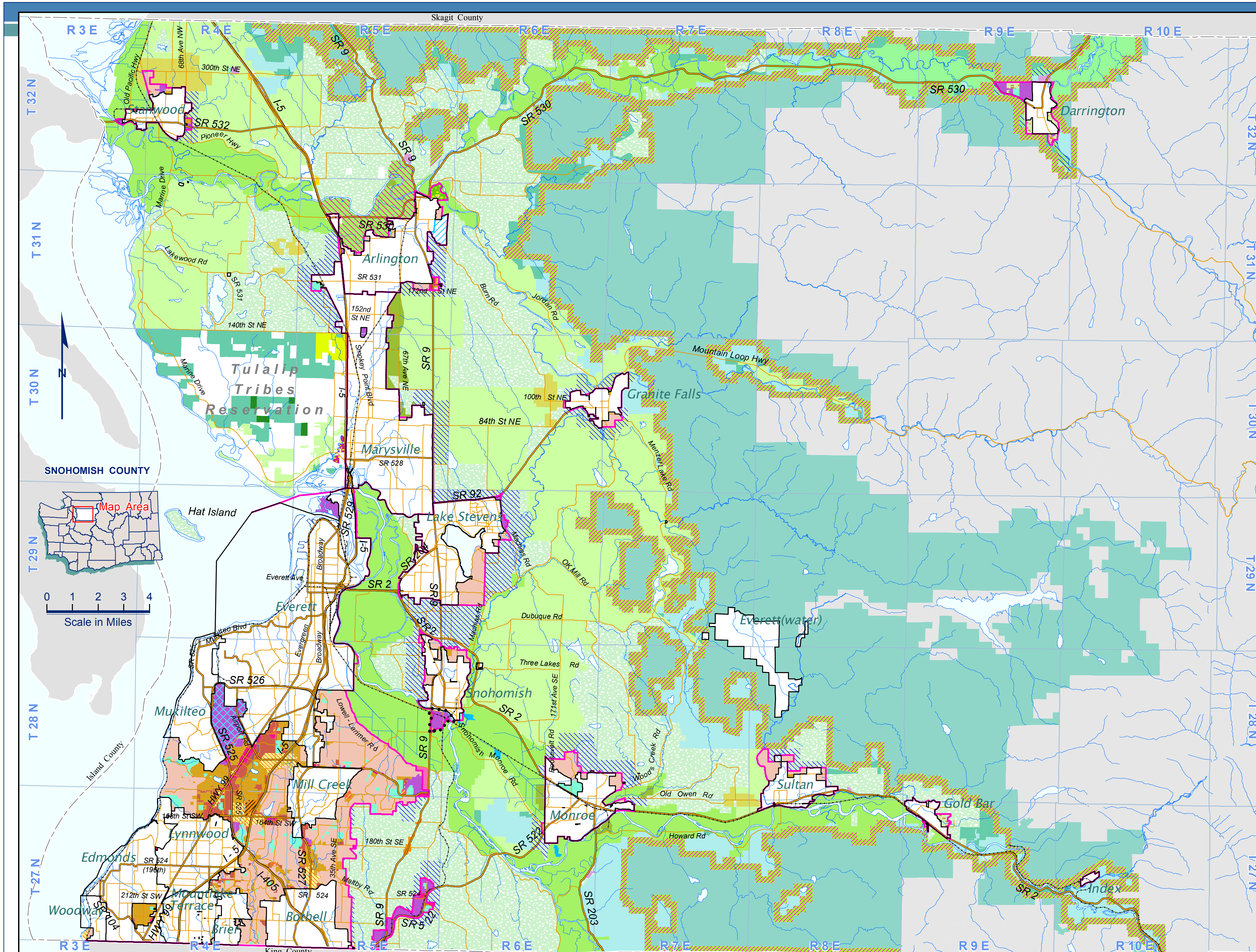
In September 2009, the District’s Board of Commissioners authorized its General Manager to sign a mutual aid and assistance agreement with the Washington State intrastate water and wastewater agency response network (WARN) for personnel, materials, equipment, or other resources required in a disaster or emergency. The Network is administered through regional committees and a state-wide committee. The agreement establishes how the Network is administered and details the procedures for requesting assistance, responding to requests, withdrawing from responding, cost reimbursement and the dispute process.

Map 1

Snohomish County GMA Comprehensive Plan

FUTURE LAND USE

EFFECTIVE DATE: August 1, 2010



Legend
National Forest (Includes Some Private and Non-Federal Public Lands)
Local Forest (Tulalip Only)
Commercial Forest
Commercial Forest-Forest Transition Area
Riverway Commercial Farmland
Upland Commercial Farmland
Local Commercial Farmland
Urban Horticulture
Low Density Rural Residential (1 DU/20 Acres)
Rural Residential-10 Resource Transition (1 DU/10 Acres)
Rural Residential-10 (1 DU/10 Acres)
Rural Residential-5 (1 DU/5 Acres)
Rural Residential - RD (1DU/5 Acres)
Rural Residential (1 DU/5 Acres Basic)
Urban Low Density Residential (3 DU/Acre Gold Bar and Darrington)
Urban Low Density Residential (Please see Map 6 of the GPP for more detail)
Urban Medium Density Residential
Urban High Density Residential
Urban High Density Residential/ Urban Industrial (Overlapping Designations)
Public/Institutional
Recreational Land
Rural Freeway Service
Clearview Rural Commercial
Reservation Commercial
Urban Commercial
Urban Village
Transit/Pedestrian Village
Urban Center
Rural Industrial
Urban Industrial
Manufacturing Industrial Overlay (Paine Field Area)
Other (Pending Completion of Master Plan)
Incorporated Cities and Towns, Tribal Lands, Rights-of-Way, and Other Jurisdictions (as of 07/08/2010)
Rural/Urban Transition Area Overlay
Transfer of Development Rights (Sending Area)
Transfer of Development Rights (Receiving Area)
Urban Growth Area Boundary
This portion of the Snohomish UGA is under review pursuant to a requested Conditional Letter of Map Revision fro the Federal Emergency Management Agency.
Snohomish County Boundary
Major Arterial Roadway
Arterial Roadway
Railway

Last Revised by
Ordinance 10-041
Ordinance 10-042
Ordinance 10-046

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Parcel lines and designation boundaries are adjusted to the Snohomish County Assessor Integrated Land Records Parcel Data Base as of July 2010.

This map is a graphic representation applied from the Snohomish County Geographic Information System. It does not represent survey accuracy. This map is based on the best available information as of the date shown on the map.

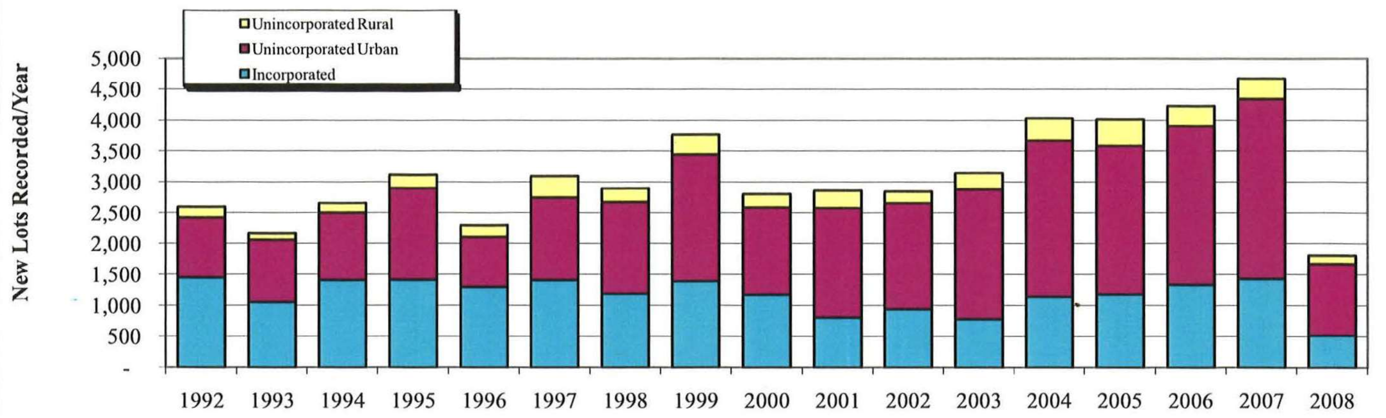
For the purposes of land use application review, final determination of future land use designations will be made by the County during the review process.

Snohomish County

W:/plng/carto/flu/current/maps/county_11x17/Map1_FutureLandUse_11x17.mxd
Produced by Snohomish County Planning and Development Services, Cartography/GIS

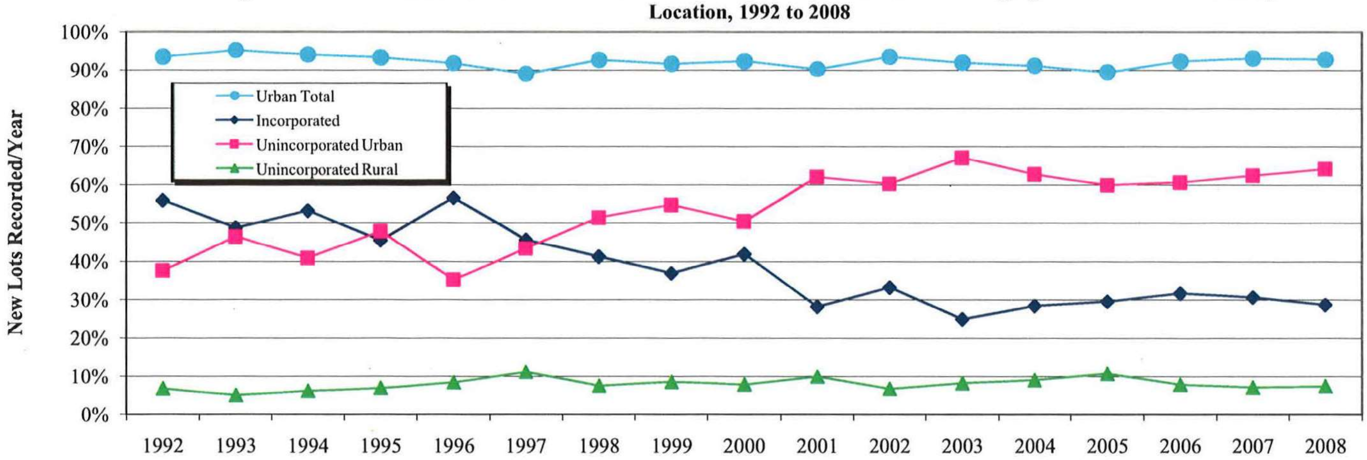
Lot creation collapsed in 2008 after several years of record development activity.

Figure 21. New Residential Lots in Recorded Formal Plat Subdivisions and Segregated-lot Condominiums, 1992 to 2008



	1992 Lots	1993 Lots	1994 Lots	1995 Lots	1996 Lots	1997 Lots	1998 Lots	1999 Lots	2000 Lots	2001 Lots	2002 Lots	2003 Lots	2004 Lots	2005 Lots	2006 Lots	2007 Lots	2008 Lots	Total Lots
Incorporated	1,453	1,057	1,415	1,417	1,302	1,412	1,195	1,391	1,176	805	946	782	1,145	1,183	1,339	1,432	517	19,967
Uninc. Urban	976	1,007	1,087	1,489	809	1,342	1,490	2,061	1,416	1,778	1,718	2,107	2,531	2,406	2,567	2,921	1,160	28,865
Uninc. Rural	173	107	161	212	191	342	215	318	218	282	189	255	360	427	328	327	132	4,237
Total County	2,602	2,171	2,663	3,118	2,302	3,096	2,900	3,770	2,810	2,865	2,853	3,144	4,036	4,016	4,234	4,680	1,809	53,069

Figure 22. Share of New Residential Lots in Recorded Formal Plat Subdivisions and Segregated-lot Condominiums by Location, 1992 to 2008



	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Incorporated	56%	49%	53%	45%	57%	46%	41%	37%	42%	28%	33%	25%	28%	29%	32%	31%	29%	38%
Uninc. Urban	38%	46%	41%	48%	35%	43%	51%	55%	50%	62%	60%	67%	63%	60%	61%	62%	64%	54%
Urban Total	93%	95%	94%	93%	92%	89%	93%	92%	92%	90%	93%	92%	91%	89%	92%	93%	93%	92%
Uninc. Rural	7%	5%	6%	7%	8%	11%	7%	8%	8%	10%	7%	8%	9%	11%	8%	7%	7%	8%
Total County	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

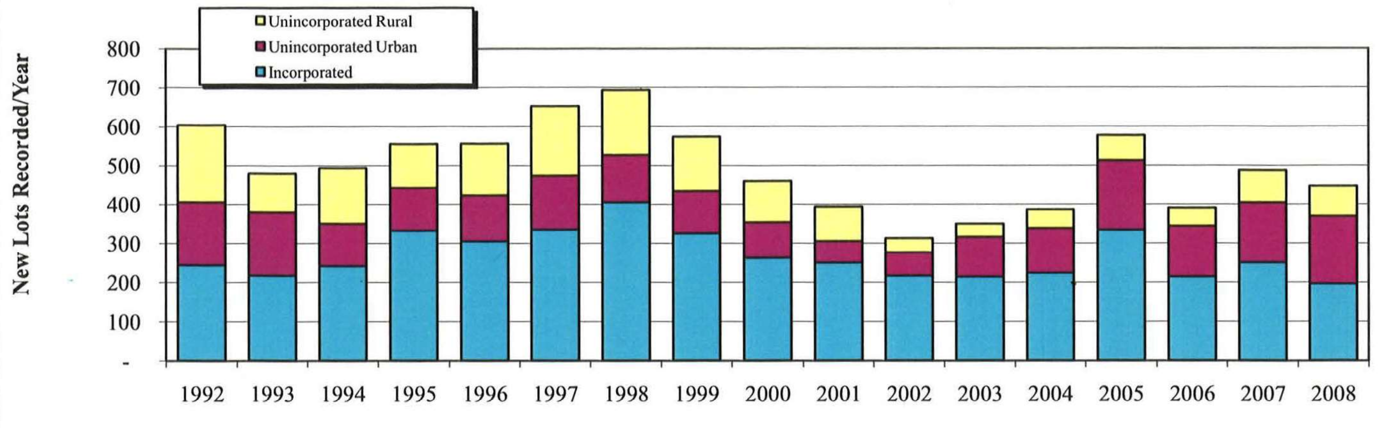
NOTES:

The definition of new residential lots in these tables includes more than just traditional single-family detached homes. It also includes duplexes and segregated-lot condominiums. Townhouse condominium projects fitting this definition must have a separate lot for each dwelling unit. Some duplex-style condominium projects fitting this definition have two lots per building while others have one lot per building.

Yearly totals may differ from those published in previous years due to adjustments made for annexations, rescinded plats, and replats.

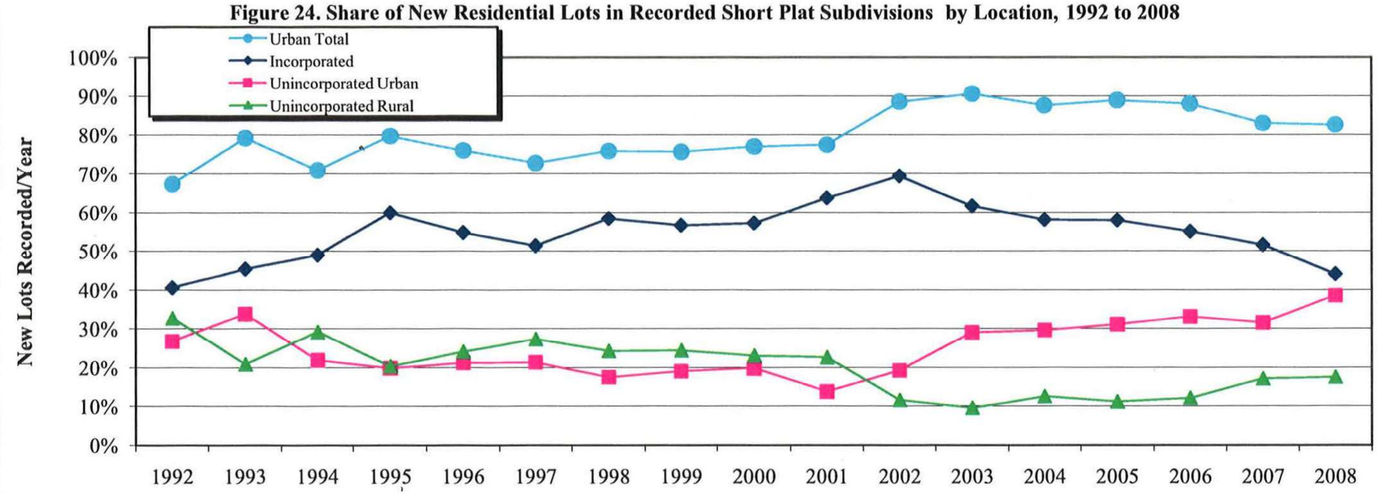
Recorded short plat activity has declined modestly since the 2005 peak, while the share in the unincorporated area has grown.

Figure 23. New Residential Lots in Recorded Short Plat Subdivisions , 1992 to 2008



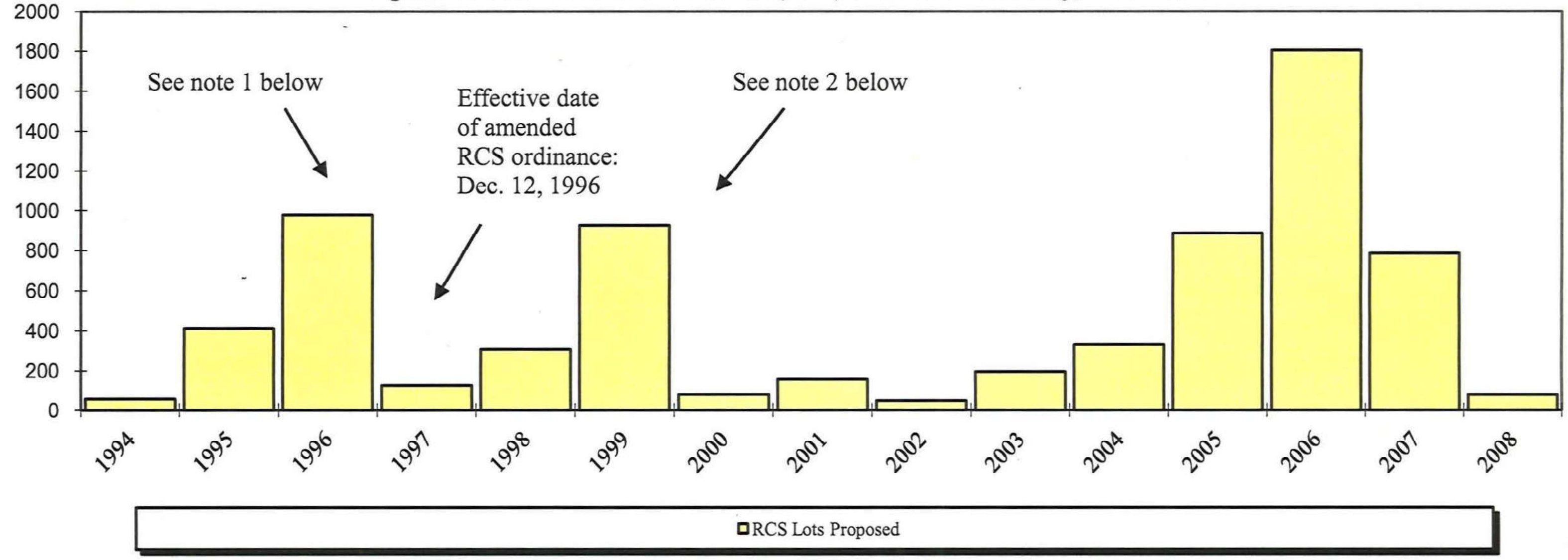
	1992 Lots	1993 Lots	1994 Lots	1995 Lots	1996 Lots	1997 Lots	1998 Lots	1999 Lots	2000 Lots	2001 Lots	2002 Lots	2003 Lots	2004 Lots	2005 Lots	2006 Lots	2007 Lots	2008 Lots	Total Lots
Incorporated	245	218	242	333	305	335	405	325	263	251	217	215	224	334	215	251	197	4,575
Uninc. Urban	161	162	108	110	118	139	121	109	91	54	60	101	114	179	129	153	172	2,081
Uninc. Rural	197	100	144	113	134	178	168	140	106	89	36	33	48	64	47	83	78	1,758
Total County	603	480	494	556	557	652	694	574	460	394	313	349	386	577	391	487	447	8,414

Figure 24. Share of New Residential Lots in Recorded Short Plat Subdivisions by Location, 1992 to 2008



	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Incorporated	41%	45%	49%	60%	55%	51%	58%	57%	57%	64%	69%	62%	58%	58%	55%	52%	44%	54%
Uninc. Urban	27%	34%	22%	20%	21%	21%	17%	19%	20%	14%	19%	29%	30%	31%	33%	31%	38%	25%
Urban Total	67%	79%	71%	80%	76%	73%	76%	76%	77%	77%	88%	91%	88%	89%	88%	83%	83%	79%
Uninc. Rural	33%	21%	29%	20%	24%	27%	24%	24%	23%	23%	12%	9%	12%	11%	12%	17%	17%	21%
Total County	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Figure 27. Rural Cluster Subdivision (RCS) Formal Plat Activity, 1994 - 2008



Notes: 1- Pilchuck East Estates RCS application for 327 lots, originally filed 9/27/96, was withdrawn by the applicant on 6/22/98
2- Port Susan Hills RCS application for 390 lots, originally filed on 4/19/99, was withdrawn by the applicant on 7/12/01.

Figure 28: Rural Cluster Subdivision (RCS) Formal Plats Recorded, 1994 - 2008

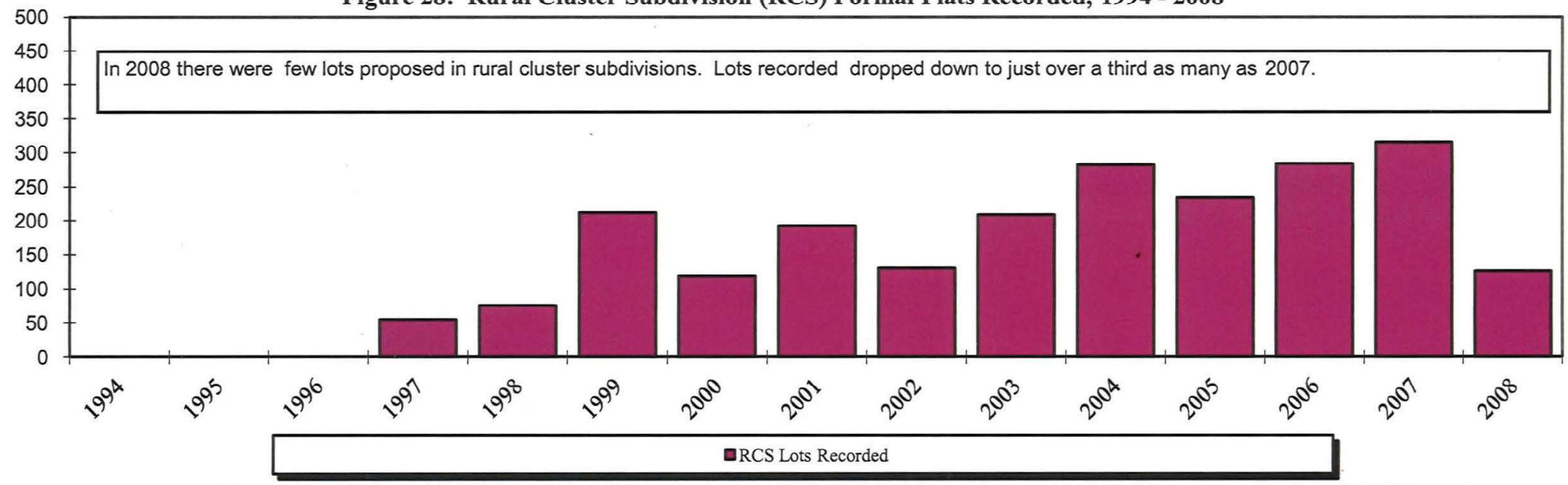


Figure 60

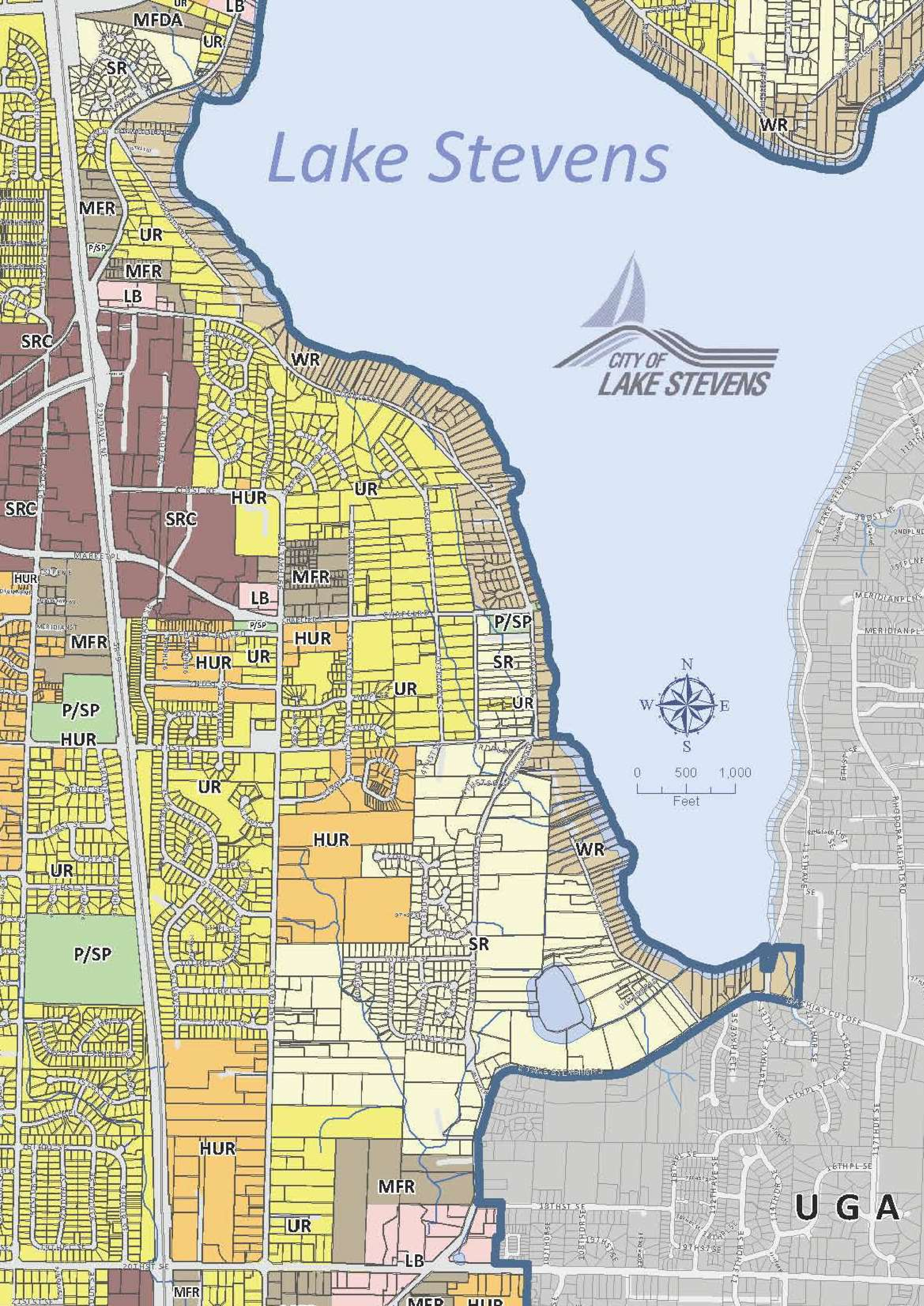
Comparison of Recorded Single Family Residential Lots and SF/Duplex Units Permitted, 1992 - 2008

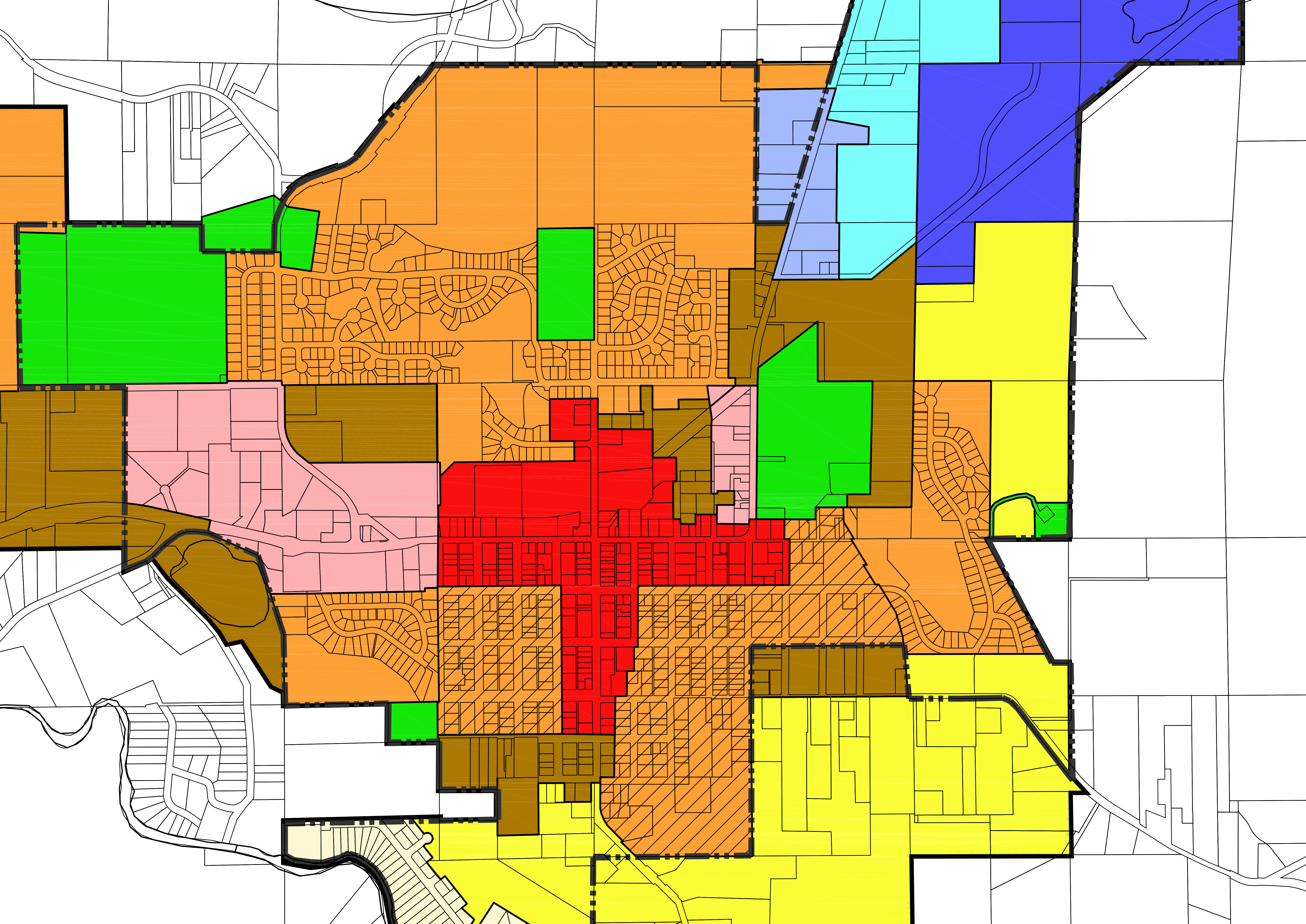
Countywide:	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
New SF/Duplex/MH units permitted	3,832	4,363	4,395	4,148	4,542	5,254	5,180	4,861	4,312	4,001	4,170	4,097	4,664	5,944	4,965	4,221	2,042	74,991
Total New Lots for SF/Duplex units in recorded formal and short plats	3,205	2,651	3,157	3,674	2,859	3,748	3,594	4,344	3,270	3,259	3,166	3,493	4,422	4,593	4,625	5,167	2,256	61,483
Ratio of new lots created to units permitted	0.84	0.61	0.72	0.89	0.63	0.71	0.69	0.89	0.76	0.81	0.76	0.85	0.95	0.77	0.93	1.22	1.10	0.82

UGA Total:	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
New SF/Duplex/MH units permitted	2,497	3,161	3,119	3,112	3,500	4,096	3,893	3,756	3,459	3,134	3,342	3,219	3,694	4,835	3,988	3,392	1,644	57,841
Total New Lots for SF/Duplex units in recorded formal and short plats	2,835	2,444	2,852	3,349	2,534	3,228	3,211	3,886	2,946	2,888	2,941	3,205	4,014	4,102	4,250	4,757	2,046	55,488
Ratio of new lots created to units permitted	1.14	0.77	0.91	1.08	0.72	0.79	0.82	1.03	0.85	0.92	0.88	1.00	1.09	0.85	1.07	1.40	1.24	0.96

Uninc Rural:	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
New SF/Duplex/MH units permitted	1,335	1,202	1,276	1,036	1,042	1,158	1,287	1,105	853	867	828	878	970	1,109	977	829	398	17,150
Total New Lots for SF/Duplex units in recorded formal and short plats	370	207	305	325	325	520	383	458	324	371	225	288	408	491	375	410	210	5,995
Ratio of new lots created to units permitted	0.28	0.17	0.24	0.31	0.31	0.45	0.30	0.41	0.38	0.43	0.27	0.33	0.42	0.44	0.38	0.49	0.53	0.35

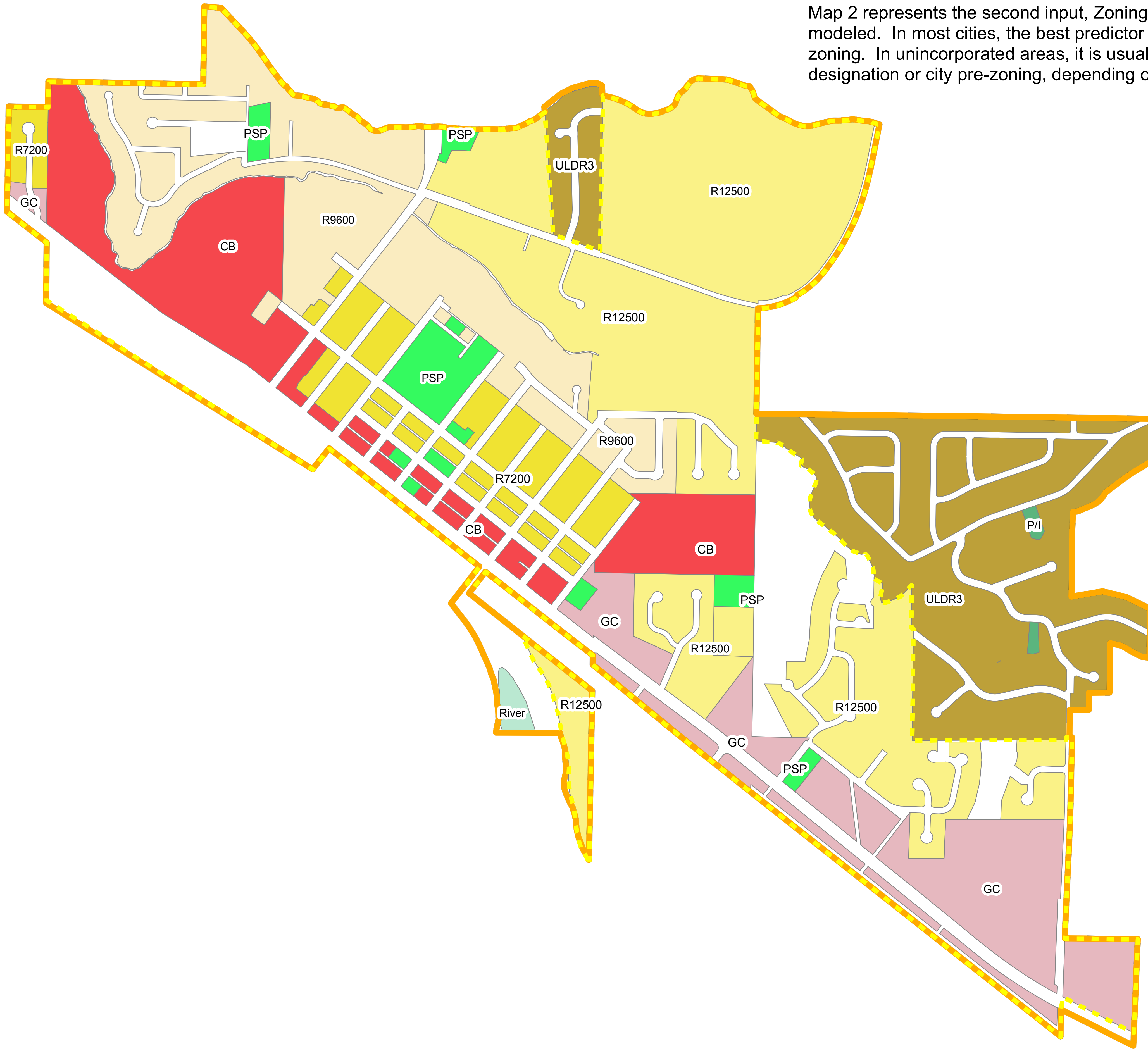
Notes: New lots recorded in formal and short plat subdivisions totals the number of lots recorded for SF detached, duplex and segregated lot condominium units. Lots recorded vs. units permitted are categorized by city vs. unincorporated based on the jurisdiction responsible for the recording or permit issuance.


Lake Stevens
CITY OF
LAKE STEVENS
N
W
E
S
0
500
1,000
Feet
UGA
MFDA
UR
LB
SR
MFR
P/SP
SRC
WR
HUR



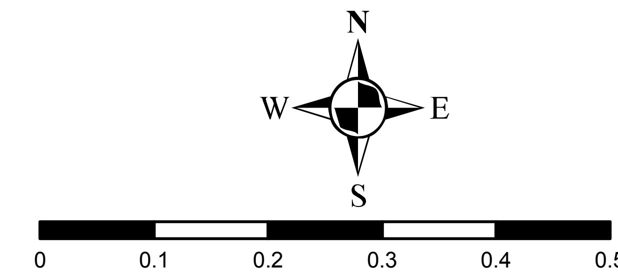
Zoning/Future Land Use

Map 2 represents the second input, Zoning or Plan Designation as modeled. In most cities, the best predictor of future development is zoning. In unincorporated areas, it is usually the county's plan designation or city pre-zoning, depending on location.



Gold Bar UGA

Final BLR 10.31.07



Legend

City
UGA Boundary

Zone or FLU Designation Labels

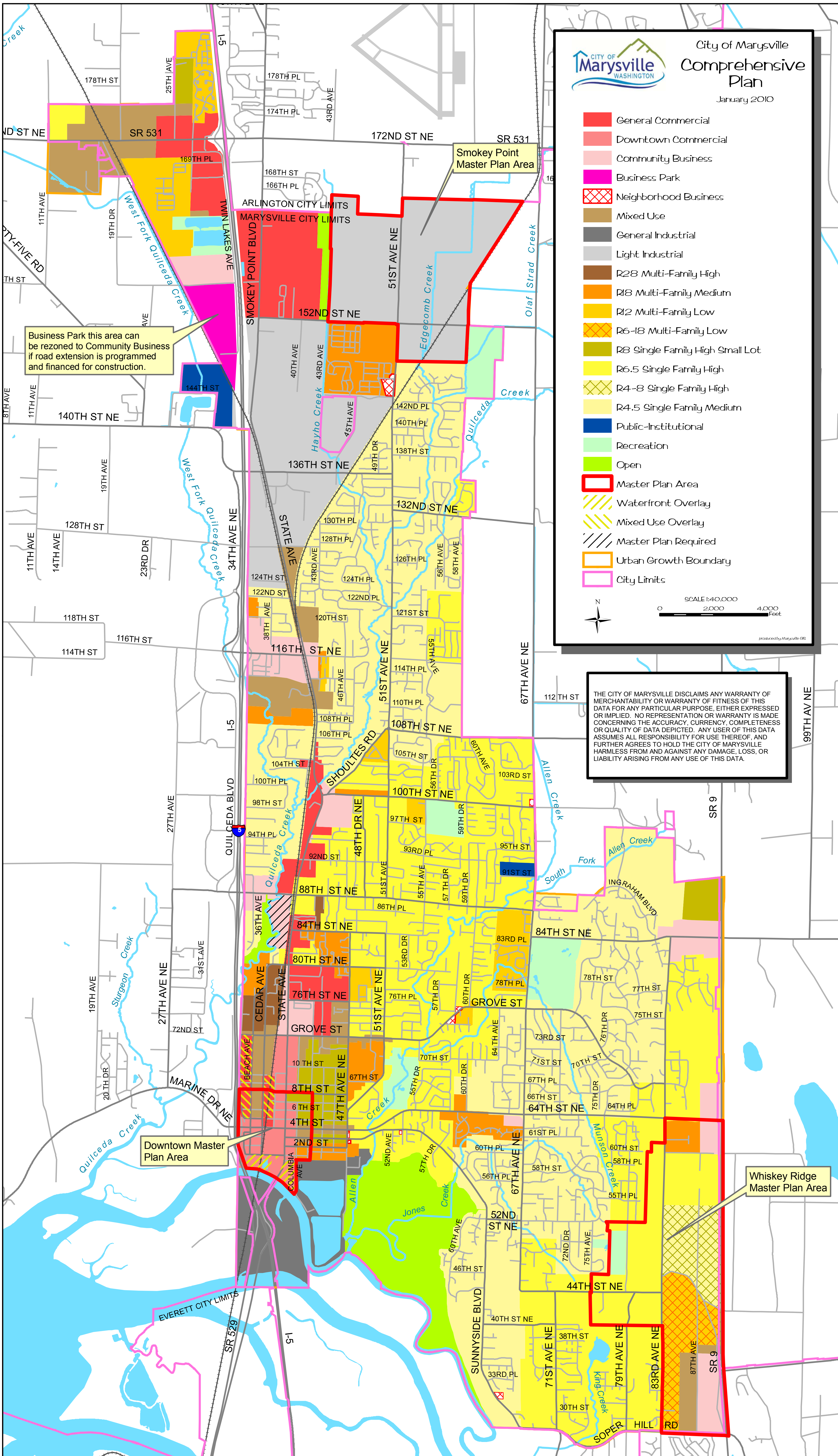
Commercial
- Community Business (CB)
- General Commercial (GC)

Residential
- Residential 12,500 Sq Ft Lots (R12500)
- Residential 9,600 Sq Ft Lots (R9600)
- Residential 7,200 Sq Ft Lots (R7200)
- Res. 3 houses/acre (ULDR3)

Other
- Public/Institutional (P/I)
- Public or Semi-Public (PSP)
- River

* Note that rights-of-way and open space tracts were not assigned zoning or FLU designation for the analysis. Therefore, they are blank on this map.

Snohomish County
Planning and Development Services
Long Range Planning
3000 Rockefeller Ave.,
Everett, Washington


City of Marysville
Comprehensive Plan
January 2010
General Commercial
Downtown Commercial
Community Business
Business Park
Neighborhood Business
Mixed Use
General Industrial
Light Industrial
R28 Multi-Family High
R18 Multi-Family Medium
R12 Multi-Family Low
R6-18 Multi-Family Low
R8 Single Family High Small Lot
R6.5 Single Family High
R4-8 Single Family High
R4.5 Single Family Medium
Public-Institutional
Recreation
Open
Master Plan Area
Waterfront Overlay
Mixed Use Overlay
Master Plan Required
Urban Growth Boundary
City Limits
SCALE 1:40,000
0 2,000 4,000 Feet
Smokey Point Master Plan Area
Business Park this area can be rezoned to Community Business if road extension is programmed and financed for construction.
Downtown Master Plan Area
Whiskey Ridge Master Plan Area
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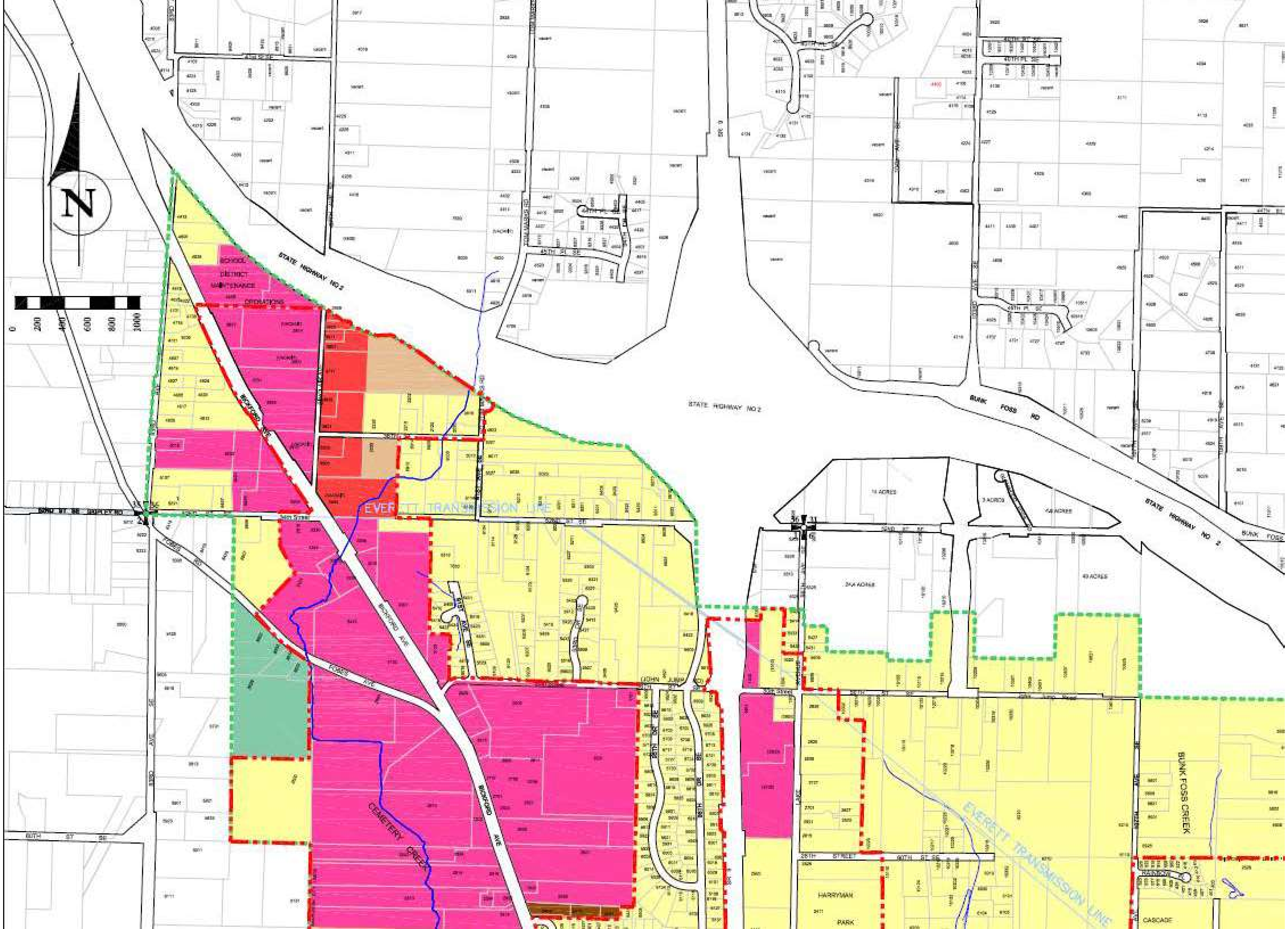
ARLINGTON CITY LIMITS
MARYSVILLE CITY LIMITS
EVERETT CITY LIMITS
SR 531
172ND ST NE
152ND ST NE
136TH ST NE
116TH ST NE
108TH ST NE
100TH ST NE
88TH ST NE
84TH ST NE
64TH ST NE
44TH ST NE
GROVE ST
4TH ST
SMOKEY POINT BLVD
STATE AVE
51ST AVE NE
67TH AVE NE
SUNNYSIDE BLVD
SOPER HILL RD
SR 9
SR 529
I-5


N
0 200 400 600 800 1000
STATE HIGHWAY NO 2
SCHOOL DISTRICT MAINTENANCE OPERATIONS
BICKFORD AVE
EVERETT TRANSMISSION LINE
BUNK FOSS RD
14 ACRES
3 ACRES
24.4 ACRES
43 ACRES
FOBES RD
CEMETERY CREEK
BUNK FOSS CREEK
HARRYMAN PARK
CASCADE
60TH ST SE

4 Existing Facilities

This chapter inventories the District's major water facilities, including 12 water systems with over 382 miles of pipelines, 15.3 million gallons of storage, 6 water supply pump stations, 11 booster pump stations, 12 wells, and 41 pressure zones. The physical condition, capacity, and age of these facilities are important in determining the adequacy of the water systems for meeting future water demands.

4.1 PRIMARY SOURCE OF SUPPLY

The District purchases the majority of its water from the city of Everett, which uses the Sultan River as its primary water source. By 1942, Everett's facilities included a concrete diversion dam and Tunnel No. 1, directing water from the Sultan River into the 4.5 billion gallon Chaplain Reservoir about 16 miles east of the city. These facilities can be seen in Figure 4-1.

The city and the District joined forces to build the "Sultan Project" starting in the early 1960s, as water supply needs increased. The first stage was completed in 1965 by constructing the Culmback Dam about 6.5 river miles upstream of Everett's diversion dam, which created the Spada Reservoir. In 1984, the second stage of the Sultan Project raised the dam, increasing the Spada Reservoir capacity to 50 billion gallons. The second phase also constructed the Jackson Hydroelectric Plant, including a 14-foot diameter tunnel and 10-foot diameter pipeline from Spada Reservoir to the hydroelectric plant and a 72-inch diameter pipeline from the power plant to Chaplain Reservoir. These facilities are also shown in Figure 4-1.

Under typical operating conditions, Tunnel No. 1 is now used in reverse to return water to the Sultan River for critical instream flows. The diversion tunnel can still be used in its original flow direction if supply from the hydropower plant is interrupted. Another use for the diversion tunnel is to provide an alternate supply to the filtration plant in the event of short-term water quality problems in Chaplain Reservoir.

District water systems receiving Everett water include: Lake Stevens, Dubuque, Lake Roesiger, Storm Lake Ridge, and Creswell. Figure 4-2 shows the location of District taps on transmission lines from the filtration plant. Water is normally conveyed to the District's systems through the city's 3- and 5-Lines and through a connection on the Marysville JOA-Line. The District has eight connections on the 3-Line (most with backup connections on the 2-Line) and four connections on the 5-Line. The 4-Line carries unfiltered water to Kimberly Clark for industrial use.

A more detailed description of all water sources supplying the District's systems can be found in Chapter 8, including discussion of water rights, hydrology and hydrogeology, fishery conditions, watershed plans, supply yield, water shortage response planning, and wellhead protection plans.

4.2 PRESSURE ZONES

Figures 4-3A and 4-3B are schematic hydraulic profiles of the District's water systems that receive Everett water. Ground elevations within these systems range from about 20 to 730 feet. To provide water at adequate pressure, the Lake Stevens water system is divided into 21 pressure zones, the Dubuque system is divided into 6 pressure zones, and the Storm Lake system is divided into 2 pressure zones. Lake Roesiger and Creswell each have a single pressure zone. The hydraulic profile figures also illustrate how the systems will be connected to form a single water system in the future.

The nominal hydraulic grade lines (HGLs) and range of service elevations for each pressure zone is summarized in Table 4-1. This table includes systems with groundwater sources, in addition to the systems with purchased water described above.

The pressure zones and their boundaries are based on topography, service elevations, natural and physical barriers, and the District's water service area boundaries. Topographic considerations are significant because the District seeks to maintain service pressures between 40 and 90 psi. Service pressures exceeding 90 psi are unavoidable in many low lying areas to assure that minimum pressure requirements are met at the highest elevations. Where service pressure exceeds 120 psi, the District installs and maintains pressure reducing valves (PRVs) in each meter box to protect the meter and the customer's plumbing. When service pressure is between 80 and 120 psi, the District gives customers an option to pay for a District-maintained PRV or to install their own PRV in their plumbing system.

4.3 FACILITIES AND COMPONENTS

The District's water facilities are shown on Figure 4-4 through 4-6. The figures also illustrate boundaries of the pressure zones described in the previous section.

4.3.1 Storage Facilities

The District owns and operates 16 water reservoirs dispersed throughout its water systems as detailed in Table 4-2 and shown in the figures at the end of this chapter.

4.3.2 Pump Stations

The District owns and operates six main supply pump stations, four of which deliver purchased water to Lake Stevens and two of which deliver purchased water to the Lake Roesiger and Storm Lake Ridge water systems. For Lake Stevens, approximately 90 percent of the purchased water is pumped into the system and the remaining 10 percent flows into the system by gravity from Everett's transmission lines. Purchased water entering the Dubuque and Creswell water systems is also delivered by gravity from the transmission lines.

The District also owns and operates 11 booster pump stations to maintain water pressure to higher elevation areas within its systems as detailed in Table 4-3 and shown in the figures. Pump station capacities in Table 4-3 are based on pump curves and recorded performance.

4.3.3 Pressure Reducing Valve Stations and Flow Control Valves

Table 4-4 details the District's many pressure reducing stations spread throughout its 41 pressure zones. Station numbers in this table can be seen in the hydraulic profile Figures 4-3A and 4-3B. Higher numbered stations are generally newer installations. When a station is abandoned, the station number is retired.

A variety of flow control valves are listed at the end of Table 4-4. These include pressure relief and surge anticipator valves in pump stations, altitude valves for tanks, flow control valves to maintain flows below set limits, and hydraulic control valves in treatment processes. The District has a database for tracking the maintenance of these valves.

4.3.4 Pipelines

The District maintains a Geographic Information System (GIS) to track location and data associated with its water facilities. A GIS query determined that the District's water systems contain over 382 miles of pipe ranging from 3/4-inches to 30-inches in diameter. A summary of the length, diameter, and material is presented in Table 4-5. Nearly 74 percent of the District's water mains are 8-inches in diameter or larger. The majority of the District's water mains are ductile iron with some of the older sections being cast iron and asbestos cement. As will be discussed in following chapters, the District has a goal to replace its old asbestos cement (AC) pipes. The District's systems still contain about 32 miles of AC pipe.

4.3.5 Wells

The District owns and operates wells for its Lake Stevens, May Creek, Skylite Tracts, Kayak, Sunday Lake, Pilchuck 10, Two Twelve Market & Deli, and Otis water systems as detailed in Table 4-6. The Lake Stevens wells are currently only used for emergency backup, but will be online within the next couple years after treatment is installed to remove iron and manganese.

4.3.6 Interties

The District has two existing emergency interties as detailed in Table 4-7 and shown in Figure 4-6.

4.3.7 Treatment Facilities

Everett adds chlorine and fluoride at its filter plant, which carries through the District's Lake Stevens, Dubuque, Storm Lake, Lake Roesiger, and Creswell water systems. The District boosts the chlorine at its Granite Falls booster pump station to maintain a residual to the far ends of its Lake Stevens water system.

The District also chlorinates its groundwater systems, with the exception of the Otis water system. In all cases, chlorine is added as a preventive measure to control bacteria growth in the distribution systems. There are no known bacteria or virus concerns with the wells. Sodium hypochlorite is used as the form of chlorine in all District disinfection facilities.

In addition, the District has a greensand filter system at its Sunday Lake water system and a pyrolucite filter system at its Kayak water system to remove manganese, iron, and a trace of hydrogen sulfide. These are secondary contaminants that are only a concern for aesthetic reasons.

At the Skylite Tracts and Pilchuck 10 water systems, the District aerates the water as it enters storage tanks. This releases naturally occurring carbon dioxide, which in turn raises the pH to reduce corrosiveness of the water toward copper plumbing.

Table 4-1: Pressure Zones

Pressure Zone	Zone HGL (ft)	Max service Elev (ft)	**Static Pressure (psi)**	Min Service Elev (ft)	**Static Pressure (psi)**
Lake Stevens Integrated Water System					
10th St SE	320	220	**43**	20	**130**
28th St SE	360	220	**61**	120	**104**
Blue Spruce/Rainbow Springs	400	280	**52**	160	**104**
Bosworth	811	720	**39**	420	**169**
Cavaleros	460	280	**78**	80	**165**
Cedar Lane/Indian Summer	320	190	**56**	170	**65**
Crest Lane	470	360	**48**	300	**74**
East Everett	300	203	**42**	80	**95**
Engebretson	470	320	**65**	185	**123**
Granite Falls	726	600	**55**	200	**228**
Hillcrest	580	460	**52**	260	**139**
Jordan	520	420	**43**	120	**173**
Jordan River Trails	325	210	**50**	140	**80**
Lake Cassidy	580	460	**52**	320	**113**
Lake Stevens	500	400	**43**	100	**173**
Meeker Retreat	270	140	**56**	120	**65**
Soper Hill	420	300	**52**	80	**147**
Sunset Ridge	700	580	**52**	390	**134**
Sunnyside	300	205	**41**	20	**121**
Walker Hill	580	440	**61**	320	**113**
Williams Road	460	370	**39**	60	**173**
Dubuque Water System					
Dubuque – Gravity Feed	500	420	**35**	60	**191**
Dubuque – 157th Boosted	640	520	**52**	340	**130**
Dubuque – 44th Boosted	640	540	**43**	350	**126**
Dubuque Southwest	400	240	**69**	70	**143**
Kla-ha-ya East	350	220	**56**	120	**100**
Kla-ha-ya North	270	140	**56**	80	**82**
Storm Lake Water System					
Storm Lake Ridge (SLR)	760	670	**39**	320	**191**
SLR Boosted Zone	850	720	**56**	660	**82**
Other Systems with Purchased Water					
Lake Roesiger	811	730	**35**	480	**143**
Creswell	525	360	**71**	300	**97**
Groundwater Systems					
Kayak-535*	535	450	**37**	325	**91**
Kayak-450	450	320	**56**	160	**126**
Kayak-370	370	180	**82**	150	**95**
Sunday Lake	430	340	**39**	223	**90**
Sunday Lake boosted	500	370	**56**	270	**100**
May Creek	392	330	**27**	200	**83**
Skylite Tracts	280	160	**52**	140	**61**
Pilchuck 10	640	540	**43**	440	**87**
212 Market	360	245	**50**	235	**54**
Otis	540	425	**50**	400	**61**

* USGS contours in Kayak are 10-20 lower than surveyed elevations. Surveyed ground at Kayak tank site is about 474 ft and tank overflow is about 74 ft above ground. HGL is adjusted to the USGS elevation because this is the District's basis for hydraulic modeling.

Table 4-2: Storage Facilities

Facility	Type	Location	Year Built	Total Volume (MG)	Diameter (ft)	Overflow Elevation (ft)	Base Elevation (ft)
Lake Stevens Water System							
Walker Hill 1 & 2	Steel	Cedar Road, near Lake Stevens HS	1973 & 1990	2.0 & 2.0	70	490	422
Hillcrest 1 & 2	Steel	96th Ave SE & 9th Pl, E of Hwy 9	1998 & 2009	3.0 & 3.0	100	502	450
Granite Falls	Steel	Wayside Mine Rd, near Iron Mountain Quarry	1995	2.7	120	726	694
Bosworth	Steel	N of 56th St NE, NW of the lake	1996	1.0	46	811	728
Total Lake Stevens System Storage:				**13.7**			
Other Systems with Purchased Water							
Lake Roesiger 1 & 2	Concrete	Frank Monson Rd, NE of the lake	1992	0.2 & 0.2	30	811	771
Storm Lake	Concrete	72nd Pl SE, W of Mero Rd	2000	0.23	30	762	718
Groundwater Systems							
Kayak	Concrete	North end of 66th Ave NW	2009	0.3	26	548	474
Sunday Lake	Concrete	West end of 254th St NW	1995	0.2	26	430	380
Skylite Tracts	Concrete	357th Ave SE, near Mann Rd	1997	0.1	30	170	150
May Creek 1 & 2	Concrete	156th St SE, W of 423rd Ave SE	1984	0.175 & 0.175	26	392	347
Pilchuck 10	Concrete	Robe Menzel Rd at 29th Pl NE	2004	0.015	4-7x12 vaults		430
212 Market	Concrete	Old Hwy 99 N at I5& Hwy 532	1995	0.002	6x5x9 vault		250
Systems with no storage that will merge into adjacent systems: Dubuque & Creswell							
System with no storage requirement: Otis							

Table 4-3: Pump Stations

Facility/ Yr Constructed	Year Pump Installed	Supply HGL	Pressure Zone Served	Pump No.	Pump Mfr.	Pump Model No.	Rated Flow (gpm)	Rated Head (ft)	Speed (rpm)	Motor Power (hp)
Lake Stevens Supply Stations:										
E. Hewitt Supply/1968	1992	3 Line-450	Lake Stevens-500	1	Fairbanks	6937T, 6" impeller	600	148	1765	30
	1968	3 Line-450	Lake Stevens-500	2	Goulds	10 LHC, 8" impeller	1450	100	1765	50
			Station capacity with both pumps running near rated flows:				**2000**			
Soperwood Supply/1997	1997	JOA-420	Lake Stevens-500	1	Cornell	5RB-60-4, 12.25" Imp	1365	120	VFD	60
	1997	JOA-420	Lake Stevens-500	2	Cornell	5RB-60-4, 12.25" Imp	1365	120	VFD	60
			Peak hour pumping to remain within limit of agreement with Marysville:				**1500**			
Machias Supply/2002	2002	3 Line-450	Lake Stevens-500	1	Byron Jackson	12MQH-2 Stage 8.1298" Impeller	1375	110	1963 max VFD	60
	2002	3 Line-450	Lake Stevens-500	2	Byron Jackson	same as pump1	1375	110	1750 max VFD	60
	2006	3 Line-450	Lake Stevens-500	3	Byron Jackson	same as pump1	1375	110	1764/ VFD.	60
			Current output with two pumps running at 25-50 ft TDH and 3rd pump maintained as a spare:				**3000**			
	Est. 2019	3 Line-450	Lake Stevens-500	4	Byron Jackson	same as pump1	1375	110	1770/ VFD	60
	Est. 2023	3 Line-450	Lake Stevens-500	5	Byron Jackson	same as pump1	1375	110	1770/ VFD	60
			Future capacity when 4 pumps are running against 100 ft TDH and 5th pump is kept as a spare:				**5500**			
Glenwood Supply/2006	2006	3 Line-450	Lake Stevens-500	1	Goulds	14RJMC, 1 stage, 8.625" impeller	1500	65	1760/ VFD	40
	2006	3 Line-450	Lake Stevens-500	2	Goulds	same as pump1	1500	65	1760/ VFD	40
			Recorded flow with both pumps running in July 2009 (speed is restricted to 85% max):				**2000**			
Combined pumped supply to Lake Stevens: - keeping one pump as a spare at all times - not counting Glenwood supply pumps 3,4, & 5 to Hillcrest zone, gravity fed supply, or Lake Stevens wells						**Existing:**	**8500**			
						2019 planned:	**9750**	(4th Machias pump installed)		
						2023 planned:	**11000**	(5th Machias pump installed)		

Table 4-3: Pump Stations (continued)

Facility/ Yr Constructed	Year Pump Installed	Supply HGL	Pressure Zone Served	Pump No.	Pump Mfr.	Pump Model No.	Rated Flow (gpm)	Rated Head (ft)	Speed (rpm)	Motor Power (hp)
Lake Stevens Booster Stations:										
Hillcrest Booster/1982	1982	Lk Stvns-500	Hillcrest-580	1	Paco	71-2D121-730101A01-1	100	85	1745	5
	1982	Lk Stvns-500	Hillcrest-580	2	Paco	71-2D121-730101A01-1	200	85	1750	10
	1982	Lk Stvns-500	Hillcrest-580	3	Paco	71-2D121-730101A01-1	200	85	1750	10
	1982	Lk Stvns-500	Hillcrest-580	4	Paco	71-30121-740101A01-1	333	85	1760	15
	1982	Lk Stvns-500	Hillcrest-580	5	Paco	71-40125-740101A01-1	667	85	1765	20
Hillcrest station capacity at rated flow and head:							**1500**			
Glenwood Supply/2006	2006	3 Line-450	Hillcrest-580	3	Goulds	10RJLC, 5 stage, 6.1875" impeller	500	145	1740/VFD	30
	2006	3 Line-450	Hillcrest-580	4	Goulds	12CLC, 3 stage, 8.5625" impeller	1000	155	1750/VFD	60
	2006	3 Line-450	Hillcrest-580	5	Goulds	same as pump 4	1000	155	1750/VFD	60
Glenwood station capacity to Hillcrest-580 zone with largest pump reserved as a spare:							**1500**			
Total pumping capacity to Hillcrest-580 zone with largest pump reserved as a spare:							**3000**			
Walker Hill Booster/1992	1992	Lk Stvns-500	Walker Hill-580	1	Paco	16-20955130101-2689	95	80	1745	5
	1992	Lk Stvns-500	Walker Hill-580	2	Paco	16-30955130101-2782	200	80	1755	10
	1992	Lk Stvns-500	Walker Hill-580	3	Paco	16-30955130101-2782	200	80	1755	10
	1992	Lk Stvns-500	Walker Hill-580	4	Paco	16-50957140101-2852	500	80	1765	20
	1992	Lk Stvns-500	Walker Hill-580	5	Paco	16-50957140101-2852	500	80	1765	20
	1992	Lk Stvns-500	Walker Hill-580	6	Paco	16-50957140101-2852	500	80	1765	20
Station capacity to Walker Hill-580 Zone with largest pump reserved as a spare:							**1500**			
Granite Falls Booster/1995	2006	Lk Stvns-500	Granite Falls-726	1	Peerless	12MB-8 Stage, 8.47" Impeller	1000	355	VFD	150
	2006	Lk Stvns-500	Granite Falls-726	2	Peerless	same as pump 1	1000	355	VFD	150
	2002	Lk Stvns-500	Granite Falls-726	3	Peerless	same as pump 1	1000	355	VFD	150
	2002	Lk Stvns-500	Granite Falls-726	4	Peerless	same as pump 1	1000	355	VFD	150
Station capacity to Granite Falls Zone (operation limited to 2 pumps at a time):							**2000**			
Bosworth Booster/1997	1997	Granite Falls	Bosworth-811	1	Peerless	1215AM-BF	250	120	SMC	15
	1997	Granite Falls	Bosworth-811	2	Peerless	1215AM-BF	250	120	soft start	15
Station capacity to Bosworth zone with one pump as a spare:							**250**			
Lake Cassidy Booster/2006	2006	Lk Stvns-500	Lk Cassidy-610	1	Peerless	C610A	150	100	3450 VFD	7.5
	2006	Lk Stvns-500	Lk Cassidy-610	2	Peerless	C820A	280	100	VFD	15
	2006	Lk Stvns-500	Lk Cassidy-610	3	Peerless	C820A	280	100	VFD	15
	2006	Lk Stvns-500	Lk Cassidy-610	4	Peerless	F41660M	1200	200	1780	100
	Offline	Lk Stvns-500	Lk Cassidy-610	5	Peerless	F41660M	1200	200	1780	100
Station capacity to Lake Cassidy zone at 110 ft TDH (with Pump 5 as a spare):							**2000**			

Table 4-3: Pump Stations (continued)

Facility/ Yr Constructed	Year Pump Installed	Supply HGL	Pressure Zone Served	Pump No.	Pump Mfr.	Pump Model No.	Rated Flow (gpm)	Rated Head (ft)	Speed (rpm)	Motor Power (hp)
Dubuque Booster Stations:										
157th Ave SE	2000	Dubuque-500	157th Ave-640	1	Goulds	3756S	75	190	3500	7.5
Booster/2000	2000	Dubuque-500	157th Ave-640	2	Goulds	3656	75	190	3500	7.5
(Machias Ridge East)						**Station capacity to 157th Ave zone (can manually switch to spare pump):**	**75**			
44th St SE	2008	Dubuque-500	44th St-640	1	Paco	624165	175	100	3500	7.5
Booster/2008	2008	Dubuque-500	44th St-640	2	Paco	624165	175	100	3500	7.5
						Station capacity at 120 ft TDH to maintain 40 psi at highest service (with one pump as spare):	**125**			
Lake Roesiger Supply Station:										
Lake Roesiger Supply/1992	1992	3 Line-540	Roesiger-811	1	Aurora	92-10029-2 Size 2-1/2 x 3 x 10B	450	280	3500	50
	1992	3 Line-540	Roesiger-811	2	Aurora	same as pump 1	450	280	3500	50
						Station capacity to Lake Roesiger zone with one pump as a spare:	**450**			
Storm Lake Supply Station:										
Storm Lake	2000	5 Line	Storm Lk-760	1	Cornell	2Y-40-2	250	260	3525	40
Supply/2000	2000	5 Line	Storm Lk-760	2	Cornell	2Y-40-2	250	260	3525	40
						Station capacity to Storm Lake water system with one pump as a spare:	**250**			
Storm Lake Booster Station:										
Storm Lake Booster / 2000	2000	Storm Lk-760	SL Boosted-850	1	Grundfos	ME3CRE4-40	22	143	850-3450 VFD	1.5
	2000	Storm Lk-760	SL Boosted-850	2	Grundfos	ME3CRE4-40	22	143	see above	1.5
	2000	Storm Lk-760	SL Boosted-850	3	Grundfos	ME3CRE4-40	22	143	see above	1.5
						Station capacity to Storm Lake boosted zone with one pump as a spare:	**44**			
Sunday Lake Booster Station										
Sunday Lake	2006	Sunday Lk-430	SL Boosted-	1	Grundfos	A91124379-P1055	90	153	3525 VFD	7.5
Booster/2006	2006	Sunday Lk-430	SL Boosted-	2	Grundfos	A91124379	90	153	3525 VFD	7.5
	2006	Sunday Lk-430	SL Boosted-	3	Grundfos	A38753006	450	155	3525 VFD	25
	2006	Sunday Lk-430	SL Boosted-	4	Grundfos	A38753006	450	155	3450 VFD	25
						Station capacity to Sunday Lake boosted zone (with one pump as a spare):	**630**			
Skylite Tracts Booster Station										
Skylite Booster	2007	Skylite Tank	Skylite	1	Grundfos	CR10-5	60	150	3510 VFD	5
2007	2007	Skylite Tank	Skylite	2	Grundfos	CR10-5	60	150	3510 VFD	5
						Station capacity to Skylite Tracts:	**120**			

Table 4-4: Pressure Reducing Valves

Station # / Location	Zone		Valve Size (in.)	Typical Upstream Pressure (psi)	Settings (psi)	Elevation (ft)	Calculated HGL (ft)	Zone HGL (ft)	Pressure Relief Valve		Reverse Flow	Notes
	From	To							Size (in)	Setting (psi)		
Integrated / Lake Stevens Water System Pressure Reducing Stations												
1 / Jordan Rd & Jordan Trails Rd	Granite Falls	Jordan Road	2-½ 8	158	57 51	383	515 500	520	3	80	Yes	Small valves in Stations 1& 3 work together as lead. Station 1 large valve is 1st lag. Station 3 large valve is 2nd lag.
3 / Jordan Rd & 179th Dr NE	Granite Falls	Jordan Road	3 8	215	105 95	273	515 492		3	125	Yes	
2 / Rainbow Drive	Jordan Road	Blue Spruce	2-½ 8	106	57 47	279	411 388	400	3	60	Yes	
4 / Chappel Rd & 117th Pl NE	Jordan Road	Blue Spruce	2 8	115	62 55	245	388 372		3	65	Yes	Station 4 operates as lag to Station 2.
5 / Chappel Rd & 119th Pl NE	Jordan Road	Blue Spruce	2		65	245	395		none	n/a	No	Serves a dead end pipe in the vicinity of other Blue Spruce stations.
6 / Chappel Rd & 177th Av NE	Jordan Road	Blue Spruce	2	160	61	245	386		none	n/a	No	Station 6 operates as lag to Station 7 in a small loop off of Chappel Rd.
7 / Chappel Rd & 178th Dr NE	Jordan Road	Blue Spruce	1	160	65	265	415		none	n/a	No	
27 / Jordan Rd, NW of 137th Dr NE	Jordan Road	Meeker Retreat	2		55	140	267	270	none	n/a	No	Small zone serving only 4 meters.
28 / Jordan River Trails	Jordan Road	Jordan River Trails	1-½ (2)3	140	35 30	247	328 316	325	none	n/a	No	Two 3" valves in series to avoid cavitation.
43 / Jordan Trails Rd & Crest Lane	Jordan Road	Crest Lane	2	78	58	340	474	470	none	n/a	No	Serves 8 meters west of Jordan River Trails.
9 / Engebretsen Rd, N of Jordan Road	Granite Falls	Engebretsen	2 8	163	68 63	315	472 461	470	3	85	No	
8 / Engebretsen Rd & 175th Av NE	Engebretsen	Cedar Lane/ Indian Summer	2 8	148	55 45	194	321 298	320	3	60	Yes	Station 42 is lag to the small valve in Station 8. The large valve in Station 8 opens last for fire flows or flushing.
42 / Engebretsen Rd & 172nd Dr NE	Engebretsen	Cedar Lane/ Indian Summer	2	148	55	190	317		none	n/a	No	
11 / Lake Bosworth Pump Station	Bosworth	Granite Falls	6	110	95	455	674	726	none	n/a	Yes	Allows water back into the Granite Falls zone in case of emergency. Also controls discharge pressure at the outlet of the Bosworth pumps, which is currently set for 140 psi.
17 / 23rd St NE & 159th Av NE	Bosworth	Sunset Ridge	1 2	117	70 65	540	702	700	none	n/a	No	Serves about 20 home on 4" pipe, southwest of Lake Bosworth
10 / Granite Falls Pump Station	Granite Falls	Lake Stevens	8	-	65	270	420	500	4	225	Yes	Allows water back to the Lake Stevens zone in case of emergency. 8-in valve is on the suction side of the pumps. A solenoid valve closes when pumps turn on, so that the valve does not open when the pumps draw down the suction side pressure.
24 / 36th St SE & 101st Av SE	Hillcrest	Lake Stevens	6	88	44	377	479		3	65	Yes	Supports fire flow to the Lake Stevens zone. Includes reverse flow in case of major pressure loss in the Hillcrest zone.
23 / 33rd St SE & 103rd Av SE	Lake Stevens	Williams Rd	8	87	60	308	447	460	3	85	Yes	Backup supply to the Williams Rd zone, which is normally fed directly from Everett transmission.

Table 4-4: Pressure Reducing Valves (continued)

Station # / Location	Zone From	Zone To	Valve Size (in.)	Typical Upstream Pressure (psi)	Settings (psi)	Elevation (ft)	Calculated HGL (ft)	Zone HGL (ft)	Pressure Relief Valve Size (in)	Pressure Relief Valve Setting (psi)	Reverse Flow	Notes
Integrated / Lake Stevens System Pressure Reducing Stations (continued)												
47 / 8421 19th St NE (Campus Park)	Lake Stevens	Soper Hill	2 8	86	55 52	282	409 402	420	3	65	Yes	These stations assist with fire flow and provide backup to gravity flow from the Marysville JOA line to the Soper Hill area. Can also flow in reverse to back up the Lake Stevens zone.
13 / 44th St NE & 79th Av NE	Lake Stevens	Soper Hill	8	83	38	290	378		3	105	Yes	
14 / 40th St NE, West of Sunnyside Blvd.	Soper Hill	Sunnyside	4	120	37	213	298	300	none	n/a	No	First to open in the series of valves serving the Sunnyside Zone.
12 / 52nd St NE & 65th Dr NE	Soper Hill	Sunnyside	1 6	145	85 80	94	290 279		none	n/a	No	Second and fourth valves to open to the Sunnyside Zone.
15 / Sunnyside Blvd & 71st Av NE	Soper Hill	Sunnyside	2 8	151	100 90	60	291 268		3	110	Yes	Third and fifth valves to open to the Sunnyside Zone.
21 / S. Lk Stevens Rd & 87th Av SE	Lake Stevens	Cavaleros	8	123	90	223	431	460	3	115	Yes	Backup supply to Cavaleros zone, which is normally fed from Everett transmission.
54 / 20th Sth SE & 79th Ave SE	Lake Stevens	Cavaleros	12	97	67	269	424		none	n/a	Yes	
18 / 10th St SE, West of 79th Av SE	Cavaleros	10th SE	2 8	118	60 55	177	316 304	320	3	70	Yes	
46 / 157th Ave SE & 15th Pl SE	Cavaleros	10th SE	2-½ 8	100	48 43	209	320 308		3	58	Yes	Serves the plat of Cavalero Ridge. Equipped with a pressure sustaining feature, to prevent pressure drop in the upstream 460 zone.
52 / Valtera, between Sunnyside & Lundeen	Lake Stevens	10th SE	2-½ 8	123	60 50	190	329 306		3	70	Yes	Serves the plat of Valtera. Also has a pressure sustaining feature.
20 / 28th St SE & Cavaleros Rd	Cavaleros	28th St SE	2	140	75	180	353	360	none	n/a	No	
53 / 17th St SE & 73rd Ave SE	Cavaleros	East Everett	2-½ 8	115	45 40	200	304 292	300	3	55	Yes	Serves the plat of East Everett Hills. Station has a pressure sustaining feature.
Dubuque Water System Pressure Reducing Stations												
25 76th St SE at Fairway View Estates	5 Line	Dubuque	3 6	94	89 85	340	546	500	-	-	No	After Dutch Hill Tap 2 from Everett transmission.
29 Kla-ha-ya (Tap)	5 Line	Dubuque	6		170/140	110	433		-	-	No	Everett-owned PRV
26 88th St SE & 125th Av SE	Dubuque	Dubuque Southwest	2 6	145	80 70	210	395 372	400	2	90	No	Small valves in Stations 26 and 33 work together as lead. Large valve in Station 33 opens next. Large valve in Station 26 opens last.
33 / 121st Ave SE & 8th St SE	Dubuque	Dubuque Southwest	1 2	125	80 75	213	398 386		-	-	No	
60 / Bartelheimer Dairy	Dubuque		2	120	70	75	237		-	-	No	This is a service PRV on the 2" pipe that only goes to the Dairy.
30 / Kla-ha-ya, 60th St NE	Dubuque	Kla-ha-ya E	1 2	145-175	100 95	120	351 339	350	-	-	No	Upstream pressure depends on Everett 5-line, which varies depending on season.
31 / 123rd Av SE, S of 58th Pl SE	Dubuque	Kla-ha-ya N	2 6	145-160	65 60	124	274 263	270	3	75	No	Upstream pressure depends on Everett 5-line, which varies depending on season.

Table 4-4: Pressure Reducing Valves (continued)

Station # / Location	Zone		Valve Size (in.)	Typical Upstream Pressure (psi)	Settings (psi)	Elevation (ft)	Calculated HGL (ft)	Zone HGL (ft)	Pressure Relief Valve		Reverse Flow	Notes
	From	To							Size (in)	Setting (psi)		
Kayak Water System Pressure Reducing Stations												
48 / 80xx 156th St NW	Kayak-548	Kayak-440	2 6	129	62 57	302	444 433		3	72	Yes	
49 / 172nd St NW & 84th Ave NW	Kayak-548	Kayak-440	2 6	119	53 48	310	432 421	440	3	63	Yes	
50 / 152xx Kayak Pt Rd	Kayak-548	Kayak-440	2 6	120	40 33	321	413 397		3	50	Yes	
Other Flow Control Valves												
32 / Soperwood Pump Station	Marysville JOA	Lake Stevens	-	-	-	297	-	500	4	-	-	High pressure relief valve.
34 / Storm Lake Ridge Pump Station	5-Line	Storm Lake	-	7	91	535	-	760	3	125	No	Control/pressure relief for pump station.
35 / Lake Roesiger Pump Station	3-Line	Lake Roesiger	-	19	124	515	-	811	2-½	-	No	Pressure relief and surge anticipator valve. Typical discharge pressure is 124 psi with pumps running.
36 / Machias Pump Station	3-Line	Lake Stevens	-	160-165		101	-	500	8	-	-	Relieves surge when pumps start. Typical discharge pressure is 195-200 with pumps running.
37 / Hillcrest Tank Site	Lake Stevens	Lake Stevens	12	-	20	-	-	500	-	-	-	Altitude valve, closes when tank is full.
38 / Walker Hill Tank Site	Lake Stevens	Lake Stevens	8	-		-	-	500	-	-	-	Altitude valve, closes when tank is full.
39 / Lake Stevens Wells	Wells	Lake Stevens		-		215	-	500	3	120	-	Purge valve and surge anticipator. Low wave set point 80 psi. High wave set point 130 psi.
40 / Burn Rd & 172nd St NE	Granite Falls	City of Arlington	6	100		485	-	710	-	-	-	Intended to maintain flow below the 1,000 gpm limit in wholesale water agreement with Arlington. Current setting is 1100 gpm max.
45 / Lake Cassidy Booster Station							-					
51 / Kayak Treatment Plant							-					
55 / May Creek Pump Station							-					
56 / Sunday Lake Booster Station							-					
57 / Sunday Lake Flow Control							-					Restrict flow from source to match water right limit.
58 / Sunday Lake Well							-					
59 / Sunday Lake Backwash Valve							-					

Table 4-5: Length of System Pipe

Diameter	AC	CI	C	DI	PE	PVC	STL	G	Total (ft)	Total (mi)
¾-inch			97						**97**	**0.02**
1-inch	24		428	19		2,074			**2,546**	**0.48**
1-¼-inch					54		1,105		**1,159**	**0.22**
1-½-inch			210	13	263	676			**1,162**	**0.22**
2-inch	236		693	5,698	10,205	45,438	69	3,093	**65,432**	**12.39**
2-½-inch	503		21	25		2,844			**3,393**	**0.64**
3-inch	468			545		7,934	6		**8,953**	**1.70**
4-inch	25,536	62		152,533		36,134			**214,264**	**40.58**
6-inch	115,169	5,050		83,664		26,429	165		**230,476**	**43.65**
8-inch	25,741	5,965		1,025,138	526	36,742	39		**1,094,152**	**207.23**
10-inch	1,416	1,430		3,921		195			**6,962**	**1.32**
12-inch	23	13,019		287,397	1,010	638			**302,087**	**57.21**
16-inch				68,612	299				**68,911**	**13.05**
18-inch		192		58					**249**	**0.05**
24-inch				17,727					**17,727**	**3.36**
30-inch				3,037					**3,037**	**0.58**
Total (feet)	**169,115**	**25,717**	**1,450**	**1,648,386**	**12,357**	**159,104**	**1,385**	**3,093**	**2,020,606**	
Total miles)	**32.0**	**4.9**	**0.3**	**312.2**	**2.3**	**30.1**	**0.3**	**0.6**		**382.7**

AC = asbestos cement; CI = cast iron; C = copper; DI = ductile iron; PE = polyethylene; PVC = polyvinyl chloride; STL = steel; G = galvanized iron

Table 4-6: Inventory of Active Wells

Water System	DOH Source ID	Well Tag #	PUD Source Name	Year Drilled	Year Pump Installed	Diameter (in)	Ground Surface Elev (ft)	Top of Screen (ft)	Bottom of Screen (ft)	Completed Well Depth (ft)	Pump No.	Pump Mfr.	Type	Pump Model No.	Rated Flow (gpm)	Rated Head (ft)	Speed (rpm)	Motor Power (hp)	Generator
Sunday Lake	S03	AGB638	Well 3	1994	1998	12	220	364	431	436	1	Goulds	Submersible	8 RALC 6 Stage, 5" Impeller	100	575	3500	20	Wired for trailer generator.
Pilchuck 10	S01	BBF572	Well 1	1994	1996	6	422	18	23	23.5	1	UNK	Submersible	UNK	10	UNK	3500	UNK	6500 Watt generator onsite.
Pilchuck 10	S02	ABO659	Well 3 dug well	2003	2003	36	422	26	28	28	2	UNK	Submersible	UNK	12	UNK	3500	UNK	
Skylite Tracts	S01	AAA901	Well 1	1962	1986	8	154	38	48	48	1	UNK	Submersible	UNK	60	150	3450	3	Generator on site.
Skylite Tracts	Secondary pump in Well 1			-	1982	-	-	-	-	-	2	UNK	Submersible	UNK	60	150	3450	5	
May Creek	S01	AGB579	Well 1	1983	1984	8	260	64	138	143	1	Layne & Bowler	Submersible	6 GH – 4 Stage	277	196	3500	20	Generator on site.
May Creek	S02	AGB629	Well 2	1994	2001	12	260	90	151	156	2	Goulds	Submersible	10 RJMC – 8 Stage 8-1/2" Impeller	500	268	1740	50	
Otis	S01	AGB580	Well	1994	1994		423	228	233	233	1	Flint & Walling	Submersible	Aermotor 31 Stage	33	368	3450	5	None
Lake Stevens	S05	AGB694	Well 1	1984		16	217	78	108	111	1	Byron Jackson	Submersible	12MQH	1200	405	1760	150	Wired for trailer generator.
Lake Stevens	S06	AGB695	Well 2	1984		16	217	78	98	101.5	2	Byron Jackson	Submersible	12MQH	1200	405	1760	150	
212 Market	S01	ABD001	Well	1994		6		93	108	118	1	UNK	Submersible	UNK	2.5	UNK	3500	UNK	None
Kayak	S01	BBF570	Well 2	1979	1992	15 (reduces to 10)	325	340	360	381	1	Berkeley	Submersible	7S3L	300	600	3600	60	Wired for trailer generator.
Kayak	S02	BBF571	Well 3	1993	1994	12	333	370	400	402	2	American Turbine	Vertical Turbine	10-L-20 13 Stage	300	600	1765	60	

Table 4-7: Interties to Adjacent Purveyors

Purveyor	Location	Meter Size (inch)	Purpose
Marysville	44th Street NE	4” & 6”	Emergency/Potential Interlocal Agreement
Gold Bar	May Creek Road	4” & (2) 2”	Emergency/Potential Interlocal Agreement

Print Date: 12/21/2010
MAJOR_SOURCE_WATER.mxd

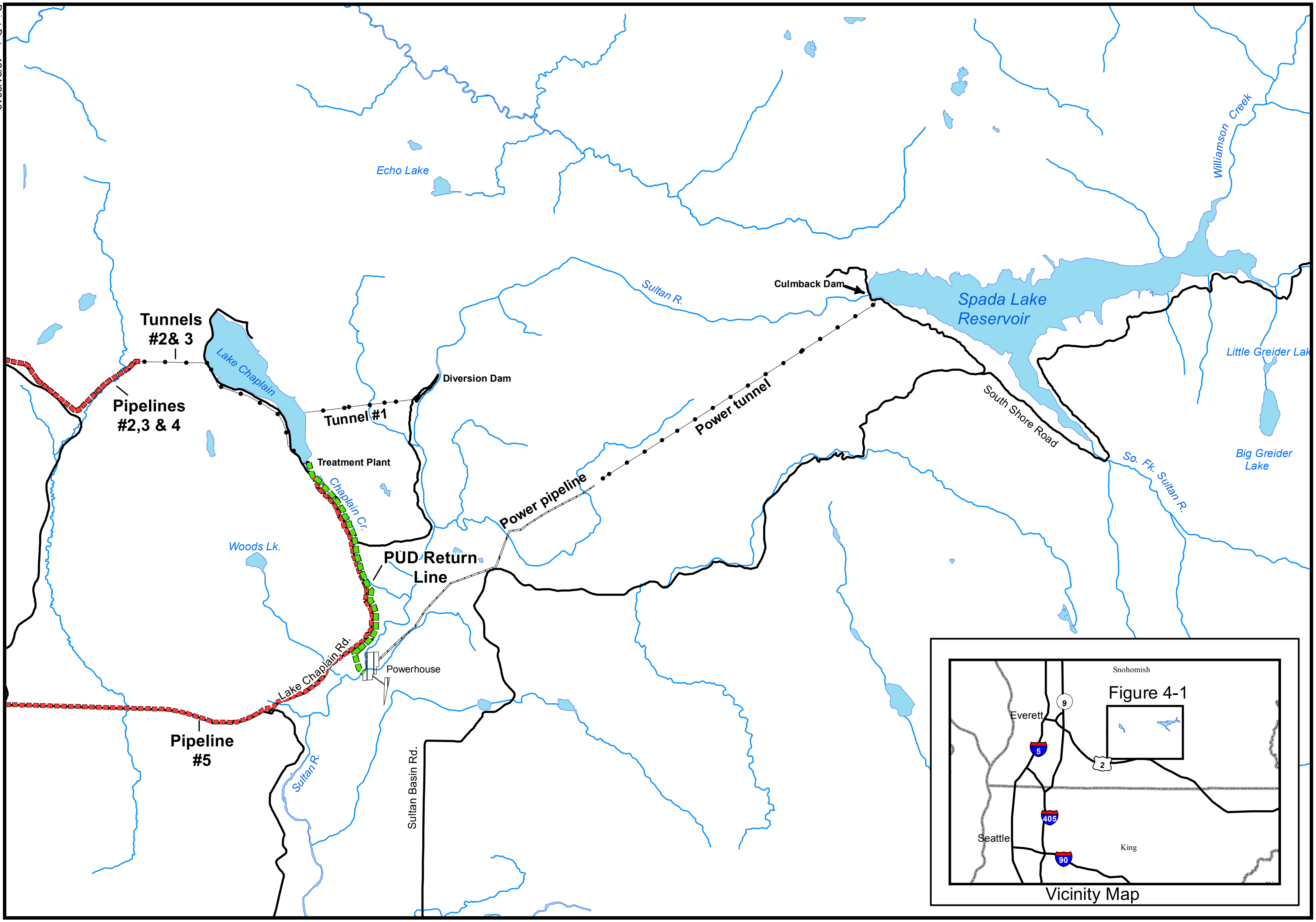
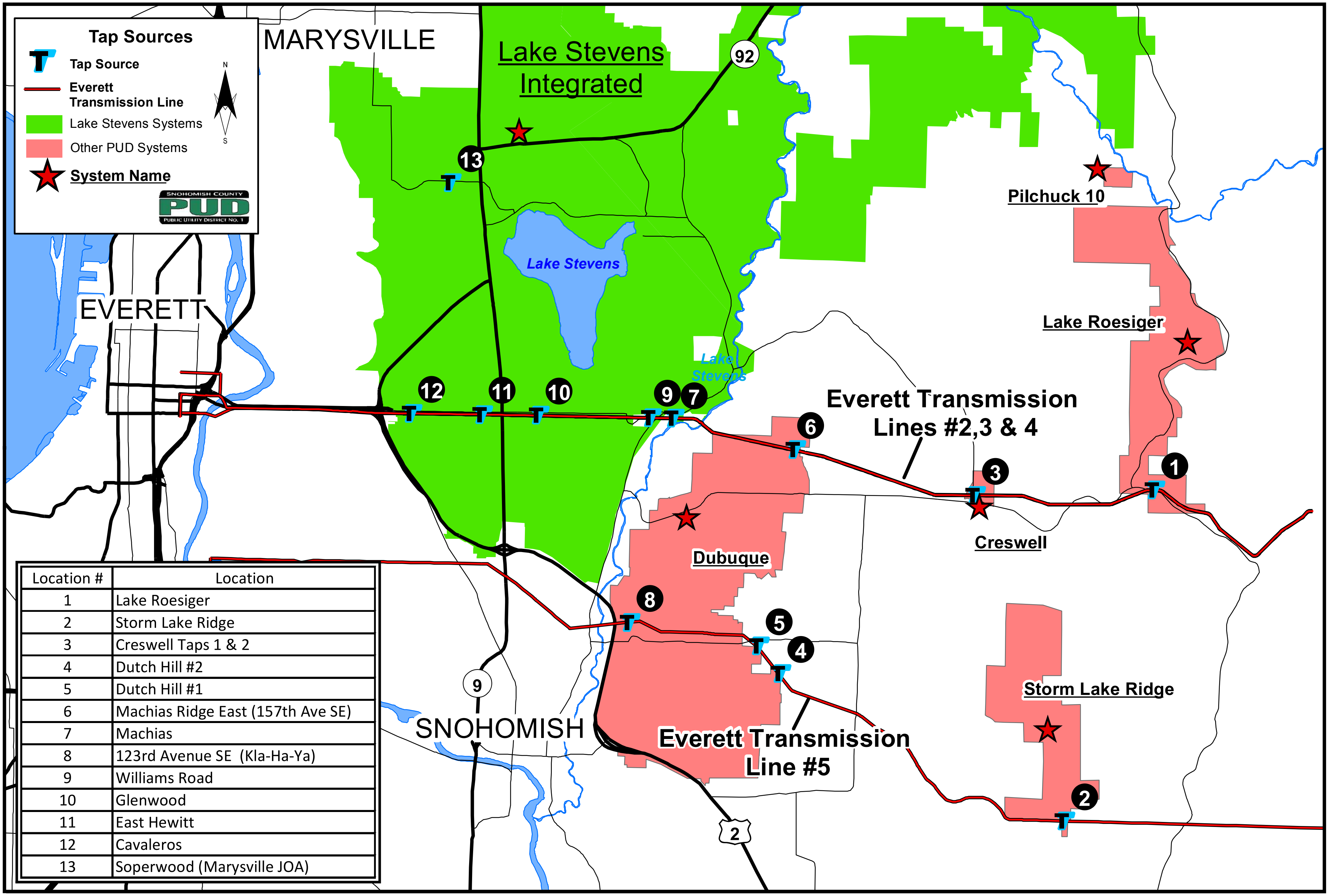


Figure 4-1 Major Source of Supply



Location #	Location
1	Lake Roesiger
2	Storm Lake Ridge
3	Creswell Taps 1 & 2
4	Dutch Hill #2
5	Dutch Hill #1
6	Machias Ridge East (157th Ave SE)
7	Machias
8	123rd Avenue SE (Kla-Ha-Ya)
9	Williams Road
10	Glenwood
11	East Hewitt
12	Cavaleros
13	Soperwood (Marysville JOA)

Figure 4-2: Source of Supply and PUD Taps

Print Date: 4/21/2011
PUD_TAPS.mxd

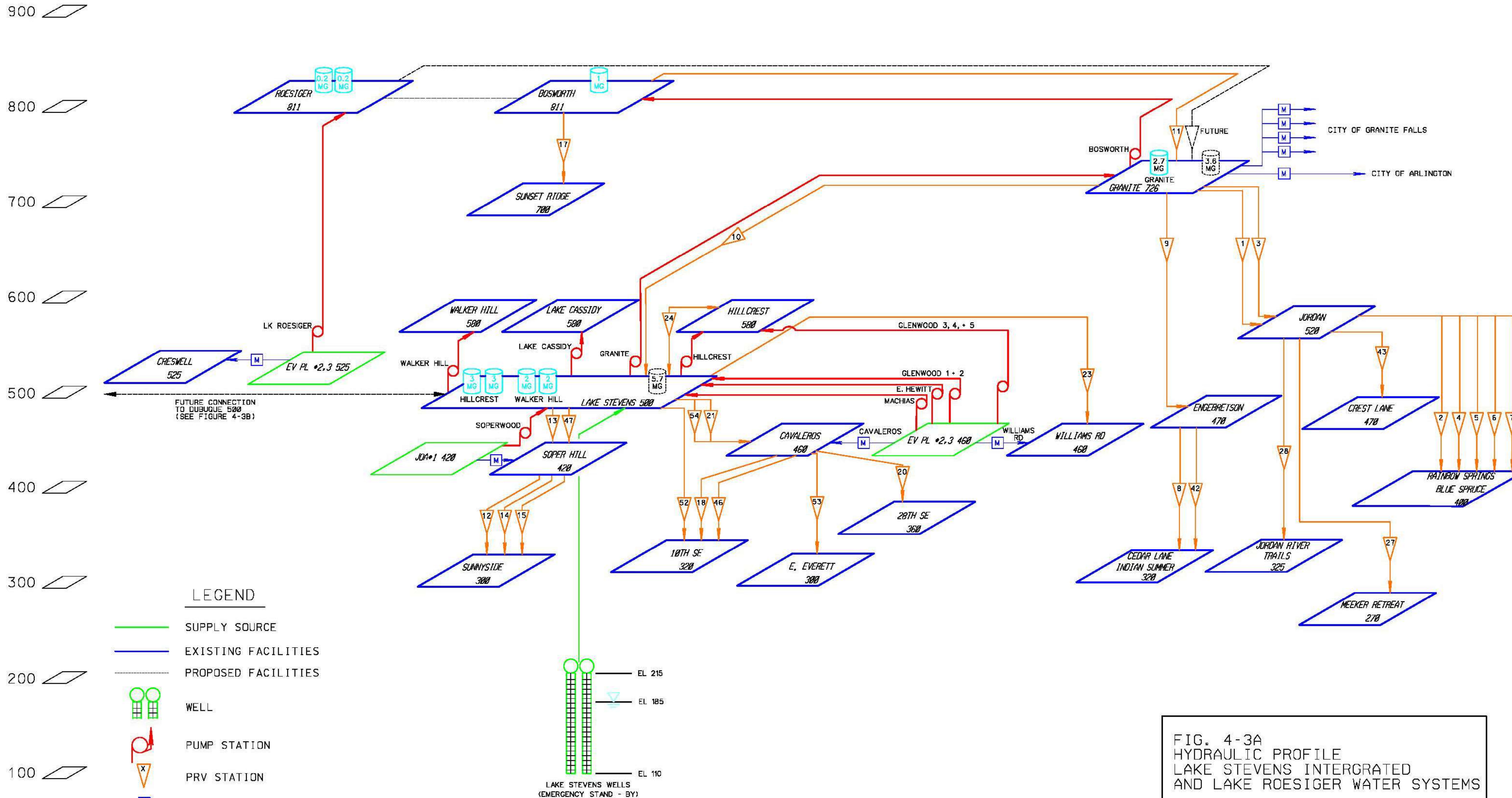


FIG. 4-3A
HYDRAULIC PROFILE
LAKE STEVENS INTERGRATED
AND LAKE ROESIGER WATER SYSTEMS

FILE: Y:\administration\District Plans-Policies\ 2009 Water System Plan\Figures\Hydraulic Profile\hydpro 2010.dgn
DATE: JANUARY 4, 2011

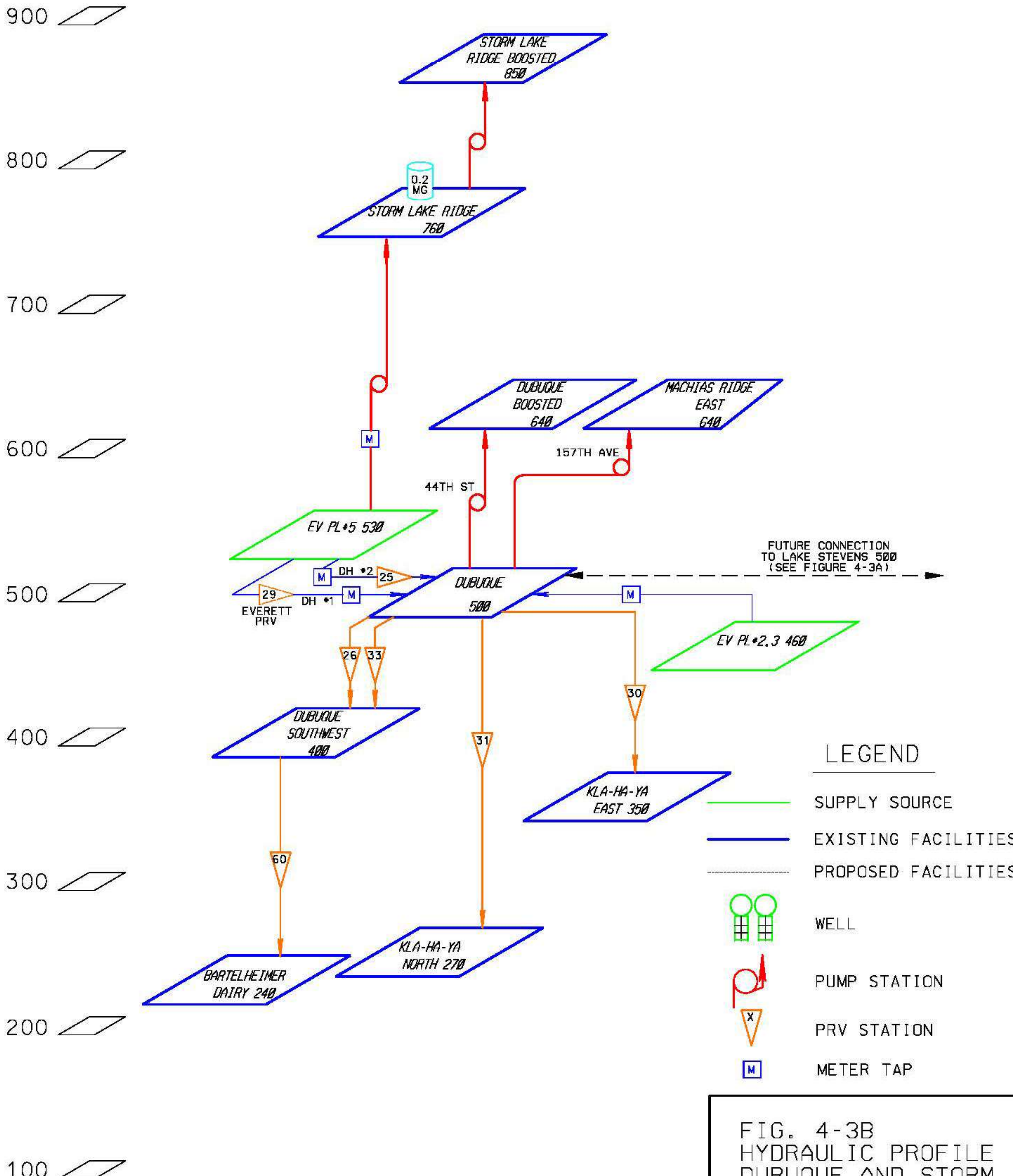
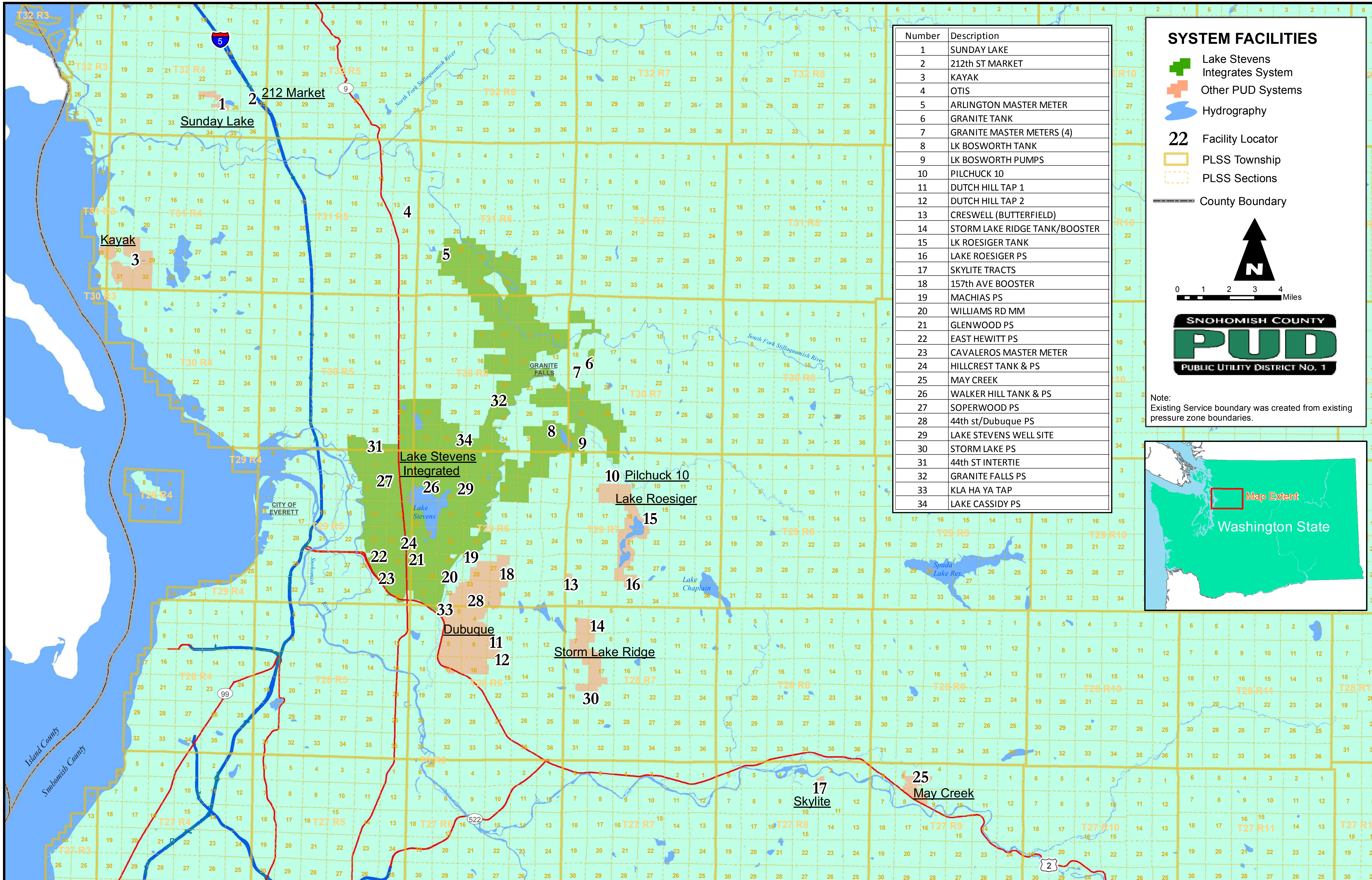


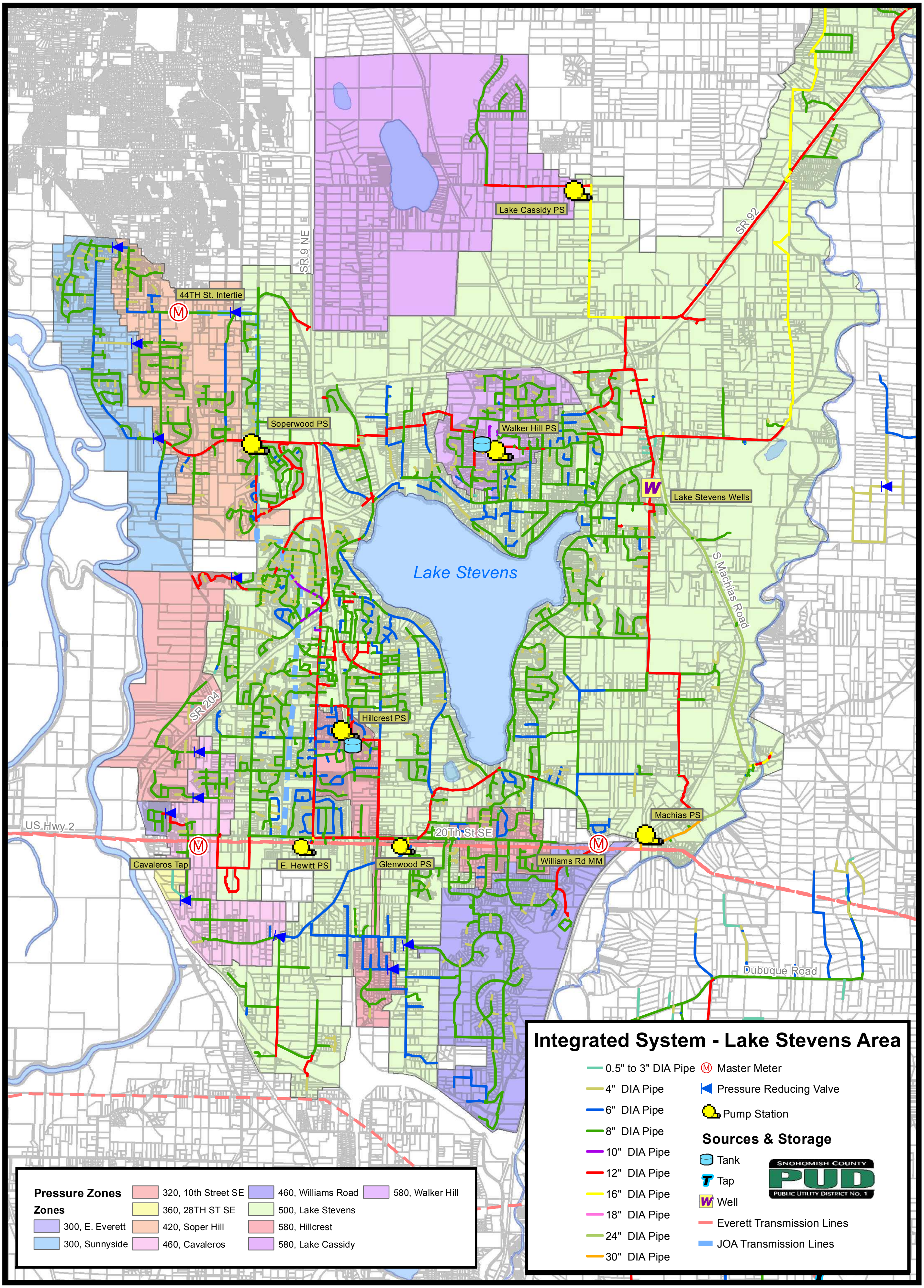
FIG. 4-3B
HYDRAULIC PROFILE
DUBUQUE AND STORM
LAKE WATER SYSTEMS



Number	Description
1	SUNDAY LAKE
2	212th ST MARKET
3	KAYAK
4	OTIS
5	ARLINGTON MASTER METER
6	GRANITE TANK
7	GRANITE MASTER METERS (4)
8	LK BOSWORTH TANK
9	LK BOSWORTH PUMPS
10	PILCHUCK 10
11	DUTCH HILL TAP 1
12	DUTCH HILL TAP 2
13	CRESWELL (BUTTERFIELD)
14	STORM LAKE RIDGE TANK/BOOSTER
15	LK ROESIGER TANK
16	LAKE ROESIGER PS
17	SKYLITE TRACTS
18	157th AVE BOOSTER
19	MACHIAS PS
20	WILLIAMS RD MM
21	GLENWOOD PS
22	EAST HEWITT PS
23	CAVALEROS MASTER METER
24	HILLCREST TANK & PS
25	MAY CREEK
26	WALKER HILL TANK & PS
27	SOPERWOOD PS
28	44th st/Dubuque PS
29	LAKE STEVENS WELL SITE
30	STORM LAKE PS
31	44th ST INTERTIE
32	GRANITE FALLS PS
33	KLA HA YA TAP
34	LAKE CASSIDY PS

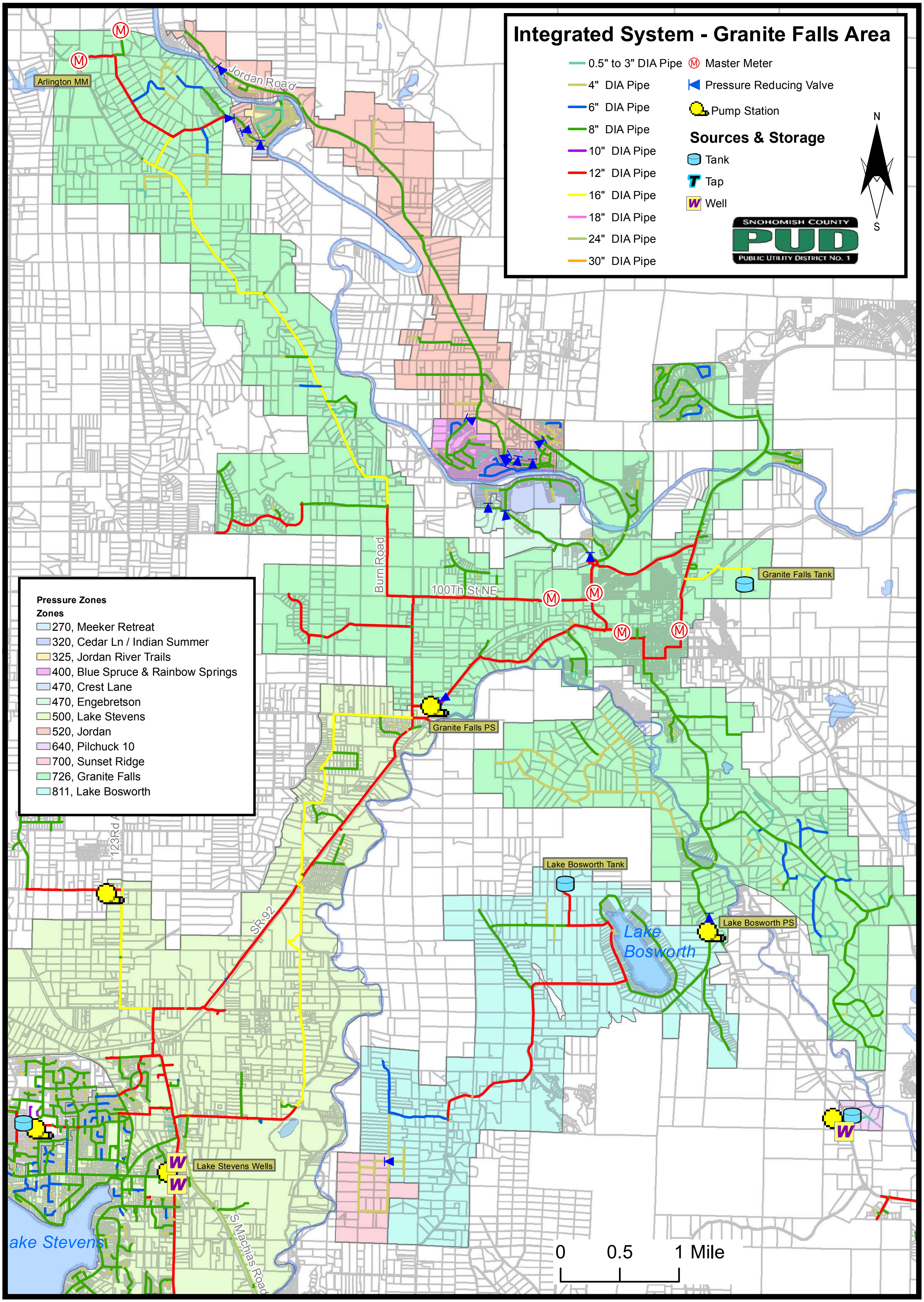
Print Date: 4/18/2011
FACILITIES.mxd

Figure 4-4: System Facilities



Print Date: 1/7/2011
Integrated_south_8x11_pz_v2.mxd

Figure 4-5 A: Integrated System - Lake Stevens Area



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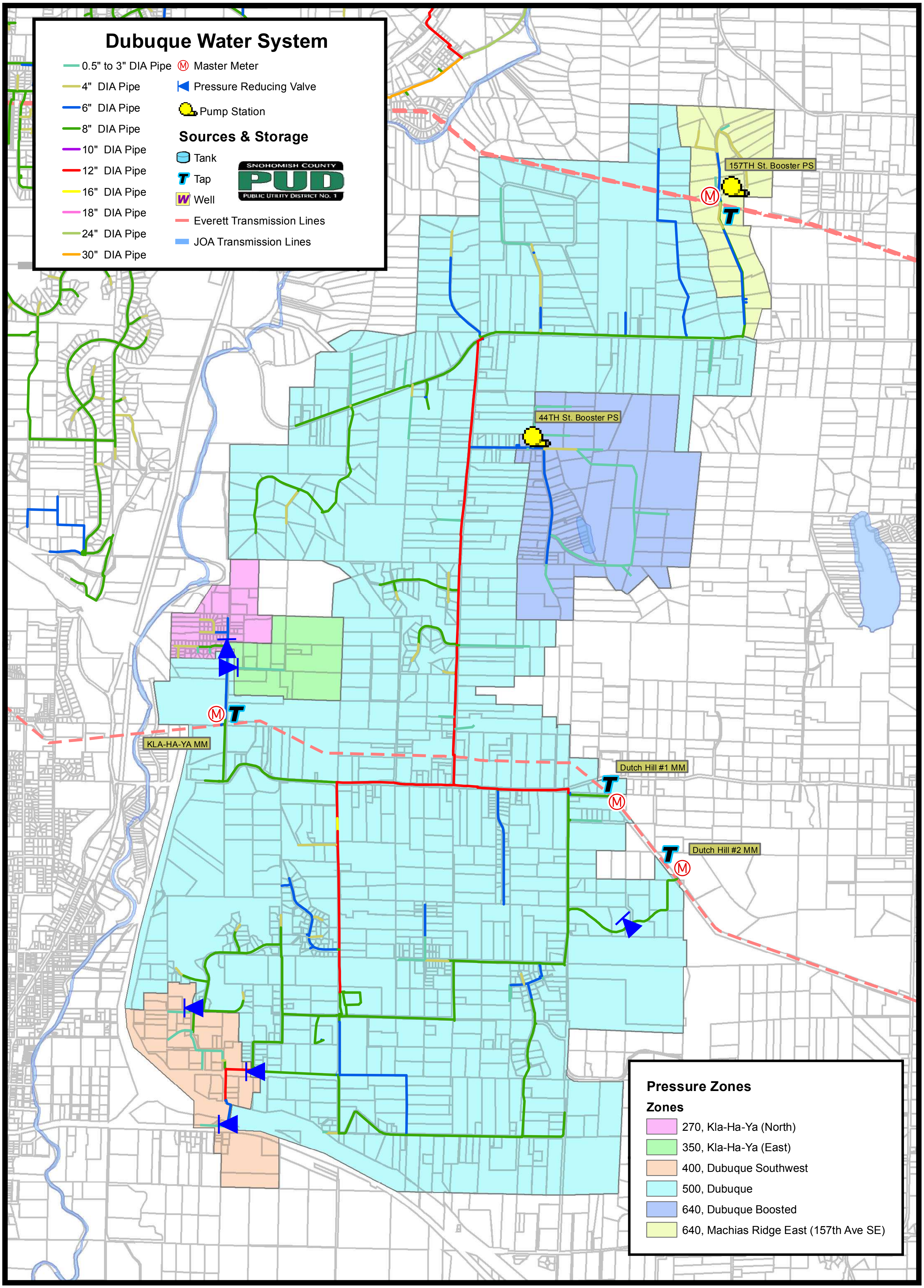
Integrated_north_8x11_pz_v2.mxd

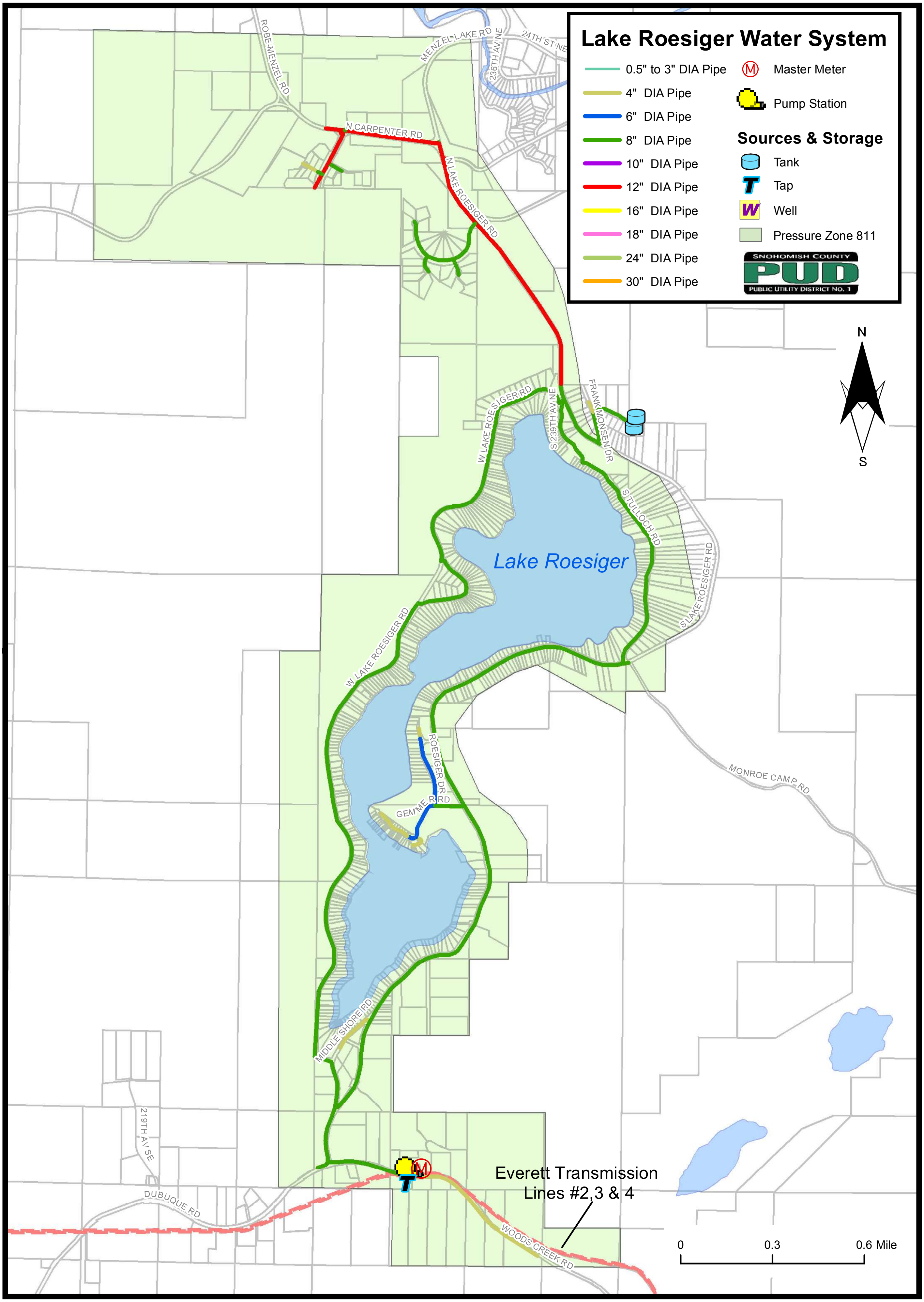
Figure 4-5 B: Integrated System - Granite Falls Area



Date: 1/7/2011

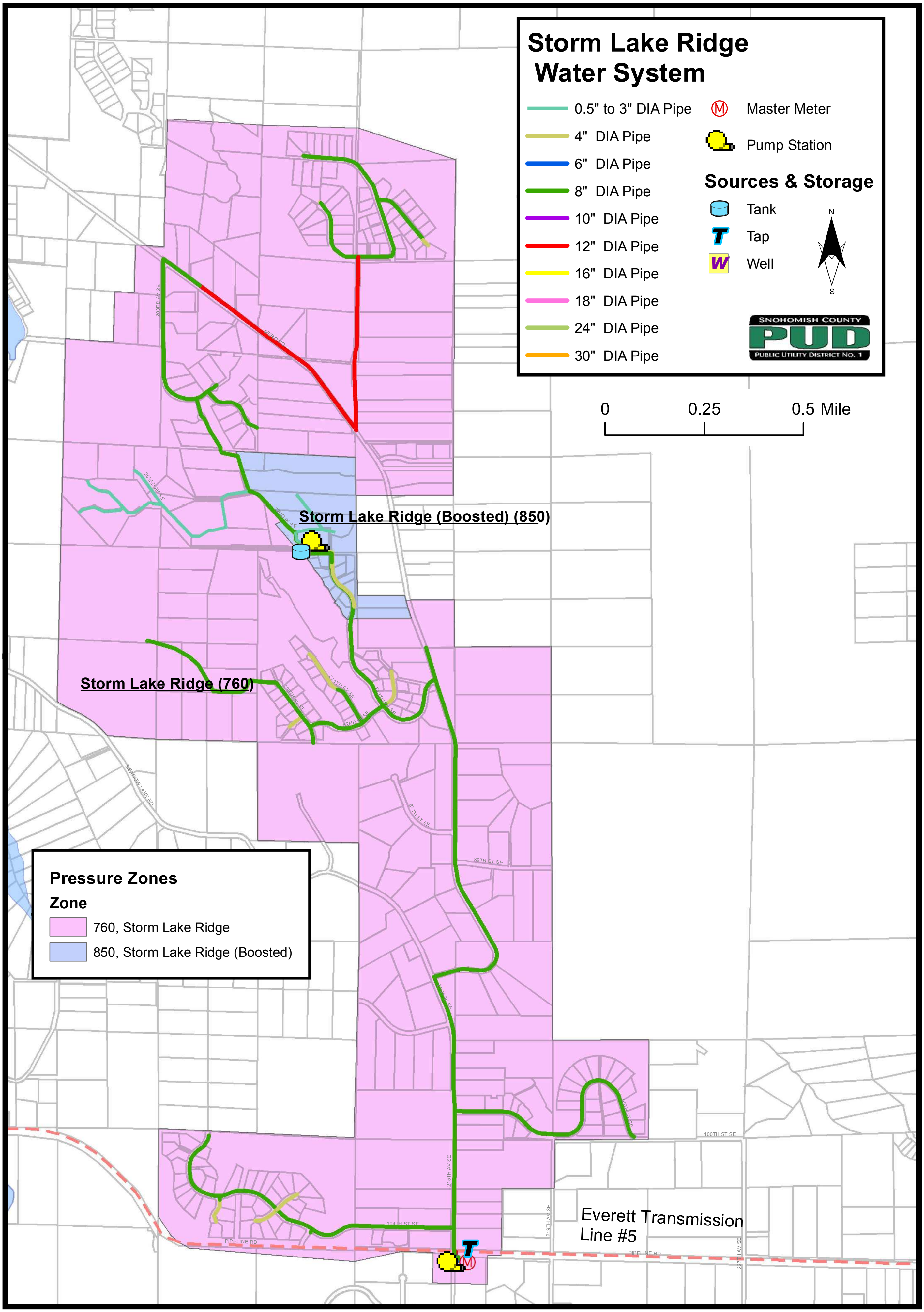
DUBUQUE_8x11_pz.mxd

Figure 4-5 C: Dubuque Water System



Print Date: 12/21/2010
Lake Roesiger.mxd

Figure 4-5 D: Lake Roesiger Water System



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Storm Lake Ridge.mxd

Figure 4-5 E: Storm Lake Ridge Water System

Print Date: 1/7/2011
Pilchuck_10.mxd

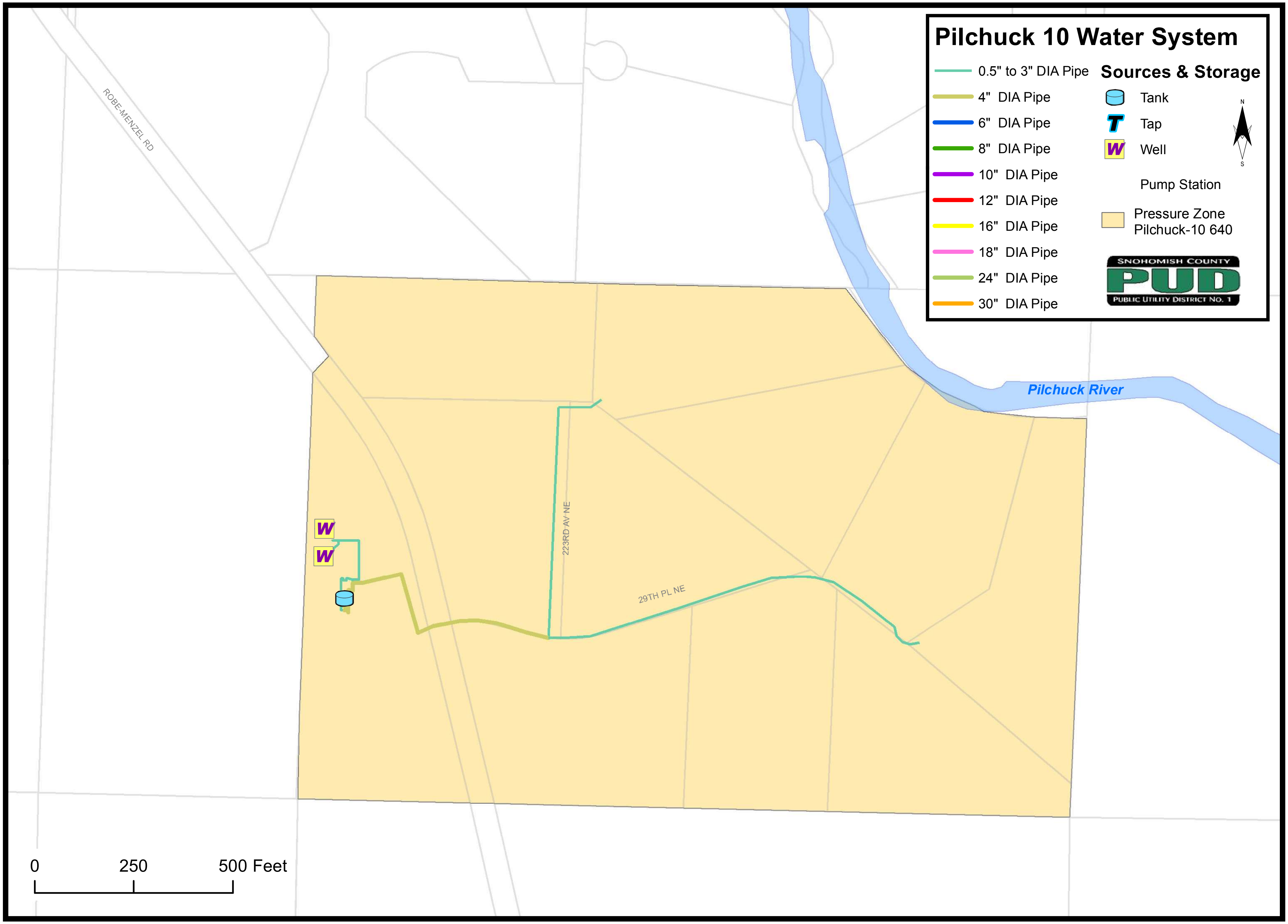

Figure 4-5 F: Pilchuck 10 Water System

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Creswell.mxd

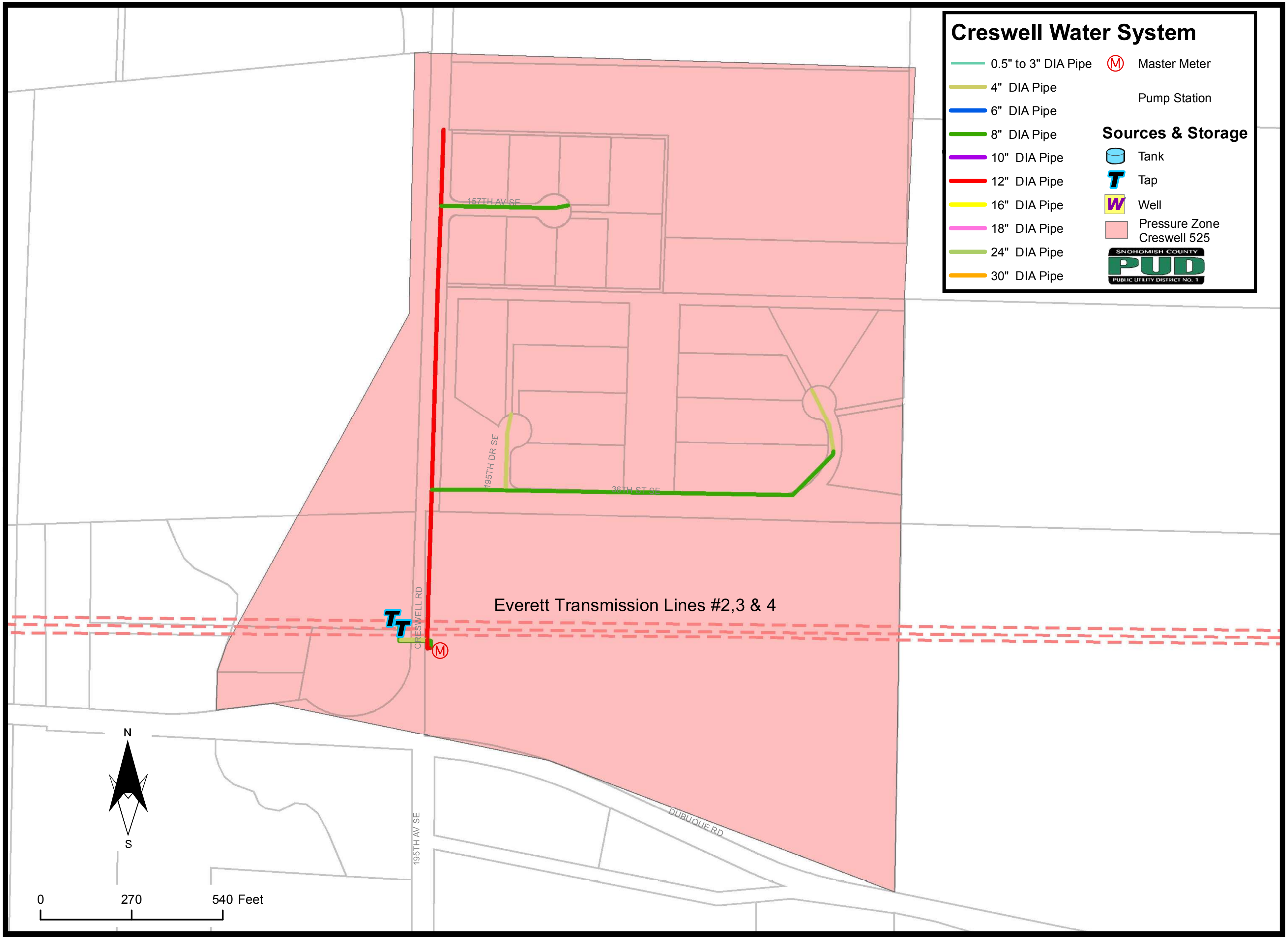
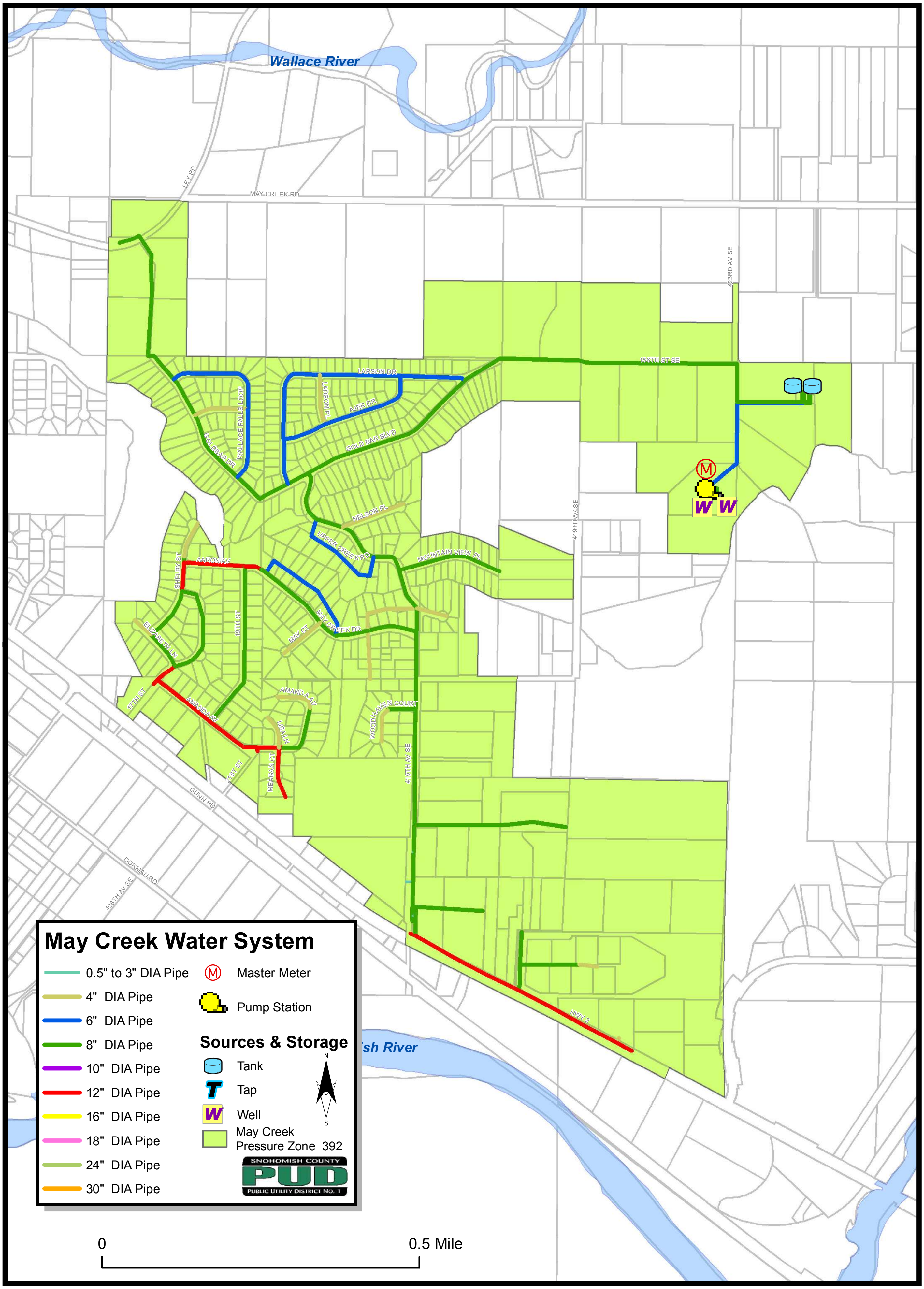


Figure 4-5 G: Creswell Water System



Print Date: 12/21/2010
May_Creek.mxd

Figure 4-5 H: May Creek Water System

Print Date: 12/21/2010
Kayak.mxd

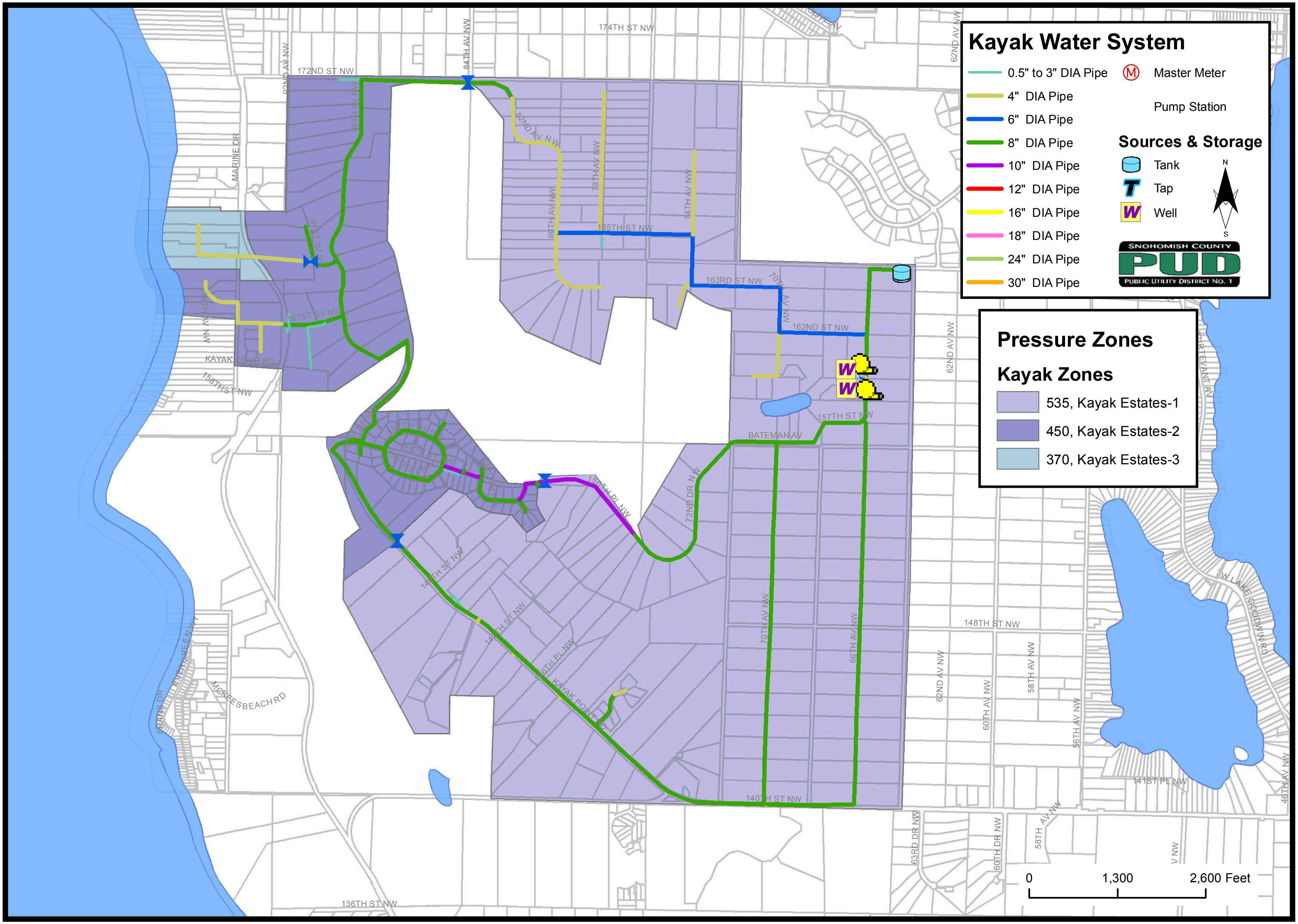


Figure 4-5 I: Kayak Water System

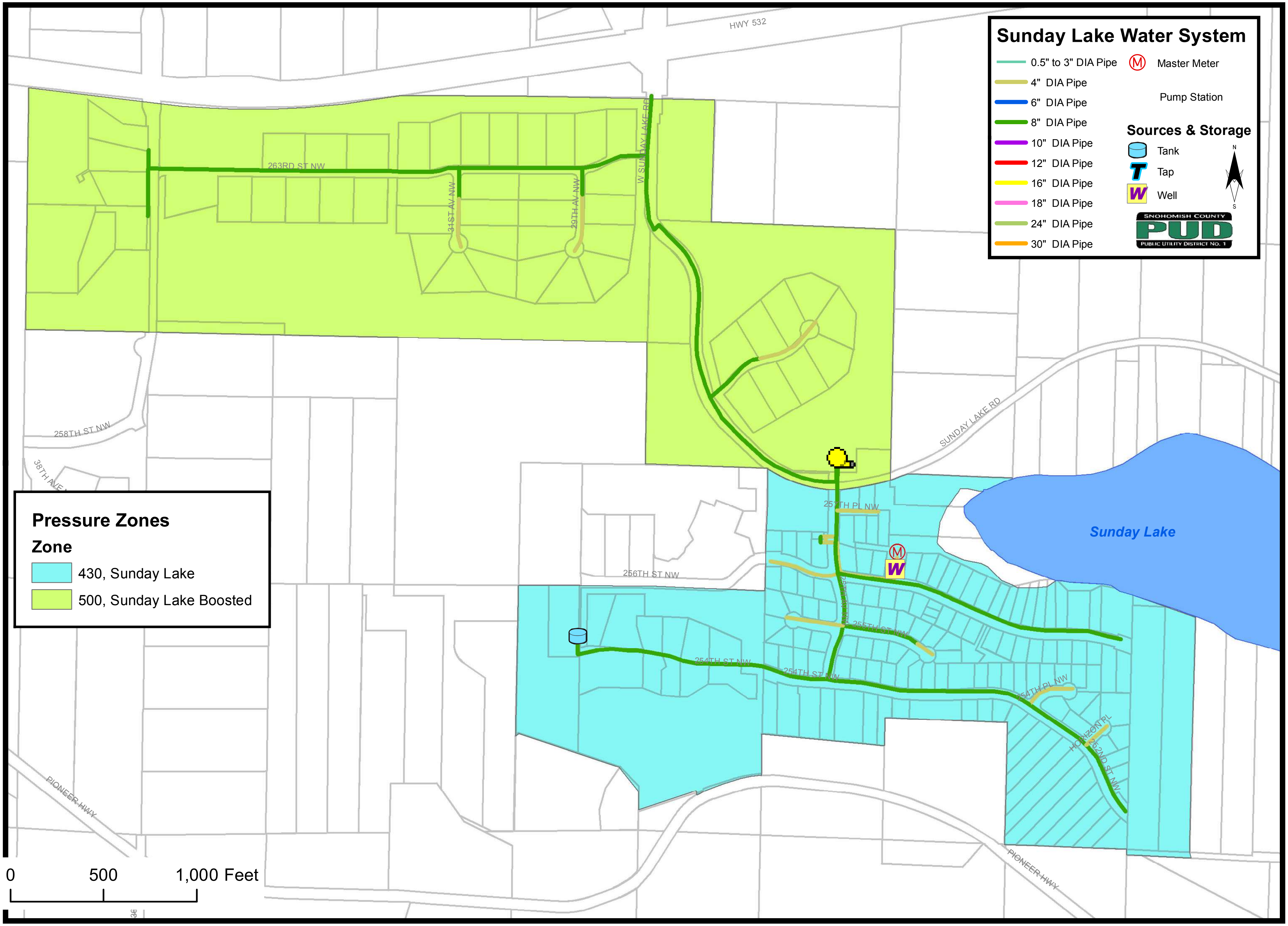


Figure 4-5 J: Sunday Lake Water System

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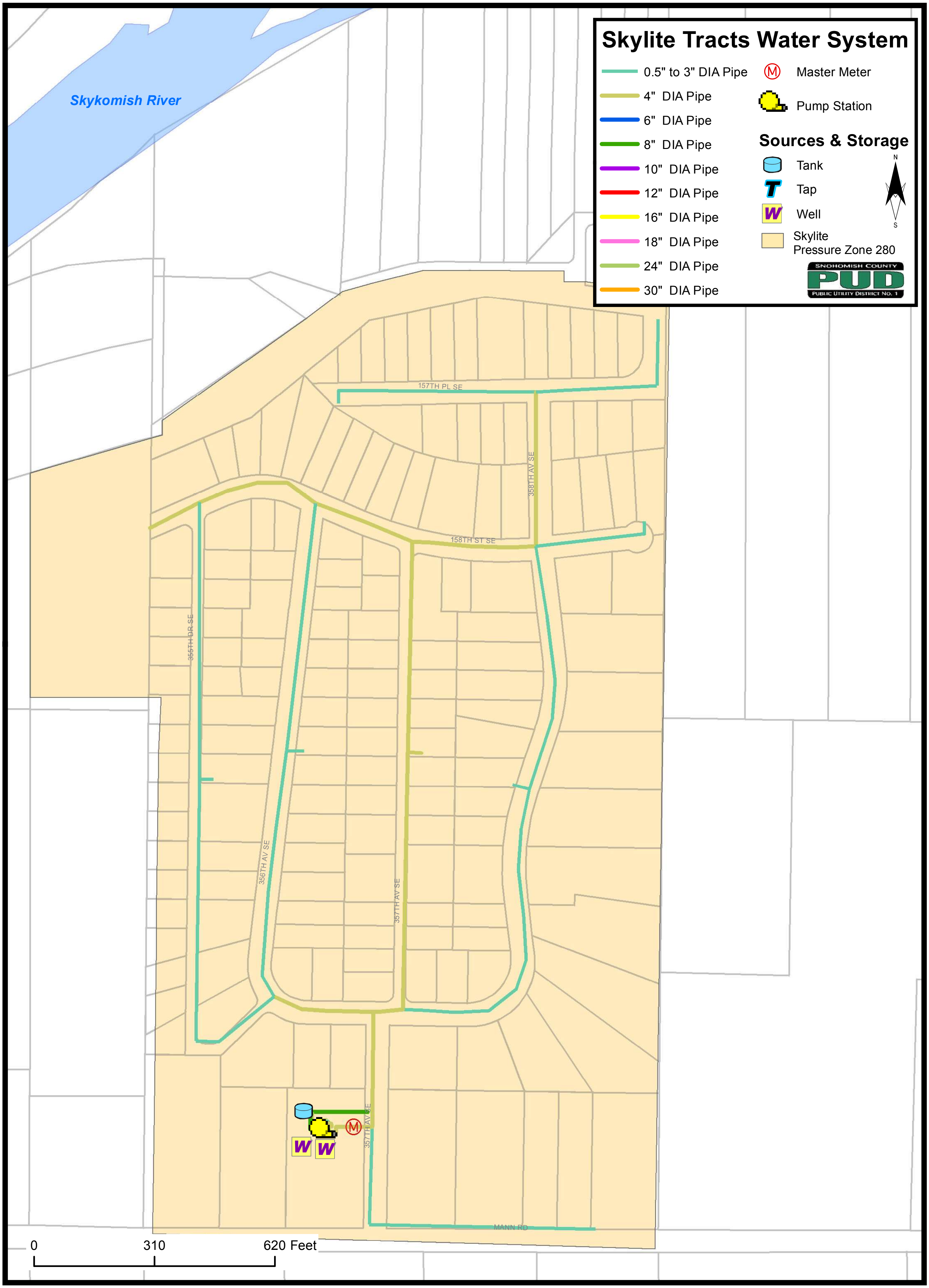
Sunday_Lake.mxd



Print Date: 12/21/2010
Skylite_Tracts.mxd

Figure 4-5 K: Skylite Tracts Water System

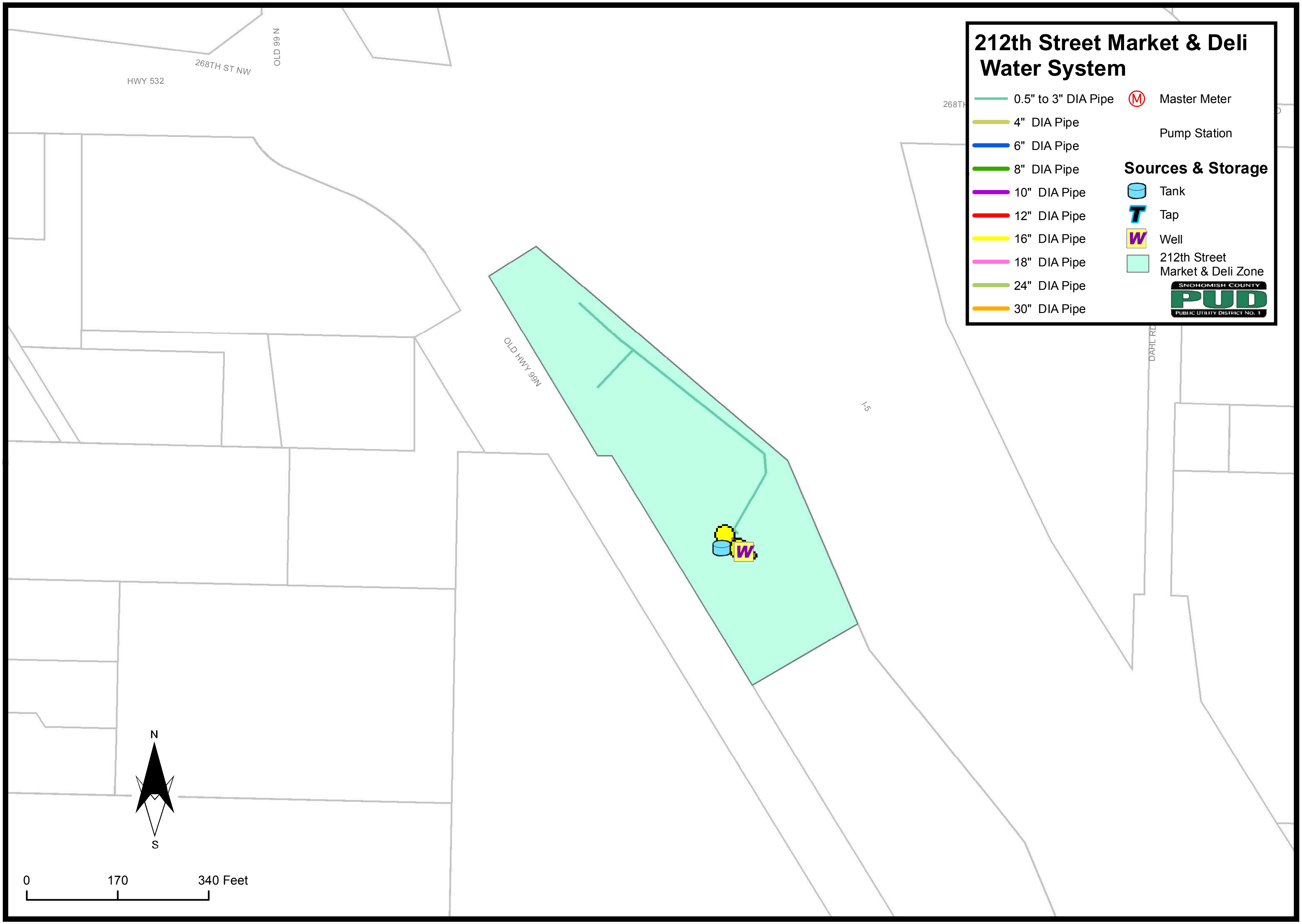


Figure 4-5 L: Two Twelve Market & Deli Water System

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212Market.mxd

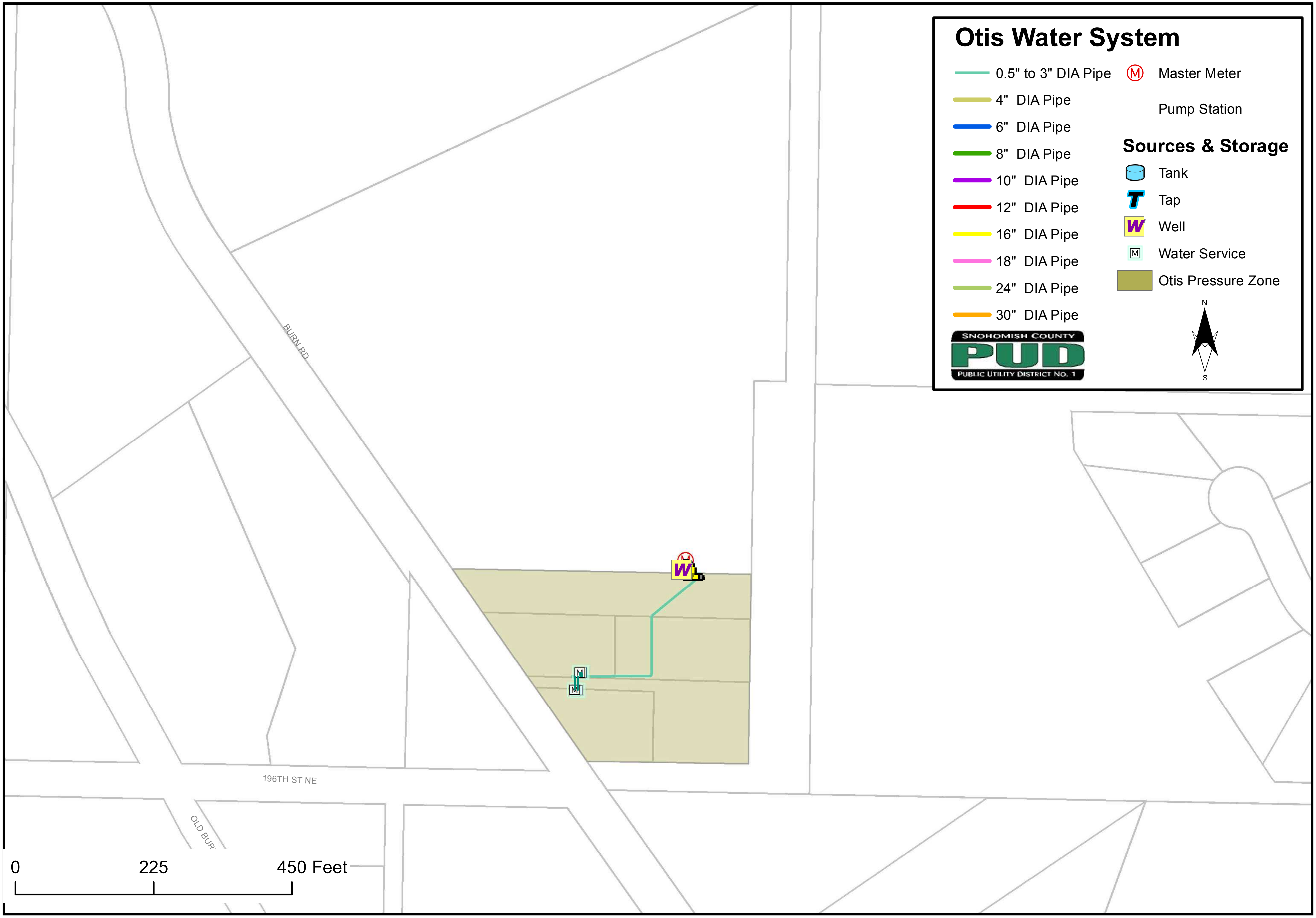

Figure 4-5 M: Otis Water System

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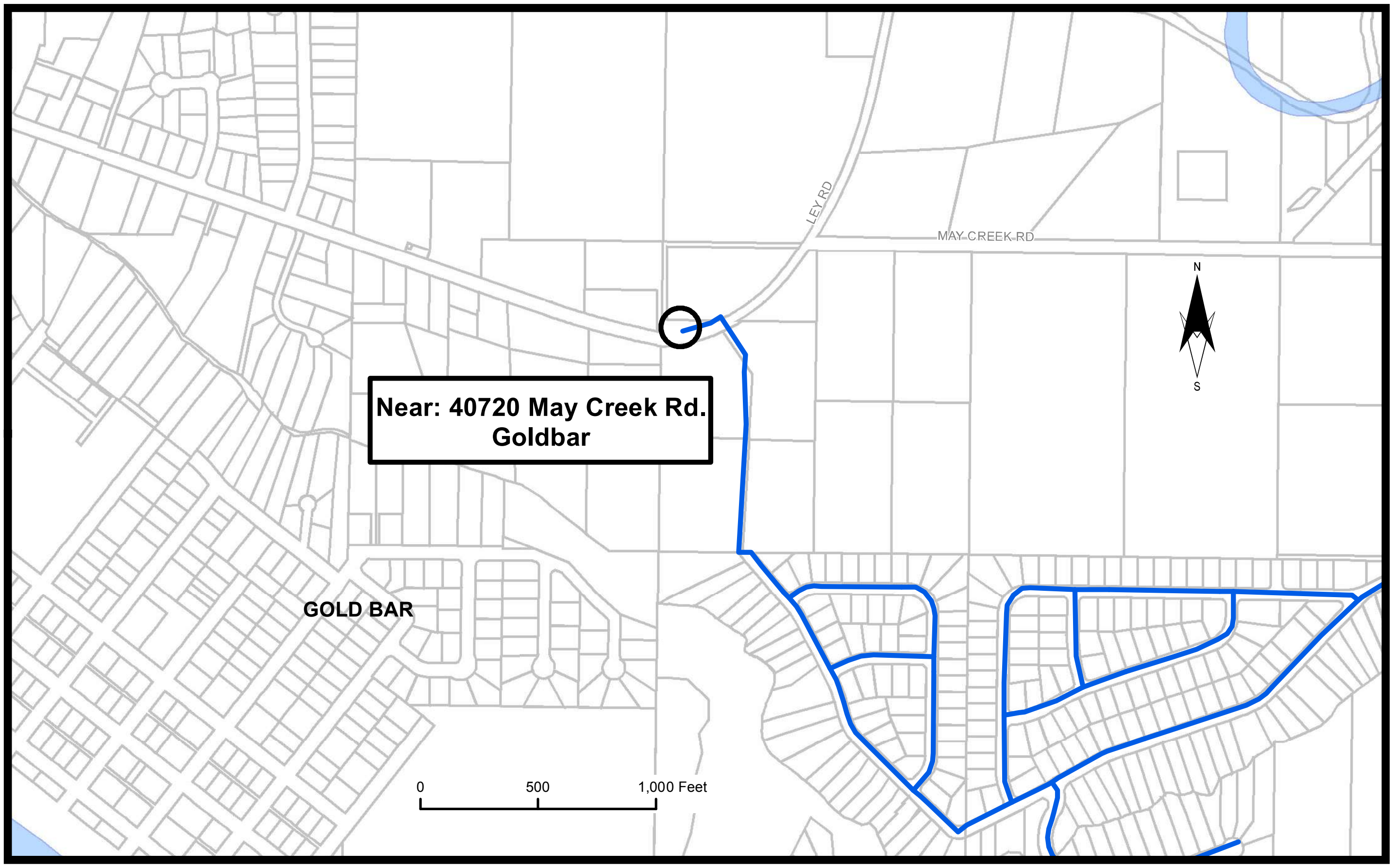
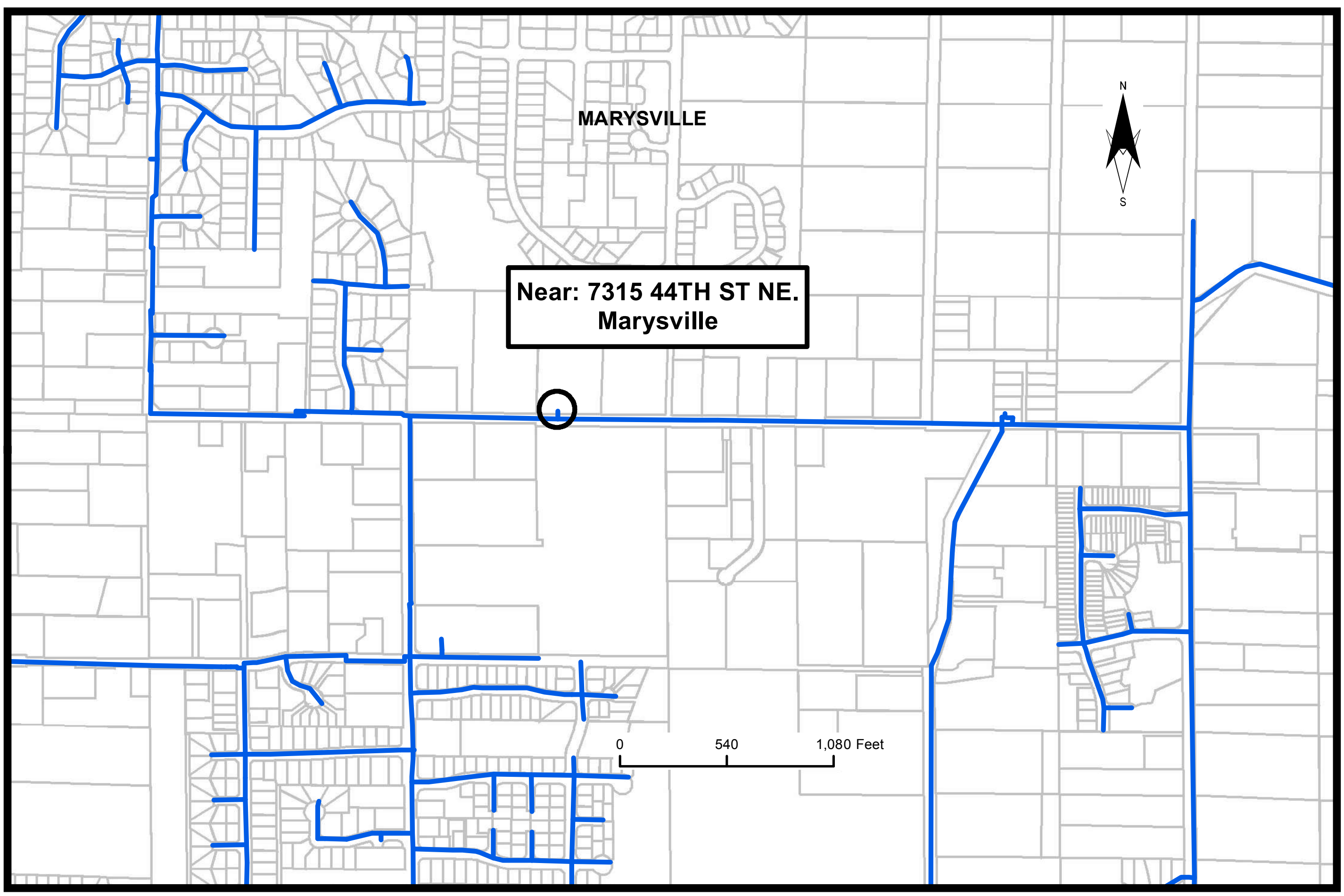
Document Name: Otis.mxd





Print Date: 1/5/2011
Existing_Interties.mxd

Figure 4-6: Existing Interties (with Marysville and Gold Bar)

5 Planning Data and Demand Forecasting

This chapter presents water demand forecasts that are used as a basis to plan facilities for the District's water systems. The District contracted with Murray, Smith, and Associates (MSA) to prepare growth and demand projections for its three largest systems. MSA's reports are attached in Appendix 5-1. This WSP summarizes MSA's results and applies their methodology to develop water demand projections for the District's smaller water systems.

5.1 CURRENT RETAIL WATER CONNECTIONS AND POPULATION

When estimating population, MSA reviewed source materials from the Washington State Office of Financial Management (OFM), the United States Census Bureau, the Puget Sound Regional Council (PSRC), Snohomish County, and the Cities of Granite Falls and Lake Stevens. A decision was made to estimate the District's retail water customer population based on 2.65 people per household, which is the average household size in Snohomish County according to the 2000 Census.

After MSA completed their work, the Census Bureau released the American Community Survey (ACS) 5-year estimates based on data collected from January 1, 2005 through December 31, 2009. Table 5-1 compares the 2000 Census and 5-year ACS estimates. Although average household size is shrinking, households in the small cities and rural areas of Snohomish County contain more people than the countywide average. Therefore, using 2.65 people per household is still reasonable for estimating population served by the District's water systems.

Table 5-1: People per Household

	2000 Census	2005-2009 ACS
Washington State	2.53	2.52
Snohomish County	**2.65**	2.56
Cities in Snohomish County	2.52	2.48 (2.32 in principal city; **2.65 not in principal city**)
Rural Snohomish Co.	2.81	2.70

Tables 5-2 and 5-3 summarize the estimated number of households and population served in the retail areas of the District's water systems in 2009. The number of retail multifamily households was determined by comparing meter records against construction drawings and the County Assessor's database. (The multifamily household numbers differ from the values used by MSA because this project was completed after MSA finished their report.) To estimate non-residential population, MSA used the number of employees per meter from the District's 2002 WSP for Lake Stevens, Dubuque, and Lake Roesiger. For the number of employees in the May Creek system, Table 5-2 assumes non-residential customers similar to the Lake Roesiger customers. For the 212 Market & Deli, non-residential population includes the average number of customers visiting the site in addition to the employees.

Table 5-2: Retail Service Connections, Households, and Employees per Meter in 2009

Water System	Single Family Meters	Multi-family Meters	Multi-family Households	MF Households per meter	Non-Residential Meters	Employees or customers per meter	Total Meters
District Systems with Purchased Everett Water Source							
Lake Stevens	16,309	230	1,154	5	441	15	16,980
Dubuque	1,001	5	10	2	15	10	1,021
Lake Roesiger	448	0	-	-	2	3	450
Storm Lake	163	0	-	-	0	-	163
Creswell	13	0	-	-	0	-	13
Subtotal	**17,934**	**235**	**-**	**-**	**458**	**-**	**18,627**
District Systems with Groundwater Sources							
May Creek	437	0	-	-	5	3	442
Kayak	363	2	4	2	0	-	365
Sunday Lake	150	0	-	-	0	-	150
Skylite	151	0	-	-	0	-	151
212 Market	0	0	-	-	1	25	1
Pilchuck 10	10	0	-	-	0	-	10
Otis	4	0	-	-	0	-	4
Total	**19,049**	**237**			**464**		**19,750**

Table 5-3: Estimated Retail Population Served by District Water Systems in 2009

Water System	Single Family	Multi-family	Non-Residential	Total Population
Population served by Everett Water Source				
Lake Stevens	43,219	3,058	6,615	52,892
Dubuque	2,653	27	150	2,830
Lake Roesiger	1,187	0	6	1,193
Storm Lake	432	0	0	432
Creswell	34	0	0	34
Subtotal	**47,525**	**3,085**	**6,771**	**57,381**
Population Served by Groundwater Sources				
May Creek	1,158	0	15	1,173
Kayak	962	11	0	973
Sunday Lake	398	0	0	398
Skylite	400	0	0	400
212 Market	0	0	25	25
Pilchuck 10	27	0	0	27
Otis	11	0	0	11
Total population served by all systems	**50,481**	**3,096**	**6,811**	**60,388**

* Assumes 2.65 people per household.

5.2 HISTORIC AND PROJECTED RETAIL GROWTH

Table 5-4 presents historic retail water connections served from 2000-2008 and projects the District's retail water connections and population for the next 6 and 20 years. The population estimates use the same number of people per connection as were used to estimate the 2009 population in Table 5-3. Household size and employment were held constant when making

Table 5-4: Projected Retail Water Services and Population

Year	Single Family	Multi-family	Non-Residential	Total	Annual Increase #/year	Annual Increase %/year
Lake Stevens Integrated Water System						
	Historic Number of Retail Meters					
2000	11,221	166	293	11,680		
2001	11,825	182	302	12,309	629	5.39%
2002	12,708	194	324	13,226	917	7.45%
2003	13,486	199	329	14,014	788	5.96%
2004	13,781	207	351	14,339	325	2.32%
2005	14,213	211	366	14,790	451	3.15%
2006	14,900	211	393	15,504	714	4.83%
2007	15,493	215	397	16,105	601	3.88%
2008	15,916	221	411	16,548	443	2.75%
Annual Growth 2002-8	3.82%	2.20%	4.04%		554	3.81%
Annual Growth 2003-8	3.37%	2.12%	4.55%		507	3.38%
	Projected Retail Connections					
6-years (2015)	19,452	270	502	20,224	613	3.40%
20-years (2029)	31,063	431	802	32,297	787	3.40%
DOH Approved Services = Unspecified						
	Projected Retail Population					
6-years (2015)	51,457	3,579	7,535	62,660	1,628	3.40%
20-years (2029)	82,317	5,715	12,032	100,064	2,359	3.40%

Year	Single Family	Multi-family	Non-Residential	Total	Annual Increase #/year	Annual Increase %/year
Lake Roesiger Water System						
	Historic Number of Retail Meters					
2000	388	-	0	388	5	
2001	391	-	1	392	4	1.03%
2002	396	-	1	397	5	1.28%
2003	406	-	1	407	10	2.52%
2004	414	-	1	415	8	1.97%
2005	422	-	1	423	8	1.93%
2006	432	-	1	433	10	2.36%
2007	434	-	2	436	3	0.69%
2008	439	-	2	441	5	1.15%
Annual Growth 2002-8	1.73%	-	12.25%		7	1.77%
Annual Growth 2003-8	1.58%	-	14.87%		7	1.62%
	Projected Retail Connections					
6-years (2015)	483	0	2	485	7	1.60%
20-years (2029)	603	0	3	606	8	1.60%
DOH Approved Services = 565 (Lake Roesiger system reaches approved limit by 2024.)						
	Projected Retail Population					
6-years (2015)	1,280	0	6	1,286	16	1.60%
20-years (2029)	1,598	0	9	1,607	21	1.60%

Year	Single Family	Multi-family	Non-Residential	Total	Annual Increase #/year	Annual Increase %/year
Creswell Water System						
	Historic Number of Retail Meters					
2000	3	-	-	3		
2001	3	-	-	3	0	0.00%
2002	3	-	-	3	0	0.00%
2003	3	-	-	3	0	0.00%
2004	3	-	-	3	0	0.00%
2005	3	-	-	3	0	0.00%
2006	3	-	-	3	0	0.00%
2007	8	-	-	8	5	166.67%
2008	12	-	-	12	4	50.00%
Annual Growth 2002-8	25.99%	-	-		2	25.99%
Annual Growth 2003-8	31.95%	-	-		2	31.95%
	Projected Retail Connections					
6-years (2015)	21	0	0	21	2	10.00%
20-years (2029)	81	0	0	81	3	10.00%
DOH Approved Services = Undetermined						
	Projected Retail Population					
6-years (2015)	56	0	0	56	5	10.00%
20-years (2029)	214	0	0	214	8	10.00%

Year	Single Family	Multi-family	Non-Residential	Total	Annual Increase #/year	Annual Increase %/year
Dubuque Water System						
	Historic Number of Retail Meters					
2000	726	-	14	740		
2001	757	-	14	771	31	4.19%
2002	789	-	14	803	32	4.15%
2003	900	4	15	919	116	14.45%
2004	960	3	14	977	58	6.31%
2005	981	3	15	999	22	2.25%
2006	988	3	15	1006	7	0.70%
2007	1001	4	15	1020	14	1.39%
2008	1000	4	14	1018	-2	-0.20%
Annual Growth 2002-8	4.03%	-	0.00%		36	4.03%
Annual Growth 2003-8	2.13%	0.00%	-1.37%		20	2.07%
	Projected Retail Connections					
6-years (2015)	1,139	5	16	1,160	24	2.20%
20-years (2029)	1,545	6	22	1,573	28	2.20%
DOH Approved Services = Unspecified						
	Projected Retail Population					
6-years (2015)	3,020	24	160	3,203	62	2.20%
20-years (2029)	4,095	33	216	4,344	76	2.20%

Year	Single Family	Multi-family	Non-Residential	Total	Annual Increase #/year	Annual Increase %/year
Storm Lake Ridge Water System						
	Historic Number of Retail Meters					
2000	23	-	-	23		
2001	26	-	-	26	3	13.04%
2002	30	-	-	30	4	15.38%
2003	32	-	-	32	2	6.67%
2004	83	-	-	83	51	159.38%
2005	132	-	-	132	49	59.04%
2006	160	-	-	160	28	21.21%
2007	165	-	-	165	5	3.13%
2008	171	-	-	171	6	3.64%
Annual Growth 2002-8	33.65%	-	-		24	33.65%
Annual Growth 2003-8	39.82%	-	-		28	39.82%
	Projected Retail Connections					
6-years (2015)	188	0	0	188	3	1.60%
20-years (2029)	235	0	0	235	3	1.60%
DOH Approved Services = 220 (Storm Lake system reaches approved limit by 2024.)						
	Projected Retail Population					
6-years (2015)	498			498	8	1.60%
20-years (2029)	622			622	8	1.60%

Year	Single Family	Multi-family	Non-Residential	Total	Annual Increase #/year	Annual Increase %/year
May Creek Water System						
	Historic Number of Retail Meters					
2000	383	-	4	387		
2001	388	-	4	392	5	1.29%
2002	398	-	4	402	10	2.55%
2003	407	-	4	411	9	2.24%
2004	409	-	4	413	2	0.49%
2005	413	-	4	417	4	0.97%
2006	422	-	4	426	9	2.16%
2007	434	-	4	438	12	2.82%
2008	437	-	4	441	3	0.68%
Annual Growth 2002-8	1.57%	-	-		7	1.56%
Annual Growth 2003-8	1.43%	-	-		6	1.42%
	Projected Retail Connections					
6-years (2015)	475	0	4	479	6	1.40%
20-years (2029)	577	0	5	582	7	1.40%
DOH Approved Number of Services = Unspecified						
	Projected Retail Population					
6-years (2015)	1,259	0	12	1,271	16	1.40%
20-years (2029)	1,529	0	15	1,544	19	1.40%

Table 5-4: Projected Retail Water Services and Population (cont.)

Year	Single Family	Multi-family	Non-Residential	Total	Annual Increase #/year	Annual Increase %/year
Kayak Water System						
	Historic Number of Retail Meters					
2000	323	-	-	323		
2001	334	-	-	334	11	3.41%
2002	345	-	-	345	11	3.29%
2003	352	-	-	352	7	2.03%
2004	357	-	-	357	5	1.42%
2005	359	-	-	359	2	0.56%
2006	360	-	-	360	1	0.28%
2007	361	1	0	362	2	0.56%
2008	362	2	0	364	2	0.55%
Annual Growth 2002-8	0.80%	-	-			0.90%
Annual Growth 2003-8	0.56%	-	-			0.67%
	Projected Retail Connections					
6-years (2015)	384	2	0	386	4	1.00%
20-years (2029)	442	2	0	444	4	1.00%
DOH Approved Services = 481						
	Projected Retail Population					
6-years (2015)	1,018	11	0	1,029	10	1.00%
20-years (2029)	1,171	11	0	1,182	10	1.00%

Year	Single Family	Multi-family	Non-Residential	Total	Annual Increase #/year	Annual Increase %/year
Sunday Lake Water System						
	Historic Number of Retail Meters					
2000	109	-	-	109	0	
2001	112	-	-	112	3	2.75%
2002	114	-	-	114	2	1.79%
2003	117	-	-	117	3	2.63%
2004	118	-	-	118	1	0.85%
2005	128	-	-	128	10	8.47%
2006	138	-	-	138	10	7.81%
2007	144	-	-	144	6	4.35%
2008	143	-	-	143	-1	-0.69%
Annual Growth 2002-8	3.85%	-	-			3.85%
Annual Growth 2003-8	4.10%	-	-			4.10%
	Projected Retail Connections					
6-years (2015)	181	0	0	181	6	4.00%
20-years (2029)	313	0	0	313	9	4.00%
DOH Approved Number of Services = 278 (Sunday Lake reaches approved limit by 2025.)						
	Projected Retail Population					
6-years (2015)	479	0	0	479	16	4.00%
20-years (2029)	830	0	0	830	24	4.00%

Year	Single Family	Multi-family	Non-Residential	Total	Annual Increase #/year	Annual Increase %/year
Skylite Tracts Water System						
	Historic Number of Retail Meters					
2000	145	-	-	145	1	
2001	146	-	-	146	1	0.69%
2002	147	-	-	147	1	0.68%
2003	148	-	-	148	1	0.68%
2004	148	-	-	148	0	0.00%
2005	148	-	-	148	0	0.00%
2006	149	-	-	149	1	0.68%
2007	151	-	-	151	2	1.34%
2008	151	-	-	151	0	0.00%
Annual Growth 2002-8	0.45%	-	-			0.45%
Annual Growth 2003-8	0.40%	-	-			0.40%
	Projected Retail Connections					
6-years (2015)	156	0	0	156	1	0.50%
20-years (2029)	167	0	0	167	1	0.50%
DOH Approved Services = 167 (Skylite Tracts reaches approved limit by 2029.)						
	Projected Retail Population					
6-years (2015)	412	0	0	412	2	0.50%
20-years (2029)	442	0	0	442	2	0.50%

The Pilchuck 10, Otis, and 212 Market water systems are not included in this table because there is essentially no expected growth for these systems.

- Pilchuck 10 currently serves 10 water connections and is approved for 11.
- The Otis system currently serves 4 connections and is designed for 5.
- The 212 Market water system is designed to only serve a deli and gas station.

The remaining connections on the Pilchuck and Otis systems are reserved for lots that were part of the original subdivisions. These three systems will not expand beyond their original design.

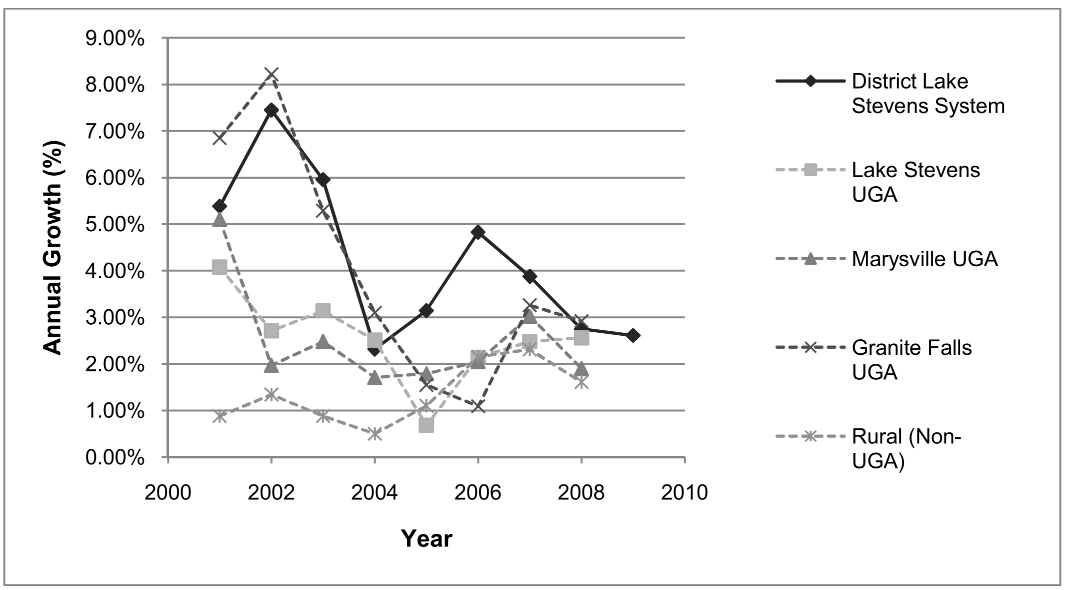
the 6 and 20-year projections. Although there may be a continuing trend toward reducing household size, the pace and extent of such trends is difficult to predict.

Water purveyors that purchase from the District on a wholesale basis are responsible to determine their own number of households, population, and growth projections. Population and water demands projections by the District's major wholesale water customers (Granite Falls and Arlington) were presented in Section 3.2 of Chapter 3.

To determine the growth rate for the District's retail water services, a decision was made to project the 5-year average growth from 2003-2008 as a straight line into the future. Although new home construction has slowed dramatically in recent years, this approach assures that the District is adequately planning for water facilities in case growth picks up later in the planning period.

History has shown that the number of new connections to the District's water systems is typically higher than overall growth in the urban growth areas (UGAs). For example, Figure 5-1 illustrates growth of the Lake Stevens system in relation to the communities it serves. In most years, growth of the Lake Stevens system mimicked whichever of these communities was growing the fastest. In 2005-2007, the Lake Stevens water system grew faster than all of the related communities.

Figure 5-1: Growth of Integrated Water System Compared to Related Areas



As pointed out by the 2008 Growth Monitoring Report (described in Chapter 3), current home construction is occurring on a backlog of lots created during the housing boom. The District's retail service area contains about 1,300 vacant lots where water utilities have already been installed. Water service can be started for these lots at any time by simply paying the remaining fees to install meters in the existing boxes. The District also has submittals for water main extensions to 1,650 proposed lots that are in various stages of review. Because much of the backlog of vacant lots is in the District's service area, activation of new water meters could again exceed growth in the general area because development will be clustered where utilities are most readily available. The District should be prepared for a possible growth pattern similar to 2005-2007 as home construction picks up.

Table 5-4 also contains notes about the approved capacity of each water system in relation to their projected growth. DOH tracks the number of active connections reported for small water systems in relation to their approved capacity to assure that they do not become over-connected, which can lead to insufficient water supply, low water pressure, and other issues with public health implications. For large expanding water systems, DOH typically indicates the approved capacity as “unspecified” as long as WSPs for these systems demonstrate adequate planning for facilities to support their projected water demands.

Several of the District’s water systems may reach their approved capacity within the 20-year planning period. These include the Lake Roesiger, Storm Lake, Sunday Lake, and Skylite systems. The Lake Roesiger system will merge with the Lake Stevens system before this limit is reached. The District does not have any obligation to provide water service from these systems beyond their approved capacity. New connections will be monitored to assure that these systems do not become over-connected. The District may choose to construct additional facilities or to re-evaluate the capacity of existing facilities to determine if additional connections can be supported. The project report for Sunday Lake in Appendix 5-2 is an example of a submittal to modify the approved capacity of a water system.

The Creswell system became classified as a Group A water system in 2009. The capacity of the Creswell system is shown as “undetermined” in DOH records. With this WSP, the District is asking DOH to change the classification from “undetermined” to “unspecified,” so that this system can expand to eventually merge with other systems in the District’s Integrated Service Area.

The capacity of the District’s water systems in relation to the growth projections will be discussed further in Chapter 7.

5.3 WATER SUPPLY PURCHASED AND PRODUCED

Table 5-5 summarizes the amount of water delivered into the District’s water systems from transmission line taps and wells. The table presents the data in terms that are commonly used for water system analysis, as described below.

<u>Average Day Demand (ADD)</u> is the annual amount of water entering each system divided by 365 days per year. For the Lake Stevens, Dubuque, and Lake Roesiger systems, master meter readings are from Everett’s control system. Source meters for the remaining systems are read monthly in the field by District staff. Annual production is determined from the combined monthly readings for each system.

<u>Maximum Month Average Day (MMAD)</u> is the average daily demand during the peak month of each year. This is determined by dividing the total source production during the peak month by the number of days in the month.

Table 5-5: Water Supply Purchased and Produced

Lake Stevens	Water Purchased (1000-gal)					
	2004	2005	2006	2007	2008	
January	110,245	108,254	114,778	125,007	115,702	
February	90,064	97,282	100,717	102,759	107,673	
March	113,206	110,145	102,856	116,733	113,679	
April	113,007	120,920	122,823	108,522	112,981	
May	118,911	130,528	133,054	132,921	126,073	
June	149,765	118,778	148,664	138,027	143,456	
July	**211,540**	158,877	**218,475**	**198,929**	**202,180**	
August	180,606	**188,403**	204,939	167,419	173,857	
September	110,221	129,646	134,441	133,094	144,934	
October	104,153	114,756	128,336	116,303	117,489	
November	112,695	106,888	111,406	107,547	109,968	
December	98,600	101,968	108,020	120,034	123,435	
Annual Production (1000-gal/year)	1,513,012	1,486,447	1,628,510	1,567,296	1,591,426	
ADD (1000-gal/day)	4,145	4,072	4,462	4,294	4,360	
Date of Peak Day	**7/24/04**	**8/15/05**	**7/23/06**	**7/10/07**	**7/20/08**	**2004-8**
MDD (1000-gal/day)	9,436	7,635	9,492	9,042	8,177	
MDD/ADD	**2.28**	**1.87**	**2.13**	**2.11**	**1.88**	**2.05**
MMAD (1000-gal/day)	6,824	6,078	7,048	6,417	6,522	
MDD/MMAD	**1.38**	**1.26**	**1.35**	**1.41**	**1.25**	**1.33**
MMAD/ADD	**1.65**	**1.49**	**1.58**	**1.49**	**1.50**	**1.54**

Lake Roesiger	Water Purchased (1000-gal)					
	2004	2005	2006	2007	2008	
January	1,067	734	1,115	1,372	756	
February	830	838	803	812	853	
March	984	898	858	811	1,103	
April	1,054	664	981	982	930	
May	1,061	1,029	978	1,103	1,226	
June	1,185	1,163	1,225	1,273	1,198	
July	**2,099**	**1,830**	**2,119**	**1,815**	**2,308**	
August	1,895	1,821	1,969	1,550	1,581	
September	1,002	1,362	1,052	1,180	1,246	
October	991	788	1,708	1,336	1,091	
November	983	844	960	922	1,333	
December	781	958	811	1,008	1,910	
Annual Production (1000-gal/year)	13,930	12,929	14,579	14,163	15,534	
ADD (1000-gal/day)	38	35	40	39	43	
Date of Peak Day	**7/24/04**	**8/6/05**	**7/21/06**	**7/4/07**	**7/26/08**	**2004-8**
MDD (1000-gal/day)	117	102	114	90	102	
MDD/ADD	**3.08**	**2.87**	**2.85**	**2.32**	**2.39**	**2.70**
MMAD (1000-gal/day)	68	59	68	59	74	
MDD/MMAD	**1.73**	**1.72**	**1.66**	**1.54**	**1.36**	**1.66**
MMAD/ADD	**1.77**	**1.67**	**1.71**	**1.51**	**1.75**	**1.68**

Storm Lake	Water Purchased (1000-gal)					
	2004	2005	2006	2007	2008	
January	309	309	685	735	789	
February	208	378	596	636	738	
March	261	507	776	752	798	
April	484	518	939	801	756	
May	365	642	1,325	1,465	1,014	
June	562	712	1,734	1,530	1,717	
July	767	1,266	**3,812**	**2,788**	**3,476**	
August	**777**	**2,034**	3,330	2,274	2,302	
September	631	1,192	1,807	1,539	1,492	
October	525	817	1,128	801	898	
November	289	666	734	734	775	
December	486	727	760	789	812	
Annual Production (1000-gal/year)	5,665	9,768	17,627	14,845	15,568	
ADD (1000-gal/day)	16	27	48	41	43	
Date of Peak Day	**7/24/04**	**8/15/05**	**7/22/06**	**7/10/07**	**7/13/08**	**2006-8***
MDD (1000-gal/day)	44	84	188	171	167	
MDD/ADD	**2.83**	**3.15**	**3.90**	**4.21**	**3.92**	**4.01**
MMAD (1000-gal/day)	25	66	123	90	112	
MDD/MMAD	**1.75**	**1.28**	**1.53**	**1.90**	**1.49**	**1.64**
MMAD/ADD	**1.62**	**2.45**	**2.55**	**2.21**	**2.63**	**2.46**

*Exclude 2004 & 2005 from averages because of rapid Storm Lake growth in those years.

Dubuque	Water Purchased (1000-gal)					
	2004	2005	2006	2007	2008	
January	10,489	11,675	12,134	14,374	10,027	
February	8,616	10,658	9,622	10,909	9,114	
March	10,634	11,084	9,753	10,986	9,684	
April	12,579	10,758	12,029	9,896	9,783	
May	13,811	13,081	13,509	11,601	10,563	
June	17,232	13,596	15,661	11,749	11,747	
July	**23,700**	18,526	**25,149**	**17,708**	**17,809**	
August	21,581	**23,169**	23,413	15,748	15,612	
September	12,138	15,735	15,008	12,483	12,208	
October	11,414	12,811	15,252	10,061	8,796	
November	11,692	11,928	13,071	10,165	8,093	
December	10,427	10,944	12,231	10,655	8,163	
Annual Production (1000-gal/year)	164,314	163,965	176,831	146,334	131,599	
ADD (1000-gal/day)	450	449	484	401	361	
Date of Peak Day	**7/24/04**	**8/4/05**	**7/24/06**	**7/11/07**	**7/13/08**	**2004-8**
MDD (1000-gal/day)	1,072	990	1,071	827	729	
MDD/ADD	**2.38**	**2.20**	**2.21**	**2.06**	**2.02**	**2.18**
MMAD (1000-gal/day)	765	747	811	571	574	
MDD/MMAD	**1.40**	**1.33**	**1.32**	**1.45**	**1.27**	**1.35**
MMAD/ADD	**1.70**	**1.66**	**1.67**	**1.42**	**1.59**	**1.61**

Creswell	Water Purchased (gallons)					
	2004	2005	2006*	2007*	2008*	
January	13,913	14,436	13,464	11,519	117,660	
February	11,818	11,370	13,389	32,463	93,425	
March	18,924	13,464	13,539	21,243	24,834	
April	15,858	11,594	12,492	13,389	29,322	
May	13,464	15,484	12,043	25,656	67,769	
June	18,924	12,566	11,893	10,023	108,909	
July	17,728	13,015	12,716	**88,339**	**134,042**	
August	**15,708**	**16,232**	**15,409**	262,473	79,961	
September	13,165	12,641	7,480	68,143	47,348	
October	13,240	13,614	10,322	97,016	42,262	
November	15,484	12,417	29,097	82,430	30,070	
December	13,090	13,838	19,224	14,810	39,120	
Annual Production (1000-gal/year)	181	161	171	728	815	
ADD (gallons/day)	497	440	469	1,993	2,232	
Date of Peak Day			unknown			**2004-6***
MDD (gallons/day)**	1,072	890	845	14,873	7,596	
MDD/ADD	**2.16**	**2.02**	**1.80**	**7.46**	**3.40**	**1.99**
MMAD (gallons/day)	631	524	497	8,749	4,468	
MDD/MMAD**	**1.70**	**1.70**	**1.70**	**1.70**	**1.70**	**1.70**
MMAD/ADD	**1.27**	**1.19**	**1.06**	**4.39**	**2.00**	**1.17**

* Creswell construction and flushing in 2007-8 makes it difficult to distinguish a normal peak month. Also, the system was flushed in Nov 2006. 2007& 2008 are excluded from averages.

* *MDD/MMAD assumed based on Design Manual recommendation for Western Washington.

Kayak	Water Produced (1000-gal)					
	2004	2005	2006	2007	2008	
January	2,793	2,351	2,103	2,668	2,445	
February	2,327	2,029	1,627	2,160	1,919	
March	2,278	1,856	3,023	2,501	2,038	
April	2,792	2,664	2,255	1,945	2,067	
May	3,802	2,870	2,939	3,537	2,164	
June	3,946	2,655	3,551	3,216	3,341	
July	**6,666**	**5,008**	**5,599**	**5,494**	**4,840**	
August	5,788	3,515	5,274	4,324	3,416	
September	2,379	2,147	3,177	3,187	2,787	
October	2,490	1,992	2,407	2,808	1,936	
November	2,289	2,735	3,001	2,030	1,596	
December	2,470	2,162	2,566	2,601	2,657	
Annual Production (1000-gal/year)	40,019	31,984	37,521	36,471	31,205	
ADD (1000-gal/day)	110	88	103	100	85	
Date of Peak Day	**07/30/04**	**08/15/05**		unknown		**2004-8**
MDD (1000-gal/day)*	290	247	253	248	219	
MDD/ADD	**2.65**	**2.82**	**2.46**	**2.48**	**2.56**	**2.59**
MMAD (1000-gal/day)	215	162	181	177	156	
MDD/MMAD*	**1.35**	**1.53**	**1.40**	**1.40**	**1.40**	**1.42**
MMAD/ADD	**1.96**	**1.84**	**1.76**	**1.77**	**1.83**	**1.83**

* MDD/MMAD assumed for 2008 based on 2004-7 average. Peak day in 2008 estimated by multiplying the actual MMAD by the assumed peaking factor.

Table 5-5: Water Supply Purchased and Produced (cont.)

May Creek	Water Produced (1000-gal)					
	2004	2005	2006	2007	2008	
January	2,431	2,303	2,638	2,989	2,355	
February	2,101	2,732	1,857	2,528	2,201	
March	2,091	1,530	2,224	2,176	2,499	
April	2,282	2,044	1,800	2,423	1,951	
May	2,024	2,519	2,677	2,714	2,294	
June	2,893	2,124	2,704	2,288	2,905	
July	**3,696**	2,360	**3,905**	**3,368**	**3,482**	
August	3,625	**3,883**	3,405	3,002	2,812	
September	2,345	2,123	2,346	2,283	2,700	
October	2,175	2,110	1,689	2,341	2,797	
November	2,228	2,157	2,422	2,224	1,819	
December	2,018	2,654	2,249	2,468	2,911	
Annual Production (1000-gal/year)	29,910	28,539	29,916	30,805	30,726	
ADD (1000-gal/day)	82	78	82	84	84	
Date of Peak Day	**07/29/04**	**08/06/05**	**07/23/06**	**07/11/07**	**07/14/08**	**2004-8**
MDD (1000-gal/day)	166	165	180	157	164	
MDD/ADD	**2.02**	**2.11**	**2.20**	**1.86**	**1.95**	**2.03**
MMAD (1000-gal/day)	119	125	126	109	112	
MDD/MMAD	**1.39**	**1.32**	**1.43**	**1.44**	**1.46**	**1.41**
MMAD/ADD	**1.45**	**1.60**	**1.54**	**1.29**	**1.33**	**1.44**

Sunday Lake	Water Produced (1000-gal)					
	2004	2005	2006	2007	2008	
January	444	563	593	578	773	
February	491	503	476	552	560	
March	518	520	749	598	576	
April	566	504	555	560	647	
May	662	727	694	974	695	
June	828	661	918	799	1,035	
July	**1,063**	848	**1,505**	**1,362**	**1,419**	
August	924	**1,085**	1,241	1,165	1,059	
September	593	741	795	840	904	
October	498	677	701	659	643	
November	525	515	734	645	468	
December	496	533	1,152	869	850	
Annual Production (1000-gal/year)	7,606	7,879	10,114	9,599	9,629	
ADD (1000-gal/day)	21	22	28	26	26	
Date of Peak Day	**07/30/04**	**07/31/05**	**07/08/06**	**07/15/07**	**08/12/08**	**2004-8**
MDD (1000-gal/day)	52	53	84	80	74	
MDD/ADD	**2.49**	**2.46**	**3.03**	**3.04**	**2.81**	**2.76**
MMAD (1000-gal/day)	34	35	49	44	46	
MDD/MMAD	**1.51**	**1.51**	**1.73**	**1.82**	**1.62**	**1.64**
MMAD/ADD	**1.65**	**1.62**	**1.75**	**1.67**	**1.73**	**1.68**

Skylite Tracts	Water Purchased (1000-gal)					
	2004	2005	2006	2007	2008	
January	962	618	698	908	1,155	
February	542	525	597	799	1,037	
March	660	544	718	822	1,241	
April	635	402	561	807	1,124	
May	582	836	952	891	1,237	
June	796	707	842	1,020	1,417	
July	950	712	**1,120**	**1,231**	**1,637**	
August	**1,008**	**1,136**	1,079	1,206	1,031	
September	605	793	751	991	1,046	
October	540	674	1,193	1,075	927	
November	628	628	883	973	755	
December	610	636	772	1,268	900	
Annual Production (1000-gal/year)	8,518	8,212	10,166	11,991	13,507	
ADD (1000-gal/day)	23	22	28	33	37	
Date of Peak Day	**-**	**-**	**-**	**-**	**07/12/08**	**2004-8**
MDD (1000-gal/day)*	55	62	61	68	67	
MDD/ADD	**2.37**	**2.77**	**2.21**	**2.05**	**1.81**	**2.24**
MMAD (1000-gal/day)	33	37	36	40	53	
MDD/MMAD*	**1.70**	**1.70**	**1.70**	**1.70**	**1.27**	**1.61**
MMAD/ADD	**1.39**	**1.63**	**1.30**	**1.21**	**1.43**	**1.39**

* MDD/MMAD based on DOH Design Manual recommendation for Western Washington.

Pilchuck 10	Water Produced (gallons)					
	2004*	2005	2006	2007	2008*	
January	80,245	43,908	59,840	59,690	54,604	
February	60,962	43,908	65,151	51,612	47,648	
March	37,400	43,908	60,588	57,072	149,151	
April	27,900	51,088	51,238	62,832	189,468	
May	34,932	57,970	73,603	57,746	106,216	
June	40,990	62,907	54,155	47,573	60,289	
July	**57,820**	55,576	**82,729**	64,328	**66,946**	
August	55,576	**75,099**	60,663	61,710	161,942	
September	27,227	63,131	63,131	**66,647**	193,732	
October	28,798	66,647	73,304	54,828	60,962	
November	48,470	65,674	54,230	47,797	47,498	
December	36,802	62,009	54,679	59,840	63,131	
Annual Production (1000-gal/year)	537	692	753	692	1,202	
ADD (gallons/day)	1,472	1,895	2,064	1,895	3,292	
Date of Peak Day			unknown			
MDD (gallons/day)**	3,171	4,120	4,540	3,777	3,671	**2004-7**
MDD/ADD	**2.15**	**2.17**	**2.20**	**1.99**	**1.12**	**2.13**
MMAD (gallons/day)*	1,865	2,424	2,670	2,222	2,160	
MDD/MMAD**	**1.70**	**1.70**	**1.70**	**1.70**	**1.70**	**1.70**
MMAD/ADD	**1.27**	**1.28**	**1.29**	**1.17**	**0.66**	**1.25**

* Values in bold selected as the most likely peak months. 2008 is excluded from averages.

* * MDD/MMAD assumed based on Design Manual recommendation for Western Washington.

Otis	Water Produced (gallons)					
	2004	2005	2006	2007	2008	
January	23,637	20,944	20,645	19,523	22,739	
February	25,582	19,298	16,456	19,747	18,251	
March	28,499	28,200	18,401	17,054	19,448	
April	24,908	20,420	16,082	18,775	20,645	
May	29,546	31,865	31,865	23,861	22,889	
June	29,621	24,609	25,432	23,487	21,842	
July	27,227	21,094	**49,966**	**37,325**	**28,200**	
August	**38,672**	**41,439**	34,707	23,263	22,515	
September	29,022	22,440	14,960	15,334	22,141	
October	19,747	20,278	17,952	18,102	18,102	
November	23,338	17,571	13,838	18,401	12,716	
December	20,645	17,354	13,688	20,271	14,212	
Annual Production (1000-gal/year)	320	286	274	255	244	
ADD (gallons/day)	878	782	751	699	668	
Date of Peak Day			unknown			
MDD (gallons/day)*	2,121	2,272	2,740	2,047	1,546	**2004-8**
MDD/ADD	**2.42**	**2.91**	**3.65**	**2.93**	**2.32**	**2.84**
MMAD (gallons/day)	1,247	1,337	1,612	1,204	910	
MDD/MMAD*	**1.70**	**1.70**	**1.70**	**1.70**	**1.70**	**1.70**
MMAD/ADD	**1.42**	**1.71**	**2.15**	**1.72**	**1.36**	**1.67**

* MDD/MMAD peaking factor assumed based on DOH Design Manual recommendation for Western Washington. Peak day (MDD) estimated by multiplying the actual MMAD by this peaking ratio.

212 Market	Water Produced (gallons)					
	2004	2005	2006	2007	2008	
January	9,013	10,771	10,502	20,218	**19,829**	
February	8,759	10,554	9,081	21,004	9,829	
March	10,577	9,754	8,849	23,315	8,946	
April	14,870	9,627	13,875	**23,420**	11,482	
May	14,392	**19,987**	21,378	23,121	10,794	
June	17,585	15,970	19,642	14,593	11,923	
July	17,488	15,633	**27,197**	17,047	10,322	
August	**20,174**	15,454	17,645	11,040	9,694	
September	13,756	12,245	14,608	8,624	10,120	
October	11,766	11,100	14,960	11,549	10,779	
November	10,255	10,420	18,827	10,450	8,916	
December	9,978	12,671	16,291	10,255	11,863	
Annual Production (1000-gal/year)	159	154	193	195	134	
ADD (gallons/day)	435	422	528	533	368	
Date of Peak Day			unknown			
MDD (gallons/day)*	874	866	1,179	1,015	859	**2004-8**
MDD/ADD	**2.01**	**2.05**	**2.23**	**1.90**	**2.33**	**2.11**
MMAD (gallons/day)	672	666	907	781	661	
MDD/MMAD*	**1.30**	**1.30**	**1.30**	**1.30**	**1.30**	**1.30**
MMAD/ADD	**1.55**	**1.58**	**1.72**	**1.46**	**1.79**	**1.62**

* Because 212 Market is a business with minimal outdoor use, a low MDD/MMAD is assumed.

Maximum Day Demand (MDD) is the peak 24-hour production during each year. For Lake Stevens and Dubuque, the recorded daily production obtained from Everett for each supply tap is combined to determine daily production for each system, and then the peak day production is determined from the daily values. For Lake Roesiger, Storm Lake, May Creek, and Sunday Lake, MDD is calculated by programmed reports that factor in tank water levels with the daily source meter data. This automated calculation also became available for Skylite beginning in 2008. For Kayak, the previous owners of the water system read the well meters in the field daily to determine MDD in 2003, 2004, and 2005.

MDD/ADD and MDD/MMAD ratios are used to estimate MDD for water systems when daily source meter readings are not available. For systems where the actual MDD is known for some but not all years, the MDD/MMAD ratio from years with known MDDs is used to estimate the MDD for other years. This method was used for Kayak in 2006-2008 and for Skylite in 2004-2007. For both of these systems, a MDD/MMAD ratio of 1.40 is assumed, which is slightly higher than the average ratios from other years. The assumed ratio is then multiplied by the actual MMAD to estimate the MDD for the year. For the remaining residential systems with only monthly production records (Creswell, Pilchuck 10, and Otis), a MDD/MMAD ratio of 1.70 is assumed, based on the DOH Design Manual recommendation for systems in western Washington. For the 212 Market, a MDD/MMAD ratio of 1.30 is used because outdoor water use is low for this commercial establishment.

Table 5-5 also shows a multi-year average of MDD/MMAD, MDD/ADD, and MMAD/ADD for each system. In most cases, the ratios are averaged from 2004 through 2008. As noted in the footnotes, a subset of the data was selected for systems when some years are atypical. The average MDD/ADD ratios are used when projecting future water demands, as will be described in Section 5.8.4.

5.4 WATER SOLD

Table 5-6 shows the annual amount of water sold to each customer class according to billing records for 2000-2008. The District divides its water billing into four classifications: single family, multi-family, commercial (non-residential), and wholesale. The cities of Arlington and Granite Falls are wholesale customers of the Lake Stevens system, and the city of Gold Bar is a wholesale customer of the May Creek system. Gold Bar only purchases water during emergencies. Non-residential customers include businesses, stores, schools, day cares, churches, industries, public parks, irrigation customers, mobile home parks, camps, and very small water systems that purchase from the District (such as Sudden View and Twin Falls), which are all billed at the “commercial/industrial” rate.

The table also shows average daily use by each household or employee in each year, which is determined by dividing the number of households or employees into the usage for each class. The resulting usage factors are comparable to customer consumption reported by adjacent water systems and to values in the 2009 Regional Water Supply Outlook. (See Section 3.2.3 and Table 3-6.)

A five-year average of the customer usage factors is shown for 2004-2008. The single family average demands are used as the basis for projecting future demands.

Lastly, Table 5-6 evaluates customer water consumption in terms of Equivalent Residential Units (ERU). An ERU is a unit of measure that equates the water use by each customer class to the amount of water consumed by a typical single-family residence. Each single family customer is considered to represent one ERU. In each year, the average daily usage by single family customers is divided into the average usage of each customer class to determine the number of ERUs in that class. The calculated number of ERUs is not always consistent from year to year because of variations in water demands, but these values do indicate general trends when viewed over multiple years.

Table 5-6: Historical Customer Consumption

Lake Stevens (Integrated) Water System

Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Households or Employees[1]	gpd per HH or per Employee	ERUs[2]
Single-Family Customer Class					
2000	855,102	2,342,745	11,221	209	11,221
2001	816,662	2,237,431	11,825	189	11,825
2002	901,076	2,468,702	12,708	194	12,708
2003	1,026,706	2,812,892	13,486	209	13,486
2004	1,019,837	2,794,073	13,781	203	13,781
2005	972,179	2,663,505	14,213	187	14,213
2006	1,052,543	2,883,679	14,900	194	14,900
2007	1,018,153	2,789,459	15,493	180	15,493
2008	1,034,215	2,833,467	15,916	178	15,916
			2004-2008 average:	**188**	
Multi-Family Customer Class					
2000	42,550	116,574	830	140	558
2001	46,036	126,127	910	139	667
2002	52,996	145,195	970	150	747
2003	51,188	140,240	995	141	672
2004	49,291	135,045	1,035	130	666
2005	52,066	142,647	1,055	135	761
2006	53,614	146,887	1,055	139	759
2007	52,692	144,361	1,075	134	802
2008	52,650	144,247	1,105	131	810
			2004-2008 average:	**134**	
Non-Residential Customer Class					
2000	113,170	310,054	4,395	71	1,485
2001	101,541	278,194	4,530	61	1,470
2002	114,349	313,286	4,860	64	1,613
2003	114,612	314,005	4,935	64	1,505
2004	134,019	367,175	5,265	70	1,811
2005	112,756	308,922	5,490	56	1,648
2006	124,820	341,974	5,895	58	1,767
2007	128,346	351,634	5,955	59	1,953
2008	116,730	319,808	6,165	52	1,796
			2004-2008 average:	**59**	
Wholesale Customer Class					
2000	125,125	342,809			1,642
2001	164,049	449,450			2,375
2002	205,274	562,394			2,895
2003	198,765	544,560			2,611
2004	211,102	578,361			2,853
2005	246,767	676,073			3,608
2006	291,463	798,529			4,126
2007	273,807	750,156			4,166
2008	287,807	788,512			4,429

Dubuque Water System

Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Households or Employees[3]	gpd per HH or per Employee	ERUs[2]
Single-Family Customer Class					
2000	71,062	194,690	726	268	726
2001	66,085	181,054	757	239	757
2002	79,564	217,983	789	276	789
2003	100,907	276,459	900	307	900
2004	97,710	267,698	960	279	960
2005	92,106	252,345	981	257	981
2006	101,851	279,044	988	282	988
2007	92,923	254,583	1,001	254	1,001
2008	91,946	251,908	1,000	252	1,000
			2004-2008 average:	**265**	
Multi-Family Customer Class					
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	329	900	8	113	3
2004	282	773	6	129	3
2005	189	519	6	86	2
2006	288	790	6	132	3
2007	225	617	8	77	2
2008	229	629	8	79	2
			2004-2008 average:	**101**	
Non-Residential Customer Class					
2000	24,875	68,150	140	487	254
2001	22,430	61,452	140	439	257
2002	17,007	46,596	140	333	169
2003	17,803	48,775	150	325	159
2004	16,609	45,505	140	325	163
2005	16,155	44,261	150	295	172
2006	17,805	48,779	150	325	173
2007	19,821	54,303	150	362	214
2008	30,359	83,176	140	594	330
			2004-2008 average:	**380**	

Creswell Water System

Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Number of Households[4]	gpd per Household[4,5]	ERUs
Single-Family Customer Class					
2000	218	596	3	199	3
2001	202	552	3	184	3
2002	188	515	3	172	3
2003	203	556	3	185	3
2004	180	492	3	164	3
2005	164	450	3	150	3
2006	150	410	3	137	3
2007	189	517	4	129	4
2008	383	1,049	9	117	9
			2004-2008 average:	**139**	

Lake Roesiger Water System

Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Households or Employees[6]	gpd per HH or per Employee	ERUs[2]
Single-Family Customer Class					
2000	10,443	28,611	388	74	388
2001	10,458	28,651	391	73	391
2002	11,262	30,856	396	78	396
2003	13,237	36,267	406	89	406
2004	12,517	34,294	414	83	414
2005	11,269	30,875	422	73	422
2006	12,664	34,696	432	80	432
2007	12,262	33,595	434	77	434
2008	12,350	33,835	439	77	439
			2004-2008 average:	**79**	
Non-Residential Customer Class					
2000	0	0	0	-	-
2001	7	19	3	6	0
2002	14	39	3	13	0
2003	108	295	3	98	3
2004	200	549	3	183	7
2005	307	841	3	280	11
2006	221	605	3	202	8
2007	212	582	6	97	8
2008	208	571	6	95	7
			2004-2008 average:	**171**	

Storm Lake Water System

Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Number of Households[4,7]	gpd per Household[4]	ERUs
Single-Family Customer Class					
2000	1,191	5,566	23	242	23
2001	1,789	4,900	23	213	23
2002	1,950	5,343	23	232	23
2003	2,105	5,767	25	231	25
2004	3,435	9,411	54	174	54
2005	8,555	23,437	123	191	123
2006	17,305	47,411	152	312	152
2007	14,783	40,501	162	250	162
2008	15,120	41,424	166	250	166
			2006-2008 average:	**270**	

Footnotes:

1 Lake Stevens System assumes 5 households per multifamily connection and 15 employees per non-residential connection.

2 Calculated by dividing average daily usage by the single-family gpd/HH usage factor from the same year.

3 Dubuque System, 2 households per multifamily connection and assumes 10 employees per non-residential connection.

4 Residential usage based on average number of meters billed during the year, rather than number of meters installed by the end of the year.

5 Creswell System, low water use per household in recent years likely due to vacant new homes.

6 Lake Roesiger System, assumes 3 employees per non-residential connection.

7 Storm Lake System, data starts in June 2000 (214 days in 2000)

Table 5-6: Historical Customer Consumption (cont.)

May Creek Water System

Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Households or Employees[1,2]	gpd per HH or per Employee[2]	ERUs[3]
Single-Family Customer Class					
2000	25,687	70,376	387	182	387
2001	24,663	67,570	388	174	388
2002	27,847	76,292	396	193	396
2003	28,369	77,722	404	192	404
2004	27,218	74,571	399	187	399
2005	25,635	70,234	402	175	402
2006	27,518	75,391	410	184	410
2007	26,720	73,205	419	175	419
2008	26,568	72,788	429	170	429
			2004-2008 average:	**178**	
Non-Residential Customer Class					
2000	0	0	12	-	-
2001	313	859	12	72	5
2002	251	687	12	57	4
2003	315	863	12	72	4
2004	896	2,456	12	205	13
2005	811	2,221	12	185	13
2006	787	2,157	12	180	12
2007	1,043	2,856	12	238	16
2008	1,614	4,423	12	369	26
			2004-2008 average:	**235**	
Wholesale Customer Class					
2000	0	0			0
2001	0	0			0
2002	0	0			0
2003	0	0			0
2004	0	0			0
2005	0	0			0
2006	613	1,680			9
2007	762	2,088			12
2008	0	0			0

Sunday Lake Water System

Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Number of Households[2]	gpd per Household[2]	ERUs
Single-Family Customer Class					
2000	6,898	18,899	105	180	105
2001	6,484	17,764	105	169	105
2002	7,090	19,425	109	178	109
2003	7,572	20,744	113	184	113
2004	7,596	20,810	116	179	116
2005	7,526	20,618	118	175	118
2006	8,776	24,043	135	178	135
2007	8,804	24,119	142	170	142
2008	9,367	25,664	142	181	142
			2004-2008 average:	**177**	

Kayak Water System

Year	Annual Consumption 1000-gal/yr[4]	Annual Consumption Gal/day	Number of Households[5]	gpd per Household[6]	ERUs[3]
Single-Family Customer Class					
2000	39,086	107,085	323	332	323
2001	47,770	130,876	334	392	334
2002	45,666	125,113	345	363	345
2003	38,857	106,457	352	302	352
2004	35,128	96,241	357	270	357
2005	31,257	85,635	359	239	359
2006	34,519	94,573	360	263	360
2007	31,543	86,418	361	239	361
2008	29,813	81,679	362	226	362
			2004-2008 average:	**247**	
Multifamily Customer Class					
2000	-	-	-	-	-
2001	-	-	-	-	-
2002	-	-	-	-	-
2003	-	-	-	-	-
2004	-	-	-	-	-
2005	-	-	-	-	-
2006	-	-	-	-	-
2007	59	161	2	80	1
2008	133	365	4	91	2
			2007-2008 average:	**86**	

Skylite Tracts Water System

Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Number of Households	gpd per Household	ERUs
Single-Family Customer Class					
2000	9,512	26,059	145	180	145
2001	8,469	23,204	146	159	146
2002	9,526	26,097	147	178	147
2003	10,020	27,452	148	185	148
2004	9,268	25,392	148	172	148
2005	8,540	23,396	148	158	148
2006	9,732	26,664	149	179	149
2007	10,268	28,132	151	186	151
2008	10,581	28,990	151	182	151
			2006-2008 average:	**186**	

Footnotes:

1 May Creek System, assumes 3 employees per non-residential meter.

2 Residential usage based on average number of meters billed during the year, rather than number of meters installed by the end of the year.

3 Calculated by dividing average daily usage by the single-family gpd/HH usage factor from the same year.

4 Kayak System, 2000-2006 is source production data from Iliad minus estimated 8% DSL.

5 Kayak System, 2 households per multifamily connection.

6 Water use restrictions implemented for Kayak beginning in 2002; metered rates started in July 2003; and pressure reducing stations put online in early 2008.

212 Market Water System

Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Employees & Customers	gpd per Person	ERUs
Non-Residential Customer Class					
2000	261	714	25	29	NA
2001	210	575	25	23	NA
2002	211	577	25	23	NA
2003	188	514	25	21	NA
2004	158	433	25	17	NA
2005	142	388	25	16	NA
2006	182	499	25	20	NA
2007	209	573	25	23	NA
2008	133	363	25	15	NA
	2004-2008 average:	**451**	**2006-2008 average:**	**19**	

Pilchuck 10 Water System

Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Number of Households[2]	gpd per Household[2]	ERUs
Single-Family Customer Class					
2000	267	731	5	146	5
2001	250	685	5	137	5
2002	318	871	5	174	5
2003	308	845	5	169	5
2004	360	987	7	141	7
2005	592	1,622	9	180	9
2006	702	1,924	9	214	9
2007	624	1,710	10	171	10
2008	586	1,606	10	161	10
			2006-2008 average:	**182**	

Otis Water System

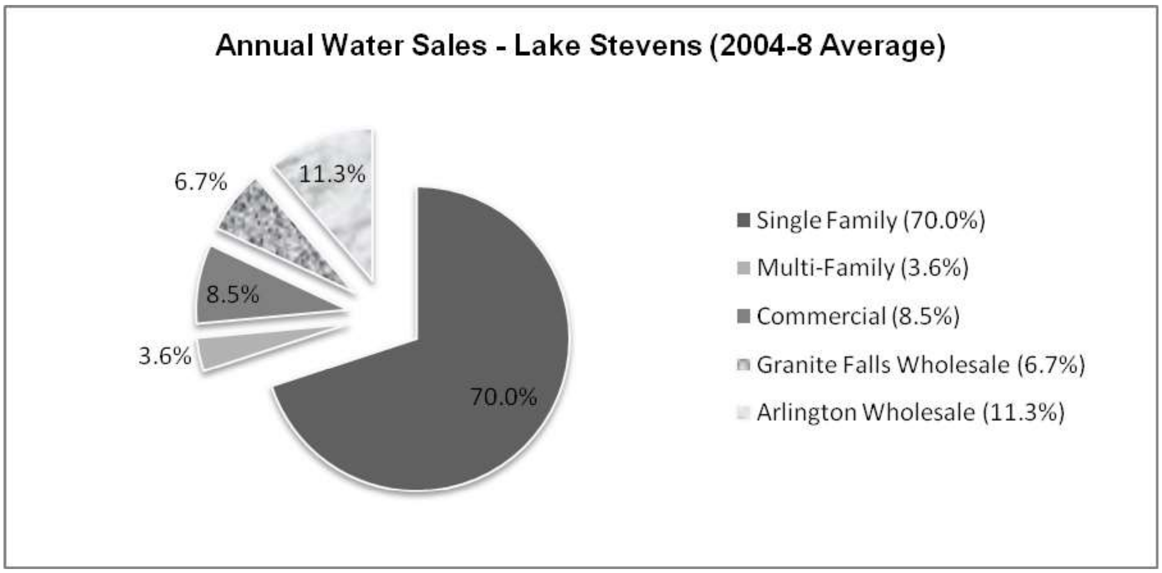
Year	Annual Consumption 1000-gal/yr	Annual Consumption Gal/day	Number of Households	gpd per Household	ERUs
Single-Family Customer Class					
2000	266	729	4	182	4
2001	263	719	4	180	4
2002	307	840	4	210	4
2003	364	997	4	249	4
2004	324	889	4	222	4
2005	293	802	4	200	4
2006	278	763	4	191	4
2007	247	676	4	169	4
2008	255	698	4	175	4
			2004-2008 average:	**191**	

5.5 TRENDS IN CUSTOMER DEMANDS

Water purveyors serving more than 1,000 customers must evaluate seasonal variations in water use by customer class. Lake Stevens and Dubuque are the only District water systems serving more than 1,000 customers. Figures 5-2 and 5-3 present this information in a bi-monthly format, matching the meter-reading schedule. These figures also break down annual water usage as the percentage of water consumed by each customer class.

The single family customer class clearly dominates the water usage. This customer class also exhibits the greatest seasonal variation, with the highest demands occurring in July and August. Seasonal variation in wholesale demands is moderated by Arlington's practice of purchasing water at a steady rate and using its own sources for peaking. Summer peaking by non-residential customers is influenced by irrigation customers in the commercial classification.

Figure 5-2: Breakdown of Lake Stevens Customer Water Demands



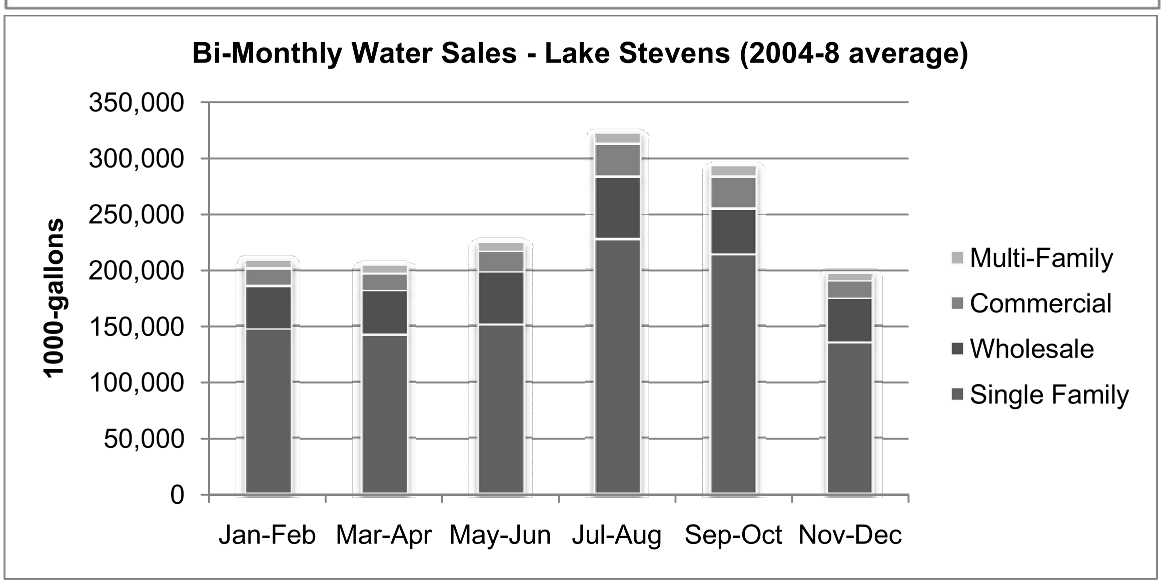
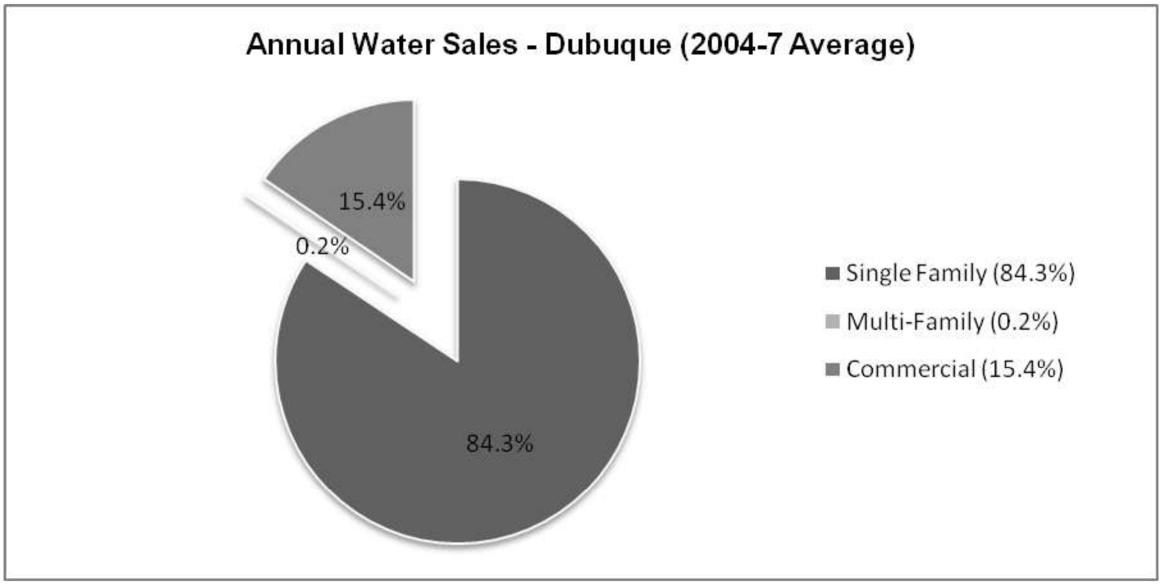
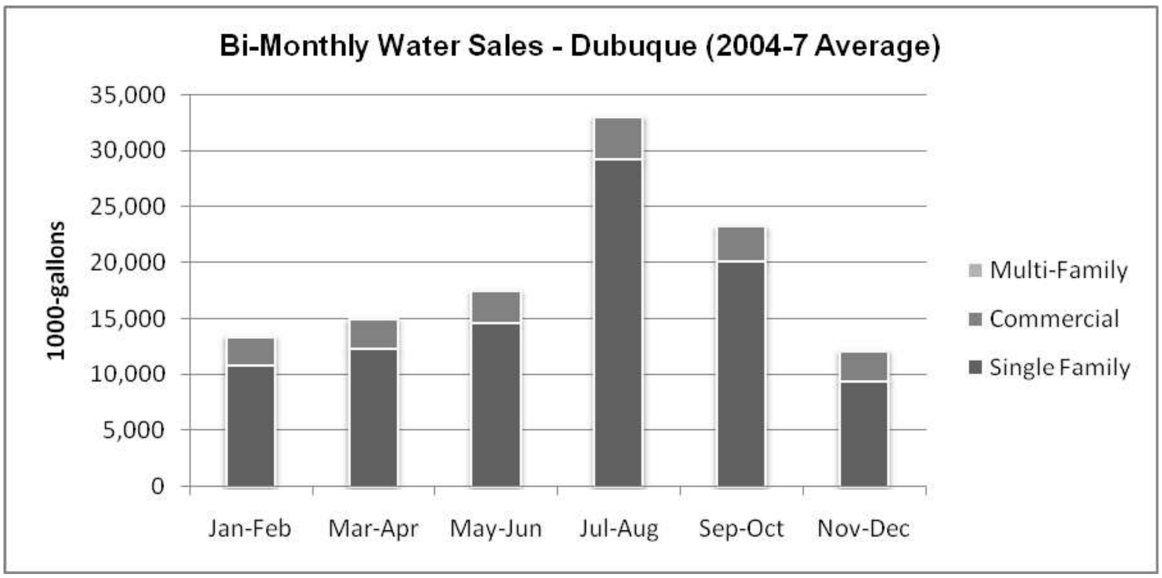


Figure 5-3: Breakdown of Dubuque Customer Water Demands





In Figure 5-3, 2008 is excluded from the Dubuque system sales volumes because the Bartelheimer dairy had their wells off-line for rehabilitation in that year. Bartelheimer later returned to its typical water usage, and even reduced its usage in 2009 through water conserving improvements to their operation.

5.6 NON-REVENUE WATER USE AND LEAKAGE

The District tracks non-revenue water as water used for flushing and tank cleaning, for construction, for fire-fighting and similar activities and water sold via withdrawals from District fire hydrants or blow-offs.

Distribution system leakage (DSL) is water that is supplied to the system, but not metered or accounted for as it is taken out of the system. DSL is calculated by subtracting the annual water consumption (customer use and non-revenue use) from the amount of water purchased and produced. There are many sources of DSL, including water system leaks, inaccurate supply metering, inaccurate customer metering, unaccounted-for fire hydrant usage, illegal water system connections or water use, and malfunctioning telemetry and control equipment. Table 5-7, on the next page, summarizes non-revenue water use and DSL in the District's water systems.

The DSL standard is 10 percent as a 3-year rolling average. In Table 5-7, it can be seen that some District systems exceed this standard. Such systems must develop an action plan to identify steps and timelines to reduce leakage below the standard. The District's action plan to meet this standard is described in Section 6.6 of the next chapter.

5.7 FIRE FLOW REQUIREMENTS

In general, the District's goal is to support fire flow demands of at least 1,000 gpm in the majority of its Integrated System service area. A flow of 1,000 gpm is also ideal for flushing 8-inch diameter pipes. Fire flow goals in the District's satellite systems depend on the original water system design as summarized below.

System	Fire Flow Design Basis
Lake Stevens	0 gpm - 3000 gpm for 1-3 hours
Dubuque	500-1000 gpm for 1-2 hours (except no fire flow provided in the boosted zones)
Lake Roesiger	500 gpm for 1 hour (original design) 1000 gpm for 2 hours (for expansion)
Storm Lake	500 gpm for 1 hour
Creswell	1000 gpm for 2 hours
May Creek	500 gpm for 1 hour
Kayak	500 gpm for 2 hours
Sunday Lake	500 gpm for 1 hour
Skylite	no fire flow provided
Pilchuck 10	no fire flow provided
212 Market	no fire flow provided
Otis	no fire flow provided

As noted above, commitments have been made to provide fire flow up to 3,000 gpm in some areas of the Lake Stevens system. This will be discussed further in the facility analysis in Chapter 7.

Table 5-7: Non-Revenue Use and Distribution System Leakage

Lake Stevens Water System (1000-gal/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	1,513,012	1,414,249	5,994	92,769	6.1%
2005	1,486,447	1,383,769	10,220	92,458	6.2%
2006	1,628,510	1,522,440	6,640	99,430	6.1%
2007	1,567,296	1,472,998	8,489	85,809	5.5%
2008	1,591,426	1,491,402	7,633	92,391	5.8%
		2004-08 average	**7,795**	**92,572**	**5.9%**

Kayak Water System (1000-gal/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	40,019	35,128		4,891	12.2%
2005	31,984	31,257		727	2.3%
2006	37,521	34,519	1,073	1,929	5.1%
2007	36,471	31,601	1,777	3,092	8.5%
2008	31,205	29,946	664	596	1.9%
		2004-08 average:	**1,171**	**2,247**	**6.0%**

Dubuque Water System (1000-gal/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	164,314	114,601	338	49,374	30.0%
2005	163,965	108,451	773	54,741	33.4%
2006	176,831	119,944	439	56,448	31.9%
2007	146,334	112,969	1,144	32,222	22.0%
2008	131,599	122,535	436	8,628	6.6%
		2004-08 average:	**626**	**40,283**	**24.8%**

Sunday Lake Water System (1000-gal/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	7,606	7,596	26	-15	-0.2%
2005	7,879	7,526	264	89	1.1%
2006	10,114	8,776	228	1,111	11.0%
2007	9,599	8,804	200	595	6.2%
2008	9,629	9,367	191	70	0.7%
		2004-08 average:	**182**	**370**	**3.8%**

Lake Roesiger Water System (1000-gal/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	13,930	12,718	223	989	7.1%
2005	12,929	11,576	487	866	6.7%
2006	14,579	12,885	661	1,032	7.1%
2007	14,163	12,475	369	1,320	9.3%
2008	15,534	12,558	410	2,566	16.5%
		2004-08 average:	**430**	**1,355**	**9.3%**

Skylite Water System (1000-gal/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	8,518	9,268	2	-751	-8.8%
2005	8,212	8,540	0	-327	-4.0%
2006	10,166	9,732	20	414	4.1%
2007	11,991	10,268	16	1,707	14.2%
2008	13,507	10,581	0	2,925	21.7%
		2004-08 average:	**8**	**793**	**5.4%**

Storm Lake Water System (1000-gal/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	5,665	3,435	209	2,022	35.7%
2005	9,768	8,555	162	1,052	10.8%
2006	17,627	17,305	148	174	1.0%
2007	14,845	14,783	11	51	0.3%
2008	15,568	15,120	74	374	2.4%
		2005-08 average:*	**99**	**413**	**3.6%**

May Creek Water System (1000-gal/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	29,910	28,115	498	1,297	4.3%
2005	28,539	26,446	656	1,437	5.0%
2006	29,916	28,918	581	417	1.4%
2007	30,805	28,525	570	1,710	5.6%
2008	30,726	28,182	414	2,130	6.9%
		2004-08 average:	**544**	**1,398**	**4.6%**

Creswell Water System (gallons/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	181,315	179,595		1,720	0.9%
2005	160,670	164,298		-3,628	-2.3%
2006	171,068	149,735	6,433	14,900	8.7%
2007	727,505	188,855	228,694	309,956	42.6%
2008	814,722	382,804	329,419	102,498	12.6%
		2004-08 average:	**188,182**	**85,089**	**12.5%**

212 Market Water System (gallons/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	158,613	158,022	0	591	0.4%
2005	154,185	141,753	0	12,432	8.1%
2006	192,857	182,235	0	10,622	5.5%
2007	194,637	209,260	0	-14,623	-7.5%
2008	134,498	132,650	0	1,848	1.4%
		2004-08 average:	**0**	**2,174**	**1.6%**

Pilchuck 10 Water System (gallons/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	537,124	360,192	0	176,932	32.9%
2005	691,825	591,997	0	99,828	14.4%
2006	753,311	702,290	0	51,021	6.8%
2007	691,676	624,019	0	67,657	9.8%
2008	1,201,587	586,320	82,280	532,987	44.4%
		2004-08 average:	**16,456**	**185,685**	**21.7%**

Otis Water System (gallons/year)

	Annual Water Supply	Customer Use	Non-Revenue Use	Distribution Leakage (DSL)	
2004	320,443	324,348	0	-3,905	-1.2%
2005	285,512	292,625	0	-7,113	-2.5%
2006	273,992	278,323	0	-4,331	-1.6%
2007	255,143	246,735	1,002	7,405	2.9%
2008	243,698	254,874	0	-11,175	-4.6%
		2004-08 average:	**200**	**-3,824**	**-1.4%**

* Storm Lake average excludes 2004.

5.8 ESTIMATING FUTURE WATER USE

Tables 5-8a through 5-8j, at the end of this chapter, summarize projected water demands for each of the District's water systems in the 6-year and 20-year planning periods. The projections include the wholesale water demands in addition to retail water demands.

Table 5-8f combines projected demands for all District systems that use water purchased from Everett. This table can be useful for examining the impact of the District's water systems as a whole on Everett's water treatment plant operations. Table 5-8f does not account for the District's Lake Stevens wells, which should reduce the amount of purchased water by about 1.2 million gallons per day and by about 1,400 acre-feet each year after they are put back into service by 2012.

The water demand projections in Tables 5-8a through 5-8j were prepared by following the example in MSA's Water Demand Analysis technical memorandum. The water demand projections will be used in the following chapters to evaluate capacity of the District's existing water facilities and to identify any new facilities that should be constructed to support growth during the planning period. The 212 Market, Pilchuck 10, and Otis water systems are not included in Tables 5-8a-j because these small systems will not expand beyond their existing facilities.

The following sections summarize how information presented earlier in this chapter is used to create the demand projections in Tables 5-8a through 5-8j.

5.8.1 Average Day Demand per ERU

The ADD usage value per ERU for each system is the basis of the water demand projections. This is the average single family customer usage between 2004 and 2008 (in most cases), as obtained from Table 5-6. These values are:

Water System	ADD factor (gpd/ERU)
Lake Stevens	188
Dubuque	265
Lake Roesiger	79 for existing customers & 188 for new customers
Storm Lake	270
Creswell	188
May Creek	178
Kayak	247
Sunday Lake	170 for the first 128 customers & 245 for new customers
Skylite	186

As noted above, modifications have been made to some of the single family ADD values. For Lake Roesiger, it is recognized that 79 gpd/ERU is abnormally low because most homes around the lake are not occupied full time. Full time Lake Roesiger residents exhibit water demands similar to customers in the Lake Stevens system. Consequently, new homes connecting to the Lake Roesiger system are assumed to also use water like the Lake Stevens customers.

For Creswell, a significant portion of the homes were vacant in recent years. It is assumed that water usage by Creswell customers will start to resemble the Lake Stevens customers as the homes become occupied.

Usage by customers of the Sunday Lake water system is based on a project report in Appendix 5-2. Because newer developments in Sunday Lake contain larger lots, newer customers are expected to use more water.

5.8.2 Existing Condition Water Demands and ERUs

Customer Water Use Existing Conditions

In the demand projections prepared by MSA for Lake Stevens, Dubuque, and Lake Roesiger, the starting number of ERUs for single family customers is the number of active single family meters at the end of 2008. For the other customer classes, the existing number of ERUs is determined by dividing the 2008 customer class usage in Table 5-6 by the single family ADD factors listed above.

Non-Revenue Use for Existing Conditions

In most cases, the non-revenue water use for the existing conditions is the 5-year average annual non-revenue use in 2004-2008 from Table 5-7 divided by 365 days per year. For the Kayak system, it is assumed that the frequency of flushing will reduce to about two times per year at about 300,000 gallons per flush now that treatment is removing manganese and iron from the well water. For the Creswell water system, it is assumed that future non-revenue use will be similar to 2006 because the high non-revenue use in 2007 and 2008 is due to construction during those years.

The number of ERUs represented by the non-revenue use is calculated by dividing the use by the single family ADD factor (in gpd/ERU) for each water system.

Distribution System Leakage for Existing Conditions

For water systems that currently exceed the DSL standard, it is assumed that leakage will be brought under control to at least meet the standard and will not exceed 10 percent in future years. For systems with lower DSL values, the projections assume DSL about one percent higher than the current average to allow for the possibility of some increase in leakage despite best efforts to keep it under control. The resulting DSL percentages for the water demand projections are:

System	Projected DSL	System	Projected DSL
Lake Stevens	7%	May Creek	6%
Dubuque	10%	Kayak	7%
Lake Roesiger	10%	Sunday Lake	5%
Storm Lake	4%	Skylite	10%
Creswell	10%		

The estimated DSL is calculated by multiplying the above percentages by the sum of the customer and non-revenue water usage for each system. The number of ERUs represented by the DSL is calculated similar to the non-revenue ERUs, by dividing the DSL volume by the ADD factor for each system.

5.8.3 Future Water Demands and ERUs

To project future water demands, the existing ERUs of the customer classes (single family, multi-family, non-residential, and wholesale) are increased by the annual growth rates that were determined for each system in Table 5-4, and then multiplied by the single ERU usage factor. In summary, the growth rates are:

System	Growth/year	System	Growth/year
Lake Stevens	3.4%	May Creek	1.4%
Dubuque	2.2%	Kayak	1.0%
Lake Roesiger	1.6%	Sunday Lake	4.0%
Storm Lake	1.6%	Skylite	0.5%
Creswell	10.0%		

For the Lake Stevens system, it should be noted that MSA decided to apply the 3.4% growth rate to wholesale water demands, in addition to the single family, multi-family, and non-residential growth projections. Section 3.2.3 presented water demand projections from Granite Falls' 2006 WSP. Granite Falls used a 4.3% growth rate in their WSP. However, based on recorded water consumption, the District observes that the actual increase in Granite Falls' water demands averaged about 2.4% per year from 2003 through 2008. Chapter 3 also noted that water use by Arlington is restricted to 1,000 gpm. The city of Arlington's maximum day water use is currently about 60 percent of this allowance, so there is also room for Arlington to increase their water usage over the 20 year planning period. On average, the 3.4% growth rate is reasonable for planning purposes.

The non-revenue authorized use is also increased by the above annual growth rates for each system. It is estimated that the water used for flushing will increase proportionately to system growth because much of the growth will be associated with water main extensions.

The future DSL estimates use the same DSL percentages as the existing conditions. The DSL percentage is multiplied by the sum of the customer and non-revenue usage in each year.

5.8.4 Planning Totals

The section of the demand projection tables labeled as Planning Totals summarizes the projected system ADD, MDD, and peak hour demands (PHD) that will be used for facility analyses in the following chapters.

Total ADD

The total ADD is simply the sum of the annual demands from the customers, non-revenue use, and leakage converted into units that will be useful for water facility analysis. The ADD in terms of acre-feet per year will be used in comparison to annual water right limits. The ADD in terms of gallons per day and gallons per minute will be used when evaluating standby storage.

Total MDD

Projected system MDD will be used to evaluate the capacity of water sources and pump stations to meet peak day demands over a 24-hour period. It will also be used as the background demand in the hydraulic model to evaluate fire flow capacity.

Historic MDD values in Table 5-5 are based on the volume of water purchased and produced in each year. Because the non-revenue water use and leakage do not increase in the summer like the customer usage, it is good to separate these values when estimating future peak day demands. MSA accomplished this by defining a Customer MDD/ADD ratio in addition to the System MDD/ADD ratio. Considering that it is not practical to read service meters daily to determine peak customer demands, the Customer MDD/ADD ratios are determined by subtracting leakage and non-revenue usage from the peak day production and then dividing the result by the average customer consumption. Following is a summary of the customer ratios compared to the system ratios.

System	Customer MDD/ADD (used in Tables 5-8a to 5-8j)	System MDD/ADD (from Table 5-5)
Lake Stevens	2.13	2.05
Dubuque	2.31	2.18
Lake Roesiger	2.93 for existing customers 2.13 to future customers	2.70
Storm Lake	4.06	4.01
Creswell	2.03	1.99
May Creek	2.10	2.03
Kayak	2.73	2.59
Sunday Lake	2.89	2.76
Skylite	2.30	2.24

The reader may notice that the above MDD/ADD ratios for Lake Roesiger differ from ratios used by MSA in their demand analysis memo in Appendix 05-1. In the initial analyses, the Lake Roesiger peak days were determined from daily source meter readings obtained from Everett's control system. Because of the current low water demands, the Lake Roesiger supply pump does not operate every day. This results in an inflated peak day demand when the pump is refilling the tank in addition to meeting the customer demands. The District refined the analysis by factoring the tank water levels into the peak day determination.

To estimate future MDD values in Tables 5-8a-j, the Customer MDD/ADD ratio is multiplied by the estimated customer consumption (total of the single family, multi-family, non-residential, and wholesale demands) and added with the projected non-revenue usage and leakage volumes. This method avoids exaggerating the non-revenue usage and leakage in the projected peak day demands.

Peak Hour Demand

The PHD flow is used in the hydraulic model to assure that minimum pressure requirements will be met throughout the water systems at the peak hour of the peak day. It is also used to evaluate the capacity of booster pump stations and to assure that storage is sufficient to supplement water supplies during the peak hour.

Equation 5-1 from the DOH Design Manual is used to calculate PHD in Tables 5-8a through 5-8j. To check the accuracy of this method, estimated tank water levels correlating to the calculated PHD were compared to actual recorded tank levels in the Lake Stevens and Lake Roesiger systems on peak days in recent years. Because a good correlation was observed, it is assumed this equation provides a reasonable estimate of PHD for all of the District's water systems.

5.8.5 Estimated Conservation Savings

The expected water savings from conservation efforts and plumbing code improvements is described in Section 6.7 of the next chapter. The estimated savings from Table 6-7 is used to determine the projected annual water demands with conservation, shown at the bottom of Tables 5-8a through 5-8j.

Table 5-8a
Lake Stevens Integrated System
Projected Water Demands

1 ERU = 188 gpd

3.4% Growth Rate

Growth Projections (as of January 1 for given year)

Customer Class	*Exisitng Conditions ADD Demand ERU*	*gpd*	*2010 (Year 1) ADD Demand ERU*	*gpd*	*2015 (Year 6) ADD Demand ERU*	*gpd*	*2019 (Year 10) ADD Demand ERU*	*gpd*	*2024 (Year 15) ADD Demand ERU*	*gpd*	*2029 (Year 20) ADD Demand ERU*	*gpd*
Single Family	15,916	2,992,208	16,457	3,093,943	19,452	3,656,916	22,235	4,180,201	26,281	4,940,829	31,063	5,839,862
Multi Family	768	144,384	794	149,293	939	176,458	1,073	201,709	1,268	238,411	1,499	281,793
Wholesale	4,194	788,472	4,337	815,280	5,126	963,628	5,859	1,101,518	6,925	1,301,950	8,185	1,538,853
Non-Residential Consumption	1,701	319,788	1,759	330,661	2,079	390,828	2,376	446,753	2,809	528,044	3,320	624,127
Non-Revenue Authorized Use	114	21,356	117	22,082	139	26,100	159	29,835	188	35,264	222	41,680
[1]Distribution System Leakage	1,588	298,635	1,642	308,788	1,941	364,975	2,219	417,201	2,623	493,115	3,100	582,842
Total Demands	24,281	4,564,843	25,107	4,720,048	29,675	5,578,906	33,921	6,377,217	40,094	7,537,614	47,389	8,909,157

Planning Totals	Existing Conditions		2010 (Year 1)		2015 (Year 6)		2019 (Year 10)		2024 (Year 15)		2029 (Year 20)	
Annual Demand (acre-ft/yr)		5,113		5,287		6,249		7,143		8,443		9,980
ADD - (gpd) (gpm)	4,564,843	3,170	4,720,048	3278	5,578,906	3,874	6,377,217	4,429	7,537,614	5,234	8,909,157	6,187
[2]MDD - (gpd) (gpm)	9,361,525	6,501	9,679,817	6722	11,441,154	7,945	13,078,321	9,082	15,458,050	10,735	18,270,793	12,688
[3]PHD - (gpm)		10,349		10,698		12,630		14,426		17,036		20,121
ADD - gal/yr	1,666,167,695		1,722,817,520		2,036,300,690		2,327,684,205		2,751,229,110		3,251,842,305	
[4]ADD w/ Conservation - gal/yr	Base year as of 1/1/2009. Conservation already factored in.		1,712,480,615		1,975,211,669		2,227,593,784		2,632,926,258		3,112,013,086	
Conservation Savings - gal/yr			10,336,905		61,089,021		100,090,421		118,302,852		139,829,219	
[4]ADD w/ Conservation - gpd/ERU			187		182		180		180		180	

1 DSL = 7% of Total Consumption + Authorized Use

2 MDD gpd = Customer consumption mutiplied by MDD/ADD Ratio of 2.13 + Non-Revenue Authorized Use and DSL

3 PHD calculated from DOH Equation 5-1 applied to customer ERUs, plus gpm demand from non-revenue authorized use and DSL

4 Conservation goal = 0.6% reduction in ADD in 2010, 3.0% in 2015, 4.3% in 2019, 2024, and 2029. (See Section 6.8 for detail.)

Table 5-8b
Dubuque System
Projected Water Demands

1 ERU = 265 gpd

2.2% Growth Rate — **Growth Projections (as of January 1 for given year)**

Customer Class	*Exisitng Conditions ADD Demand* ERU	gpd	*2010 (Year 1) ADD Demand* ERU	gpd	*2015 (Year 6) ADD Demand* ERU	gpd	*2019 (Year 10) ADD Demand* ERU	gpd	*2024 (Year 15) ADD Demand* ERU	gpd	*2029 (Year 20) ADD Demand* ERU	gpd
Single Family	1,000	265,000	1,022	270,830	1,139	301,961	1,243	329,424	1,386	367,290	1,545	409,509
Multi Family	3	795	3	812	3	906	4	988	4	1,102	5	1,229
Non-Residential Consumption	189	50,085	193	51,187	215	57,071	235	62,261	262	69,418	292	77,397
Non-Revenue Authorized Use	6	1,716	7	1,754	7	1,955	8	2,133	9	2,378	10	2,652
[1]Distribution System Leakage	120	31,760	122	32,458	137	36,189	149	39,481	166	44,019	185	49,079
Total Demands	1,318	349,356	1,347	357,041	1,502	398,082	1,639	434,287	1,827	484,207	2,037	539,866

Planning Totals

	Existing		2010		2015		2019		2024		2029	
Annual Demand (acre-ft/yr)		391		400		446		486		542		605
ADD - (gpd) (gpm)	349,356	243	357,041	248	398,082	276	434,287	302	484,207	336	539,866	375
[2]MDD - (gpd) (gpm)	763,158	530	779,948	542	869,601	604	948,689	659	1,057,738	735	1,179,323	819
[3]PHD - (gpm)		948		966		1,064		1,150		1,270		1,402

	Existing	2010	2015	2019	2024	2029
ADD - gal/yr	127,514,794	130,320,119	145,300,112	158,514,696	176,735,589	197,050,930
[4]ADD w/ Conservation - gal/yr	Base year as of 1/1/2009. Conservation already factored in.	129,538,199	140,941,108	151,698,564	169,135,958	188,577,740
Conservation Savings - gal/yr		781,921	4,359,003	6,816,132	7,599,630	8,473,190
[4]ADD w/ Conservation - gpd/ERU		263	257	254	254	254

1 DSL = 10% of Total Consumption + Authorized Use

2 MDD gpd = Customer consumption mutiplied by MDD/ADD Ratio of 2.31 + Non-Revenue Authorized Use and DSL

3 PHD calculated from DOH Equation 5-1 applied to customer ERUs, plus gpm demand from non-revenue authorized use and DSL

4 Conservation goal = 0.6% reduction in ADD in 2010, 3.0% in 2015, 4.3% in 2019, 2024, and 2029. (See Section 6.8 for detail.)

Table 5-8c
Lake Roesiger System
Projected Water Demands

1 ERU = 79 gpd (188 gpd for new customers)

1.6% Growth Rate — **Growth Projections (as of January 1 for given year)**

Customer Class	*Exisitng Conditions ADD Demand* ERU	gpd	*2010 (Year 1) ADD Demand* ERU	gpd	*2015 (Year 6) ADD Demand* ERU	gpd	*2019 (Year 10) ADD Demand* ERU	gpd	*2024 (Year 15) ADD Demand* ERU	gpd	*2029 (Year 20) ADD Demand* ERU	gpd
Single Family	439	34,681	446	36,002	483	42,928	515	48,879	557	56,869	603	65,519
Multi Family	0	0	0	0	0	0	0	0	0	0	0	0
Non-Residential Consumption	7	553	7	574	8	684	8	779	9	907	10	1,045
Non-Revenue Authorized Use	15	1,178	15	1,197	16	1,296	16	1,381	17	1,495	17	1,618
[1]Distribution System Leakage	46	3,641	48	3,777	51	4,491	54	5,104	58	5,927	63	6,818
Total Demands	507	40,053	516	41,550	557	49,399	593	56,143	641	65,197	693	75,000
Resulting gpd/ERU		79		81		89		95		102		109
Planning Totals												
Annual Demand (acre-ft/yr)		45		47		55		63		73		84
ADD - (gpd) (gpm)	40,053	28	41,550	29	49,399	34	56,143	39	65,197	45	75,000	52
[2]MDD - (gpd) (gpm)	108,055	75	111,067	77	126,868	88	140,443	98	158,670	110	178,403	124
[3]PHD - (gpm)		172		240		263		283		310		340
ADD - gal/yr	14,619,418		15,165,625		18,030,580		20,492,016		23,796,938		27,374,850	
[4]ADD w/ Conservation - gal/yr	Base year as of 1/1/2009. Conservation already factored in.		15,074,631		17,489,663		19,610,859		22,773,669		26,197,732	
Conservation Savings - gal/yr			90,994		540,917		881,157		1,023,268		1,177,119	
[4]ADD w/ Conservation - gpd/ERU			79		86		91		98		104	

1 DSL = 10% of Total Consumption + Authorized Use
2 MDD gpd = Customer consumption mutiplied by MDD/ADD Ratio of 2.93 for existing customers and 2.13 for future customers + Non-Revenue Authorized Use and DSL
3 PHD calculated from DOH Equation 5-1 applied to customer ERUs, plus gpm demand from non-revenue authorized use and DSL
4 Conservation goal = 0.6% reduction in ADD in 2010, 3.0% in 2015, 4.3% in 2019, 2024, and 2029. (See Section 6.8 for detail.)

Table 5-8d
Storm Lake Water System
Projected Water Demands

1 ERU = 270 gpd

1.6% Growth Rate | **Growth Projections (as of January 1 for given year)**

Customer Class	*Exisitng Conditions ADD Demand*		*2010 (Year 1) ADD Demand*		*2015 (Year 6) ADD Demand*		*2019 (Year 10) ADD Demand*		*2024 (Year 15) ADD Demand*		*2029 (Year 20) ADD Demand*	
	ERU	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*
Single Family	171	46,170	174	46,909	188	50,783	200	54,112	217	58,582	235	63,421
Multi Family	0	0	0	0	0	0	0	0	0	0	0	0
Non-Residential Consumption	0	0	0	0	0	0	0	0	0	0	0	0
Non-Revenue Authorized Use	1	270	1	274	1	297	1	316	1	343	1	371
[1]Distribution System Leakage	7	1,858	7	1,887	8	2,043	8	2,177	9	2,357	9	2,552
Total Demands	179	48,298	182	49,070	197	53,124	210	56,606	227	61,282	246	66,344
Planning Totals												
Annual Demand (acre-ft/yr)		54		55		60		63		69		74
ADD - (gpd) (gpm)	48,298	34	49,070	34	53,124	37	56,606	39	61,282	43	66,344	46
[2]MDD - (gpd) (gpm)	189,578	132	192,611	134	208,521	145	222,190	154	240,543	167	260,412	181
[3]PHD - (gpm)		337		341		363		382		407		435
ADD - gal/yr	17,628,624		17,910,682		19,390,127		20,661,198		22,367,839		24,215,452	
[4]ADD w/ Conservation - gal/yr	Base year as of 1/1/2009. Conservation already factored in.		17,803,218		18,808,424		19,772,766		21,406,022		23,174,187	
Conservation Savings - gal/yr			107,464		581,704		888,432		961,817		1,041,264	
[4]ADD w/ Conservation - gpd/ERU			268		262		258		258		258	

1 DSL = 4% of Total Consumption + Authorized Use
2 MDD gpd = Customer consumption mutiplied by MDD/ADD Ratio of 4.06 + Non-Revenue Authorized Use and DSL
3 PHD calculated from DOH Equation 5-1 applied to customer ERUs, plus gpm demand from non-revenue authorized use and DSL
4 Conservation goal = 0.6% reduction in ADD in 2010, 3.0% in 2015, 4.3% in 2019, 2024, and 2029. (See Section 6.8 for detail.)

Table 5-8e
Creswell Water System
Projected Water Demands

1 ERU = 188 gpd

10.0% Growth Rate

Growth Projections (as of January 1 for given year)

	Exisitng Conditions ADD Demand		*2010 (Year 1) ADD Demand*		*2015 (Year 6) ADD Demand*		*2019 (Year 10) ADD Demand*		*2024 (Year 15) ADD Demand*		*2029 (Year 20) ADD Demand*	
Customer Class	*ERU*	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*
Single Family	12	2,256	13	2,482	21	3,997	31	5,851	50	9,424	81	15,177
Multi Family	0	0	0	0	0	0	0	0	0	0	0	0
Non-Residential Consumption	0	0	0	0	0	0	0	0	0	0	0	0
Non-Revenue Authorized Use	1	270	2	297	3	478	4	700	6	1,128	10	1,816
[1]Distribution System Leakage	1	253	1	278	2	447	3	655	6	1,055	9	1,699
Total Demands	15	2,779	16	3,056	26	4,922	38	7,207	62	11,607	99	18,693
Planning Totals												
Annual Demand (acre-ft/yr)		3.1		3.4		5.5		8.1		13.0		20.9
ADD - (gpd) (gpm)	2,779	1.9	3,056	2.1	4,922	3.4	7,207	5.0	11,607	8.1	18,693	13.0
[2]MDD - (gpd) (gpm)	5,102	3.5	5,613	3.9	9,039	6.3	13,234	9.2	21,313	14.8	34,326	23.8
[3]PHD - (gpm)		28		29		36		44		59		81
ADD - gal/yr	1,014,189		1,115,608		1,796,698		2,630,545		4,236,519		6,822,956	
[4]ADD w/ Conservation - gal/yr	Base year as of 1/1/2009. Conservation already factored in.		1,108,914		1,742,797		2,517,432		4,054,349		6,529,569	
Conservation Savings - gal/yr			6,694		53,901		113,113		182,170		293,387	
[4]ADD w/ Conservation - gpd/ERU			187		182		180		180		180	

1 DSL = 10% of Total Consumption + Authorized Use
2 MDD gpd = Customer consumption mutiplied by MDD/ADD Ratio of 2.03 + Non-Revenue Authorized Use and DSL
3 PHD calculated from DOH Equation 5-1 applied to customer ERUs, plus gpm demand from non-revenue authorized use and DSL
4 Conservation goal = 0.6% reduction in ADD in 2010, 3.0% in 2015, 4.3% in 2019, 2024, and 2029. (See Section 6.8 for detail.)

Table 5-8f
Total of Systems With Purchased Water
Projected Water Demands

1 ERU = 190 gpd (weighted average of Lake Stevens, Dubuque, Lake Roesiger, Storm Lake, and Creswell gpd/ERU)

Growth Projections (as of January 1 for given year)

Customer Class	*Exisitng Conditions ADD Demand* ERU	gpd	*2010 (Year 1) ADD Demand* ERU	gpd	*2015 (Year 6) ADD Demand* ERU	gpd	*2019 (Year 10) ADD Demand* ERU	gpd	*2024 (Year 15) ADD Demand* ERU	gpd	*2029 (Year 20) ADD Demand* ERU	gpd
Single Family	17,551	3,340,315	18,129	3,450,165	21,315	4,056,585	24,267	4,618,467	28,547	5,432,994	33,594	6,393,488
Multi Family	763	145,179	789	150,106	932	177,364	1,065	202,697	1,259	239,513	1,487	283,021
Wholesale	4,143	788,472	4,284	815,280	5,063	963,628	5,788	1,101,518	6,841	1,301,950	8,086	1,538,853
Non-Residential Consumption	1,946	370,426	2,009	382,422	2,357	448,583	2,679	509,794	3,144	598,369	3,692	702,569
Non-Revenue Authorized Use	130	24,790	135	25,604	158	30,127	181	34,366	213	40,607	253	48,138
[1]Distribution System Leakage	1,766	336,146	1,824	347,189	2,145	408,146	2,441	464,618	2,871	546,473	3,379	642,990
Total Demands	26,300	5,005,328	27,169	5,170,766	31,970	6,084,434	36,421	6,931,460	42,876	8,159,907	50,490	9,609,059
Minus Production from Lk Stvns Wells												
Planning Totals												
Annual Demand (acre-ft/yr)		5,607		5,792		6,815		7,764		9,140		10,764
ADD - (gpd) (gpm)	5,005,328	3,476	5,170,766	3591	6,084,434	4,225	6,931,460	4,814	8,159,907	5,667	9,609,059	6,673
[2]MDD - (gpd) (gpm)	10,427,419	7,241	10,769,056	7479	12,655,183	8,788	14,402,877	10,002	16,936,315	11,761	19,923,257	13,836
[3]PHD - (gpm)		11,324		11,695		13,748		15,651		18,411		21,667
ADD - gal/yr	1,826,944,720		1,887,329,590		2,220,818,410		2,529,982,900		2,978,366,055		3,507,306,535	
[4]ADD w/ Conservation - gal/yr	Base year as of 1/1/2009. Conservation already factored in.		1,876,005,612		2,154,193,858		2,421,193,635		2,850,296,315		3,356,492,354	
Conservation Savings - gal/yr			11,323,978		66,624,552		108,789,265		128,069,740		150,814,181	
[4]ADD w/ Conservation - gpd/ERU			189		185		182		182		182	

1 DSL = Sum of DSL values from Tables 5-8a through 5-8e

2 MDD gpd = Sum of MDD values from Tables 5-8a through 5-8e

3 PHD calculated from DOH Equation 5-1 assuming a MDD/ADD ratio of 2.13 applied to customer ERUs, plus gpm demand from non-revenue authorized use and DSL

4 Conservation goal = 0.6% reduction in ADD in 2010, 3.0% in 2015, 4.3% in 2019, 2024, and 2029. (See Section 6.8 for detail.)

Table 5-8g
May Creek Water System
Projected Water Demands

1 ERU = 178 gpd

1.4% Growth Rate

Growth Projections (as of January 1 for given year)

Customer Class	*Exisitng Conditions ADD Demand ERU*	*gpd*	*2010 (Year 1) ADD Demand ERU*	*gpd*	*2015 (Year 6) ADD Demand ERU*	*gpd*	*2019 (Year 10) ADD Demand ERU*	*gpd*	*2024 (Year 15) ADD Demand ERU*	*gpd*	*2029 (Year 20) ADD Demand ERU*	*gpd*
Single Family	437	77,786	443	78,875	475	84,553	502	89,388	538	95,823	577	102,721
Multi Family	0	0	0	0	0	0	0	0	0	0	0	0
Non-Residential Consumption	25	4,450	25	4,512	27	4,837	29	5,114	31	5,482	33	5,877
Non-Revenue Authorized Use	8	1,490	8	1,511	9	1,620	10	1,712	10	1,836	11	1,968
[1]Distribution System Leakage	28	5,024	29	5,094	31	5,461	32	5,773	35	6,188	37	6,634
Total Demands	499	88,750	506	89,992	542	96,470	573	101,987	614	109,329	658	117,199
Planning Totals												
Annual Demand (acre-ft/yr)		99.4		100.8		108.1		114.2		122.5		131.3
ADD - (gpd) (gpm)	88,750	62	89,992	62	96,470	67	101,987	71	109,329	76	117,199	81
[2]MDD - (gpd) (gpm)	179,209	124	181,718	126	194,800	135	205,940	143	220,765	153	236,657	164
[3]PHD - (gpm)		273		276		290		302		318		336
ADD - gal/yr	32,393,589		32,847,100		35,211,685		37,225,336		39,905,099		42,777,773	
[4]ADD w/ Conservation - gal/yr	Base year as of 1/1/2009. Conservation already factored in.		32,650,017		34,155,334		35,624,646		38,189,180		40,938,329	
Conservation Savings - gal/yr			197,083		1,056,351		1,600,689		1,715,919		1,839,444	
[4]ADD w/ Conservation - gpd/ERU			177		173		170		170		170	

1 DSL = 6% of Total Consumption + Authorized Use
2 MDD gpd = Customer consumption mutiplied by MDD/ADD Ratio of 2.10 + Non-Revenue Authorized Use and DSL
3 PHD calculated from DOH Equation 5-1 applied to customer ERUs, plus gpm demand from non-revenue authorized use and DSL
4 Conservation goal = 0.6% reduction in ADD in 2010, 3.0% in 2015, 4.3% in 2019, 2024, and 2029. (See Section 6.8 for detail.)

Table 5-8h
Kayak Water System
Projected Water Demands

1 ERU = 247 gpd

1.0% Growth Rate

Growth Projections (as of January 1 for given year)

Customer Class	*Exisitng Conditions ADD Demand ERU*	*gpd*	*2010 (Year 1) ADD Demand ERU*	*gpd*	*2015 (Year 6) ADD Demand ERU*	*gpd*	*2019 (Year 10) ADD Demand ERU*	*gpd*	*2024 (Year 15) ADD Demand ERU*	*gpd*	*2029 (Year 20) ADD Demand ERU*	*gpd*
Single Family	362	89,414	366	90,308	384	94,915	400	98,769	420	103,807	442	109,102
Multi Family	1	247	1	249	1	262	1	273	1	287	1	301
Non-Residential Consumption	0	0	0	0	0	0	0	0	0	0	0	0
Non-Revenue Authorized Use	7	1,650	7	1,667	7	1,752	7	1,823	8	1,916	8	2,013
[1]Distribution System Leakage	26	6,392	26	6,456	27	6,785	29	7,060	30	7,421	32	7,799
Total Demands	396	97,703	400	98,680	420	103,713	437	107,925	459	113,430	483	119,216
Planning Totals												
Annual Demand (acre-ft/yr)		109		111		116		121		127		134
ADD - (gpd) (gpm)	97,703	68	98,680	69	103,713	72	107,925	75	113,430	79	119,216	83
[2]MDD - (gpd) (gpm)	252,816	176	255,344	177	268,370	186	279,266	194	293,512	204	308,484	214
[3]PHD - (gpm)		388		391		407		421		438		457
ADD - gal/yr	35,661,511		36,018,126		37,855,413		39,392,494		41,401,907		43,513,821	
[4]ADD w/ Conservation - gal/yr	Base year as of 1/1/2009. Conservation already factored in.		35,802,017		36,719,750		37,698,617		39,621,625		41,642,726	
Conservation Savings - gal/yr			216,109		1,135,662		1,693,877		1,780,282		1,871,094	
[4]ADD w/ Conservation - gpd/ERU			246		240		236		236		236	

1 DSL = 7% of Total Consumption + Authorized Use
2 MDD gpd = Customer consumption mutiplied by MDD/ADD Ratio of 2.73 + Non-Revenue Authorized Use and DSL
3 PHD calculated from DOH Equation 5-1 applied to customer ERUs, plus gpm demand from non-revenue authorized use and DSL
4 Conservation goal = 0.6% reduction in ADD in 2010, 3.0% in 2015, 4.3% in 2019, 2024, and 2029. (See Section 6.8 for detail.)

Table 5-8i
Sunday Lake Water System
Projected Annual Water Demands

1 ERU = 245 gpd (170 gpd for the first 128 customers)

4.0% Growth Rate — **Growth Projections (as of January 1 for given year)**

Customer Class	*Exisitng Conditions ADD Demand* ERU	gpd	*2010 (Year 1) ADD Demand* ERU	gpd	*2015 (Year 6) ADD Demand* ERU	gpd	*2019 (Year 10) ADD Demand* ERU	gpd	*2024 (Year 15) ADD Demand* ERU	gpd	*2029 (Year 20) ADD Demand* ERU	gpd
Single Family	143	25,435	149	26,836	181	34,730	212	42,260	258	53,496	297	63,165
Multi Family	0	0	0	0	0	0	0	0	0	0	0	0
Non-Residential Consumption	0	0	0	0	0	0	0	0	0	0	0	0
Non-Revenue Authorized Use	2	498	2	518	3	630	3	737	4	897	5	1,091
[1]Distribution System Leakage	5	1,297	6	1,368	8	1,768	10	2,150	13	2,720	15	3,213
Total Demands	150	27,230	156	28,722	191	37,129	225	45,147	275	57,113	318	67,469
Resulting gpd/ERU		178		180		192		200		208		213
Planning Totals												
Annual Demand (acre-ft/yr)		30.5		32.2		41.6		50.6		64.0		75.6
ADD - (gpd) (gpm)	27,230	19	28,722	20	37,129	26	45,147	31	57,113	40	67,469	47
[2]MDD - (gpd) (gpm)	75,302	52	79,443	55	102,769	71	125,019	87	158,220	110	186,851	130
[3]PHD - (gpm)		197		202		234		265		310		345
ADD - gal/yr	9,938,822		10,483,543		13,551,943		16,478,800		20,846,089		24,626,181	
[4]ADD w/ Conservation - gal/yr	Base year as of 1/1/2009. Conservation already factored in.		10,420,642		13,145,384		15,770,211		19,949,707		23,567,255	
Conservation Savings - gal/yr			62,901		406,558		708,588		896,382		1,058,926	
[4]ADD w/ Conservation - gpd/ERU			177		186		191		199		204	

1 DSL = 5% of Total Consumption + Authorized Use
2 MDD gpd = Customer consumption mutiplied by MDD/ADD Ratio of 2.89 + Non-Revenue Authorized Use and DSL
3 PHD calculated from DOH Equation 5-1 applied to customer ERUs, plus gpm demand from non-revenue authorized use and DSL
4 Conservation goal = 0.6% reduction in ADD in 2010, 3.0% in 2015, 4.3% in 2019, 2024, and 2029. (See Section 6.8 for detail.)
5 20-year ERUs were adjusted until MDD matched the 130 gpm water right limit. System approved for 278 ERUs. Re-examine capacity as number of connects approaches the approved limit.

Table 5-8j
Skylite Water System
Projected Water Demands

1 ERU = 186 gpd

0.5% Growth Rate

Growth Projections (as of January 1 for given year)

Customer Class	*Exisitng Conditions ADD Demand*		*2010 (Year 1) ADD Demand*		*2015 (Year 6) ADD Demand*		*2019 (Year 10) ADD Demand*		*2024 (Year 15) ADD Demand*		*2029 (Year 20) ADD Demand*	
	ERU	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*	*ERU*	*gpd*
Single Family	151	28,086	152	28,226	156	28,939	159	29,522	163	30,268	167	31,032
Multi Family	0	0	0	0	0	0	0	0	0	0	0	0
Non-Residential Consumption	0	0	0	0	0	0	0	0	0	0	0	0
Non-Revenue Authorized Use	0	21	0	21	0	22	0	22	0	23	0	23
[1]Distribution System Leakage	15	2,811	15	2,825	16	2,896	16	2,954	16	3,029	17	3,106
Total Demands	166	30,918	167	31,072	171	31,857	175	32,499	179	33,319	184	34,161
Planning Totals												
Annual Demand (acre-ft/yr)		34.6		34.8		35.7		36.4		37.3		38.3
ADD - (gpd) (gpm)	30,918	21	31,072	22	31,857	22	32,499	23	33,319	23	34,161	24
[2]MDD - (gpd) (gpm)	67,430	47	67,767	47	69,478	48	70,878	49	72,668	50	74,503	52
[3]PHD - (gpm)		132		132		135		137		139		142
ADD - gal/yr	11,284,961		11,341,385		11,627,769		11,862,075		12,161,607		12,468,703	
[4]ADD w/ Conservation - gal/yr	Base year as of 1/1/2009. Conservation already factored in.		11,273,337		11,278,936		11,352,006		11,638,658		11,932,549	
Conservation Savings - gal/yr			68,048		348,833		510,069		522,949		536,154	
[4]ADD w/ Conservation - gpd/ERU			185		180		178		178		178	

1 DSL = 10% of Total Consumption + Authorized Use
2 MDD gpd = Customer consumption mutiplied by customer MDD/ADD Ratio of 2.30 + Non-Revenue Authorized Use and DSL
3 PHD calculated from DOH Equation 5-1 applied to customer ERUs, plus gpm demand from non-revenue authorized use and DSL
4 Conservation goal = 0.6% reduction in ADD in 2010, 3.0% in 2015, 4.3% in 2019, 2024, and 2029. (See Section 6.8 for detail.)

6 Conservation / Water Use Efficiency

6.1 INTRODUCTION

As stewards of the Spada Reservoir and associated watershed feeding into the Sultan River, the District has an interest in preserving long-term water supply for power generation, drinking water, and fish needs. Water conservation and water use efficiencies may also preserve groundwater resources for the District's satellite systems by extending water rights to serve people that would otherwise drill individual wells.

The District is a member of the Everett Water Utilities Committee (EWUC) and its conservation subcommittee. The subcommittee was formed in 1999 to coordinate water conservation efforts among systems that use water from the city of Everett's filtration plant. Prior to forming this regional committee, the District's conservation program was coordinated through its Water Resources Department. The District continues to participate in the EWUC regional water conservation program, and supplements this program with additional conservation measures in the District's water service area.

The state of Washington's water conservation requirements are incorporated in the Water Use Efficiency (WUE) Rule, which was finalized as WAC 246-290-800 in January 2007. DOH published a *Water Use Efficiency Guidebook* (Guidebook) in July 2007 and released a second edition of this guidance in January 2009. The District's water conservation program is consistent with the Guidebook and the WUE Rule.

6.2 OBJECTIVES AND GOALS

The WUE Rule requires water purveyors to define at least one measurable water conservation goal. Measurable goals provide a benchmark for evaluating the effectiveness of WUE programs. The goal of the District's previous program was to reduce the average daily customer demand by about 4.4 percent between 2000 and 2010, or about 0.4 percent per year. For the District's Lake Stevens system this was expected to save 0.8 million cubic feet (6.0 million gallons) of water per year in 2002 and 2003.

As staff re-evaluated the conservation program in preparation for meeting the WUE Rule, two objectives rose to the forefront:

1. A desire to reduce distribution system leakage as much as possible because this represents money spent for water that is not used by customers; and
2. The importance of reflecting the District's participation and support of the regional conservation program.

To achieve these objectives, the District proposed a supply-side and a demand-side conservation goal. Supply-side conservation consists of measures implemented at the utility level (such as leak detection and repair) and demand-side conservation is achieved through efforts at the customer level.

A public meeting was held as part of the District's regularly scheduled Commission meeting on January 8, 2008, to present the proposed goals and to collect input from District customers. After reviewing and considering all comments, the District's Board of Commissioners approved Resolution 5337 adopting the following goals:

> ***Supply-side goal:*** The District shall maintain its distribution leakage below the Washington State 10 percent standard, and shall strive to progressively achieve lower percentages of lost water, where possible.
>
> ***Demand-side goal:*** The District shall actively participate in the Everett Water Utilities Committee regional conservation program to reduce the 2012 regional demand for water by 3 percent (1.97 MGD), while implementing additional water use efficiency measures for the District's water systems.

WUE goals must be re-evaluated and re-established every six years and any time a WSP is submitted to DOH for approval. With this WSP update, the District proposes to re-affirm the two goals set in 2008. These goals will be presented at a public meeting as part of the WSP review and approval process. Within the next six years, the District will participate in the EWUC subcommittee to review and update the regional conservation program. The District’s goals can be re-evaluated after the updated regional goal is established.

6.3 WATER USE EFFICIENCY PROGRAM

Municipal water suppliers must develop and implement WUE programs to achieve their goals by implementing cost-effective water use efficiency measures. The Guidebook lists eleven items that must be included in WUE programs. The following table shows where the required program elements can be found in this document.

Table 6-1: Required WUE Program Elements

Water Use Efficiency Program Element	Chapter/Section
1a. Describe current water conservation program	6.1, 6.4 & 6.5
1b. Estimate of water saved over the last six years	6.7
2. Describe goals of the program and how they were established	6.2
3. Evaluate water use efficiency measures for cost-effectiveness	6.5
4. Describe measures to meet goals for the next six years	6.4 & 6.5
5. Educate customers to use water efficiently	6.5.1
6. Estimate projected savings from the selected measures	5.6 & 6.8
7. Describe how program effectiveness will be evaluated	6.9
8. Evaluate distribution system leakage	5.4 & 6.6
9. Evaluate rate structures that encourage water use efficiency	6.5.5
10. Evaluate reclaimed water opportunities	3.2.5 & 6.4.9
11. Describe water supply characteristics	8

The next two sections (6.4 and 6.5) describe measures to meet the supply-side and demand-side goals. These include measures that are currently implemented, measures that have been evaluated for cost-effectiveness, and measures that are being considered for the future. Section 6.6 describes the current status of distribution system leakage (DSL) in relation to the supply-side goal and presents an action plan for systems that still exceed the DSL standard. Section 6.7 presents water saved by the District's demand-side measures, demonstrating that the District has greatly surpassed the conservation goal of its previous WSP.

6.4 SUPPLY-SIDE MEASURES

Supply-side conservation consists of measures implemented at the utility level, such as leak detection and repair. The following sections describe supply-side measures currently implemented by the District and further measures under consideration for the next six years.

6.4.1 Calculating Distribution System Leakage

The District has been calculating DSL since 1996 (previously referred to as unaccounted-for water). The WUE Rule requires that DSL be reported in annual performance reports. For these reports, the District uses an annual period from March through February, for the best possible correlation between the source and service meter readings.

The following supply-side measures are intended to improve the accuracy of the distribution leakage calculation and to reduce the amount of water lost through actual leakage.

6.4.2 Source Meters and Service Meters

The District has source meters for all water entering its systems and service meters for all water customers. Meter accuracy is maintained through inspection, maintenance, and replacement as described in the Operations and Maintenance chapter of this plan.

Source meters and wholesale master meters are read monthly. Service meters are read in conjunction with the District's electric meters (monthly for most commercial customers and every other month for residential customers). To increase accuracy, the District's meter reading and billing department began reading all digits on commercial water meters in March 2010 when a new customer billing system was implemented. Beginning in 2011, the meter reading and billing department will begin progressively reading all digits on all water meters. Previously, the meter readers were reading only the left 5 digits, and on at least one occasion this led to a delayed discovery of a service break and inaccurate billing.

6.4.3 Accounting for Construction Water and Bulk Water Withdrawals

In 2005, the District changed its policy under which bulk water is sold via withdrawal from District fire hydrants and for construction use. Water Fill Stations were installed strategically throughout the District's service territory to meter water truck use and to improve cross-connection control. Filling of water trucks is monitored through a permit system. A $275 refundable deposit is required to obtain a key to access the designated Water Fill Stations. Permits are issued at flat rates for daily (2,500 gallons total), monthly (10,000 gallons total), or six-month (10,000 gallons/month) periods. Water usage is recorded and the records are collected by District staff on a monthly basis. Usage over the allotted amount is charged to the permit holder.

Contractors are required to rent a “hydrant watchdog” from the District for the duration of water main construction projects. The “hydrant watchdog” is attached to a blow-off or hydrant and consists of a meter and backflow device. The meter is read monthly by District staff and the contractor billed.

6.4.4 Reporting by Fire Districts

To improve the accounting of non-revenue water, the District continues to work with the local fire districts on reporting water used from hydrants for firefighting activities.

6.4.5 Accounting for Flushing and Tank Cleaning

District staff estimate water used when flushing water mains, cleaning water tanks, and similar activities. Water used for operational activities are tracked in a spreadsheet.

6.4.6 Leak Detection

The annual budget contains an amount for water leak detection services. In 2007, staff purchased sounding equipment to improve detection of leaks in the distribution system. Devices are placed in service meter boxes to “listen” for leaks overnight. The District intends to expand the use of the leak detection equipment.

6.4.7 Tracking Water Main Breaks

The District tracks unplanned water shutdowns resulting from water main breaks and other occurrences. Main breaks caused by aging infrastructure are plotted in the District’s GIS mapping system. This information is used in conjunction with input from staff to identify and prioritize water main replacement projects.

6.4.8 Water Main Replacement Program

A major portion of the District's ongoing improvement program is dedicated to replacement of aging water mains. The District's goal has been to replace all old asbestos cement, steel, and galvanized iron pipe within 20 years. Over time, the amount of annual budgeted funds was inadequate to sustain this water main replacement program goal. By Resolution 5403 adopted on December 2, 2008, the District’s Board of Commissioners approved a four-year rate package that includes an additional $200,000 annually to ensure that 171,000 lineal feet of pipe installed pre-1949 will be replaced within 20 years.

6.4.9 Reclaimed Water Opportunities

Reclaimed water evaluations conducted by the Lake Stevens Sewer District and the cities of Granite Falls, Everett, and Marysville were summarized in Chapter 3. These evaluations thoroughly cover the potential for reclaimed water within and near the District’s water service areas. Relevant pages from the referenced documents are provided in Appendix 3-1.

The study for the Lake Stevens Sewer District mentions that features to fill trucks for sewer jetting and possibly for street cleaning could be incorporated into the Phase III improvements planned for 2019 at the WWTP. Making reclaimed water available at the WWTP would also require the submittal of engineering reports to Ecology and DOH. This project could use about

200,000 gallons of reclaimed water for sewer jetting each year. The District should communicate with the sewer district regarding the possibility that this access point could be used by trucks that currently use fill stations on the District's water systems. Water used for dust control, dampening soil for compaction at construction sites, washing aggregate, and for making concrete only needs to meet Class C standards, whereas the new WWTP will be capable of producing Class A reclaimed water.

The most promising irrigation project in the referenced studies would have the potential to deliver 181,000 gpd to 36 acres at the Skyline Elementary and Lake Stevens Middle Schools. Over the irrigation season, this could add up to 13.9 million gallons. The estimated cost for this project was $1,164,000 in 2006. The District estimates that the 2010 project cost would be about $1,356,000, when factoring in inflation and the fact that it is too late for a portion of the pipe to share a trench with the influent sewer.

The sewer district estimated the 2006 annualized cost of the project to be about $72,500 per year, based on funding the project with a 1.5 percent Public Works Trust Fund (PWTF) loan over 20 years and adding $4,500 per year for power and maintenance. The updated 2010 annualized cost is estimated to be $122,800 per year. This includes the operational cost and assumes the project would be financed with 6 percent bond funds, because the future of the PWTF loan program is uncertain. The 2010 cost to purchase 13.9 million gallons from the District's Lake Stevens water system would be $38,500. So, the project is still far from being financially feasible. The District will continue to look for opportunities to help make use of reclaimed water.

6.5 DEMAND-SIDE MEASURES

Demand-side conservation is achieved through efforts at the customer level. Table 6-2 summarizes demand-side measures that have been evaluated for the District's water systems. The "regional program" consists of measures evaluated by the EWUC subcommittee, as described in Everett's 2007 Water System Plan. The "local program" consists of measures implemented by the District beyond the regional program.

The WUE Rule specifies that at least nine demand-side measures must be evaluated for cost-effectiveness for systems the size of Lake Stevens water system, five for Dubuque, and one for the District's other water systems. Evaluated measures must be selected from three categories: (1) indoor residential, (2) outdoor, and (3) industrial/commercial/institutional. As can be seen in Table 6-2, the number of measures implemented in the District's local program alone could more than satisfy the WUE Rule. The regional measures satisfy the District's supply-side goal to actively participate in the regional program while implementing additional local measures.

The regional planning effort used an avoided cost approach to evaluate the cost-effectiveness of potential conservation measures. The avoided cost for the regional program in 2007 was $0.35/ccf. This includes operational cost to supply and treat the water and associated waste-water. The avoided cost also factors in the construction cost for new capital facilities that can be delayed as the conservation extends the capacity of existing facilities.

Table 6-2: Demand-Side Measures

Measure Name	Cost Effective?			Implemented			Counts as # of Measures Evaluated
(RI) = required to implement (RE) = required to evaluate	SF	MF	C	SF	MF	C	
Regional Program							
Customer Education (RI)				x	x	x	0
Watering Calendar				x	x	x	3
School Outreach						x	1
Toilets 1.6 gpf	N	N	N				3
Toilets 1.0 gpf	N	N	N	x	x	x	3
Toilets Leak Detection	**Y**	**Y**	**Y**	x	x	x	3
Urinals 1.0 gpf			N				1
Urinals 0.5 gpf			N				1
Showerheads 2.0 gpm	**Y**	**Y**		x	x		2
Bathroom Faucet Aerators 1.0 gpm	**Y**	**Y**		x	x		2
Bathroom Faucet Aerators 0.5 gpm			**Y**				1
Kitchen Faucet Aerators 2.2 gpm		N			x		1
Recirculating Hot Water	N						1
Clothes Washers in Units	N	N		x	x		2
Clothes Washers in Common Areas		**Y**	**Y**		x	x	2
Outdoor Irrigation Kits	N	**Y**		x	x		2
Indoor Audit			**Y**			x	1
Outdoor Audit			N				1
Irrigation - School Audit Only			N			x	1
Irrigation - School Audit + Financing			N				1
						Subtotal:	**32**
Local Program							
Customer Education (RI)				x	x	x	0
Bill Showing Consumption History				x	x	x	3
School Outreach						x	1
Leak Adjustment				x	x	x	3
Toilets Leak Detection				x	x	x	3
Toilet Rebates				x	x	x	3
Clothes washer Rebates				x	x	x	3
Dishwasher Rebates				x	x	x	3
Conservation Rate Structure (RE)	x	x	x				0
Reclaimed Water Opportunities (RE)	x	x	x				0
						Subtotal:	**19**
						Total Evaluated:	**51**

<u>WUE Rule instructions for "counting" evaluated measures:</u>
Count one measure for each customer class in which the measure was evaluated.
Each implemented measure automatically counts as having been *evaluated*.
Any measure *required to be implemented* (RI) does not count toward number of measures evaluated.
Any measure *required to be evaluated* (RE) does not count *unless* it is actually implemented.

(SF) = Single-Family; (MF) = Multi-Family; (C) = Commercial

Conservation measures whose cost per unit is below the avoided cost are considered to be cost effective. As indicated in Table 6-2, all of the cost-effective measures were implemented with the exception of 0.5 gpm faucet aerators for commercial customers. The regional program also implemented several measures that did not meet the cost effective criteria. Overall, the program was designed to have an annual budget similar to previous expenditures while providing assistance to all customer sectors and staying within a reasonable range of the avoided cost of supply.

The following sections describe the measures that were selected for implementation in the regional and local programs.

6.5.1 Program Promotion & Customer Education

The District contributes financially to promote the Everett regional conservation program. A primary effort uses billboards with conservation themes on city buses during the summer months. It is estimated these billboards are seen by over 75 percent of residents in the region each year. The EWUC also participates in tri-county (Snohomish, King, and Pierce) water conservation marketing campaigns to broadcast radio and/or television messages.

Everett develops a summer lawn watering calendar encouraging customers to water every third day (staggered, based on street address). This helps reduce peak day demand by reducing the amount of watering on a given day. The District mails this calendar to all of its water customers each year.

In addition, the District conducts its own educational program, including mailings, newsletters, brochures, bill inserts, a web page, contests, and local advertisement. In 2008, the District began including conservation performance in its annual Consumer Confidence Report.

6.5.2 School Outreach

The District participates in the regional school outreach program coordinated by the city of Everett. The city uses trained instructors for presentations to elementary, middle, and high school students. A re-design of the program in 2005 increased the level of interest and requests by teachers for these presentations. The city also offers teacher workshops and a broad collection of classroom materials.

In addition, the District also has its own outreach program to public, private, and home schools within its water service territory. The selection of available offerings can be viewed on the Education page of the District's website, www.snopud.com. These include classroom presentations, curricula, teacher workshops, tours, special programs, videos, books, and other support materials. Educators can subscribe to a mailing list to keep informed of special events, regular program offerings, and general information and updates about energy and water education. Current highlights include interactive storytelling for grades K-1 entitled "Exploring Water with Wanda Flipplefairy," promotion of regional classroom presentations, mini-grants of up to $500 in the District's water service territory for water education projects, materials and events, educator workshops, and a wide variety of free educational materials.

6.5.3 Bill Showing Consumption History

The District provides as much consumption history as possible on water and electric bills. The current billing software is limited to comparing average use per day and average temperature per day between same time previous year as compared to current year. Due to limitations in the billing program, it is unable to show customers their consumption history in a graph format.

6.5.4 Conservation Rate Structure

The WUE Rule requires purveyors to evaluate a rate structure that encourages conservation. The Guidebook classifies the District's current water rate structure as a "uniform rate," with the same charge per unit of water used. According to the Guidebook, this is better than a declining block rate or a flat rate, but does not qualify as encouraging efficient water use.

The Guidebook instructs utilities with a uniform water rate to evaluate an inclining block rate or a seasonal rate structure. The District did such an evaluation several years ago, but at that time the then-current billing system could not process conservation-type rates. In 2008, the District's Board of Commissioners adopted a water rate package for years 2009 through 2012. In 2010, the District replaced its old billing system with a system that can accommodate various rate structures. It is the District's intent to re-evaluate options for a conservation rate structure as part of its next rate case in late-2012 for 2013 implementation.

6.5.5 Leak Adjustment

District meter readers observe for signs of leaks when reading retail water meters. Computer variance reports also flag high and low meter readings. When a leak is suspected, a staff person visits the site and contacts the customer if a potential problem is confirmed. As an incentive to fix qualifying service line leaks, the District allows for a water bill adjustment of 50 percent for the excess amount of water used during the eligible time frame.

6.5.6 Toilet Leak Detection

This measure provides dye strips for customers to determine if their toilets leak and detailed information on how to fix the leaks. The strips are mailed or given to customers as needed to trouble-shoot such problems. This measure applies to single-family and multi-family sectors, both existing and new customers, and businesses with tank style toilets.

6.5.7 Indoor Retrofit Kits (Single and Multi-Family)

As part of the EWUC regional conservation program, the District distributes free indoor water conservation kits to single-family and multi-family retail customers. The indoor conservation kits are intended for homes built prior to 1993, when the National Plumbing Code of 1991 was adopted in Washington State. The indoor kits include a low-flow showerhead, a kitchen faucet aerator, two bathroom faucet aerators, a toilet tank water displacement bag, toilet leak detection strips, a gauge to measure losses from household leaks, and a conservation brochure.

6.5.8 Outdoor Irrigation Kits (Single and Multi-Family)

The District will also continue to distribute its share of single-family / multi-family outdoor conservation kits. Based on studies that show that most households overwater their landscape areas by 15 to 20 percent, these kits are designed to encourage consumers to reduce watering and other outdoor water use. The outdoor kits include an automatic shut-off watering timer, a hose nozzle, a gauge to measure rainfall and/or sprinkler output, a package of hose washers to reduce leaks, and a conservation brochure. The contents may remain similar in future years, although some fine-tuning could occur. The outdoor conservation kits are estimated to save an average of 40 gallons of water per day per household.

6.5.9 Toilet Rebates

The District previously offered $50 rebates in its local program as an incentive for water customers to replace older toilets with new models that meet the Uniform Plumbing Code. The current standard is 1.6 gallons per flush (gpf) compared to old toilets meeting a 5-gallon standard. A new measure in the regional program provides additional motivation by providing $100 rebates for high efficiency toilets with a flush volume of 1.0 gpf or less. This program ends on December 31, 2010, or when funds are exhausted, but it is likely to continue in future years.

6.5.10 Clothes Washer Rebates

Through a partnership with other regional electric and water utilities, the District offers three levels of rebates ($50, $75, $100) for premium-efficiency clothes washers which meet WashWise program criteria. The WashWise program criteria and rebate levels are based on increasing efficiency as determined by Modified Energy Factors* and Water Factors† funds (**the higher the Modified Energy Factor, the more efficiently the clothes washer uses electricity; † the lower the Water Factor, the more efficiently the clothes washer uses water)*. The rebate program is dependent on annual budget. The $75 rebate ends on December 31, 2010, but it is likely to continue in future years. Rebates are issued by WashWise.

The District offers an equivalent rebate for its satellite water system customers so that all water customers receive an equal opportunity.

6.5.11 Dishwasher Rebates

The District offers a $35 rebate for Energy Star® rated dishwashers. These dishwashers use much less water than conventional models. The current rebate program is in effect until December 31, 2010, but is likely to continue in future years. Rebates are issued as a credit on the customer’s PUD bill.

6.5.12 Construction Rebates

In addition, the District offers builders rebates to include efficient measures in new homes being built in Snohomish County and Camano Island. The rebates help offset the cost of installing higher efficiency Energy Star® clothes washers and dishwashers.

6.5.13 School Irrigation Audit

The District provides funding to the EWUC regional program for school irrigation audits conducted by a professional irrigation auditor who identifies equipment upgrades and operational changes to decrease water use. The program targets schools with large irrigation demands resulting in significant water savings. Financial assistance in the form of a 50 percent cost share is available to participating schools to motivate them to follow through on audit recommendations.

6.5.14 Commercial Indoor Audits

In 2005, an intensive program was conducted to replace pre-rinse sprayheads in food service establishments. The program was jointly funded by the District, Puget Sound Energy, and the City of Everett, and modeled after a similar successful effort in Seattle/King County. A contractor was hired to market the program, install the sprayheads, and to install aerators on other faucets at the participating facilities. Each sprayhead was estimated to save 100 gallons of water a day, and each aerator to save 30 gallons per day.

6.6 MEASURING SUCCESS - DISTRIBUTION SYSTEM LEAKAGE

Table 6-3 summarizes distribution system leakage since reporting began in 2008. Water systems serving 1,000 or more connections are required to meet the 10 percent DSL standard as a 3-year average by July 1, 2010. Systems serving less than 1,000 connections must meet the standard by July 1, 2011. For systems that do not have meters for all customers, the standard must be met three years after all service meters are installed.

Table 6-3: Reported DSL in Annual WUE Performance Reports

Water System	> 1000 connections?	3/07-2/08	3/08-2/09	3/09-2/10	3-year Average
Lake Stevens	Yes	3.72%	5.9%	5.6%	5.1%
Dubuque	Yes	17.99%	7.6%	12.1%	**12.6%**
Lake Roesiger	No	5.84%	22.7%	13.9%	**14.1%**
Storm Lake	No	0.35%	0.7%	2.5%	1.2%
Kayak	No	8.64%	2.9%	6.0%	5.8%
May Creek	No	4.67%	8.8%	9.0%	7.5%
Sunday Lake	No	2.90%	-4.5%	6.2%	1.5%
Skylite	No	12.84%	18.1%	3.0%	**11.3%**
Pilchuck 10	No			**25.6%**	
Creswell	No			10.0%	

As can be seen in the above table, the District's Dubuque system failed to meet the standard by the deadline for large water systems. The District spent more than $3.5 million in 2007 and 2008 to replace at least 4.6 miles of old AC pipe in the Dubuque system. It appeared these projects successfully reduced leakage below 10 percent by the end of 2008. However, by the end of 2009, the annual average crept back above the standard. As was presented in Table 5-7, annual leakage exceeded 30 percent in 2004 through 2006, so the pipe replacement clearly improved the situation. Since May 2010, the running annual average has again returned below 10 percent, but this will take careful vigilance to maintain. As can be seen in Chapter 11, a project is planned to merge the Dubuque and Lake Stevens systems by 2013.

The three-year average DSL also exceeds 10 percent in the Lake Roesiger and Skylite systems, and the first annual report for Pilchuck 10 indicates leakage problems with that system.

The elevated DSL in the Lake Roesiger system began in 2008. Because of the low water usage among Lake Roesiger customers, a leak of 20 percent represents a flow of only 6 gpm. The system could exceed the DSL standard with a leak of only 3 gpm. Lake Roesiger is a relatively new water system with all ductile iron pipes, so leakage should normally not be a concern. District crews have used leak detection equipment to no avail and the accuracy of the source meter has been examined. Water used for flushing is closely documented and the District makes efforts to communicate with the fire department regarding hydrant usage. If the cause of the DSL issue is not found soon, the Lake Roesiger system may be included in the contract for professional leak detection services in 2011. Also, as can be seen in Chapter 11, a project is planned to merge the Lake Roesiger and Lake Stevens water systems by 2012.

Leakage in the Skylite water system exceeded 10 percent in 2007 and 2008. A leak was found and repaired in August 2008 and leakage returned to a low value in the following year. It is expected that Skylite will remain in compliance with the DSL standard in upcoming years. For reference, a leak of 10 percent in the Skylite system represents a flow of only 2 gpm.

The Pilchuck 10 system has had repeated problems with leaking valves on its tank drain manifold. These tanks will be abandoned when the Pilchuck 10 system is merged with Lake Roesiger and Lake Stevens systems by 2012. Due to continued high leakage in 2010, the Pilchuck 10 system should be included in the 2011 leak detection contract to check the integrity of the PVC pipes before connecting to the larger systems. A leak of 30 percent represents only 0.5 gpm in this water system.

With the above action plan to address leakage in systems that exceed the standard, the District's goal is to assure that the three year average DSL for all systems is below 10 percent by the time of the next WSP update, which will be due in about six years.

6.7 MEASURING SUCCESS - CUSTOMER WATER SAVINGS

Everett's 2007 WSP estimated that the previous regional program reduced peak season demand by 2.25 mgd from 2001 to 2006 and that the city's retail conservation program reduced in-city demands by an additional 0.08 mgd during the same period.

The goal of the current program is to reduce the region's average day water demand by an additional 3 percent (1.97 MGD) from 2007 through 2012. As can be seen in Table 6-4 (obtained from the city), the regional program is currently ahead of this target, having reduced the regional demand by 1.98 MGD as of the end of 2010 compared to the initial goal to save 1.43 MGD by this time.

The District's 2002 WSP set an individual goal to reduce average daily customer demand by about 4.4 percent between 2000 and 2010, or about 0.4 percent per year. For the District's Lake Stevens System this was expected to save 0.8 million cubic feet (6.0 million gallons) of water per year in 2002 and 2003.

Water systems that serve more than 1,000 customers are required to include an estimate of water saved over the last six years in their WSPs. Table 6-5 shows the District's water savings for the six year period from 2003 through 2008 and an eight year period from 2001 through 2008 as well as savings for the individual years.

Table 6-4: Status of Regional Water Conservation (2007-2010)

Measure	2010				2007-2010				
	PLAN		ACTUAL		PLAN		ACTUAL		
	Units	MGD	Units	MGD	Units	MGD	Units	MGD	
Education	-	0.64	-	0.64	-	0.64	-	0.64	
Indoor Kits	8,250	0.06	5,210	0.04	28,500	0.22	22,380	0.17	
Outdoor Kits	3,750	0.02	6,000	0.04	22,500	0.14	24,940	0.16	
Toilet Rebates	1,610	0.03	660	0.01	3,970	0.06	1,320	0.02	
Washer Rebates	1,610	0.02	5,100	0.14	3,970	0.05	11,280	0.30	
Other	-	0.03	-	0.01	-	0.46	-	0.68	(1)
Totals	n/a	0.80	n/a	0.88	n/a	1.43	n/a	1.98	

(1) Planned figures are for leak detection, ICI audits and school audits. Actual figures are for leak detection, spray nozzle project (2008-9), Comcast Arena project (2009), and an Everett/PUD project (2010).

To calculate the goals in Table 6-5, the three-year single family ADD usage factor from 1998-2000 is used as the starting point. This three-year average had been used as the basis for water demand projections in the 2002 WSP. The factor is reduced by 0.4 percent each year to reflect the conservation goal. Then the difference between the base and the reduced usage factors is multiplied by the number of ERUs in each year to determine the volume of water that should be saved. Savings are assumed to be cumulative, so that 0.4 percent is saved in the first year, 0.8 percent in the second year, and so on. For the Storm Lake and Kayak systems, the average single family usage for 2000-2002 is used for the base because data is not available before 2000 for these systems.

The number of ERUs in each year is determined by adding single-family and multi-family numbers from Table 5-6. Non-residential customers are not included in the analysis because they have dissimilar usage patterns and because the majority of the District's demand-side efforts are directed toward its residential customers. Wholesale customers are also excluded from the analysis because other water systems that purchase water from the District have their own conservation programs.

The actual savings in each year is estimated by multiplying the number of ERUS during the year by the actual ADD of the single-family customers during that year (also obtained from Table 5-6). The six-year and eight-year cumulative savings are determined by adding the goals and the actual savings from the individual years.

The District's 2002 WSP had expected to save about six million gallons of water each year in 2002 and 2003 for the Lake Stevens water system. The calculated goals in Table 6-5 are higher than this because the number of new connections in these years exceeded growth estimates.

Table 6-5 shows that the actual amount of water saved greatly exceeded expectations. In the six-year period from 2003 through 2008, the amount of water saved was more than four times greater than the goal, and from 2001 through 2008 the amount of water saved was almost six times greater than the goal. This is easier to see graphically in Figure 6-1.

Table 6-5: Amount of Water Saved by District Residential Customers in 2001-2008

System	6-Year Savings 2003-8 Goal Savings (gal)	2003-8 Actual Savings (gal)	2001-8 Goal Savings (gal)	2001-8 Actual Savings (gal)
Lake Stevens	160,183,170	700,374,045	174,564,900	893,643,735
Dubuque	13,651,365	25,140,470	14,503,640	39,313,785
Lake Roesiger	1,405,980	-10,908,755	1,550,520	-13,067,730
Storm Lake*	1,003,750	-4,347,150	1,004,845	-4,361,385
Creswell	42,340	501,145	4,881,510	116,850,370
Purchased water:	**176,286,605**	**710,759,755**	**196,505,415**	**1,032,378,775**
May Creek	3,621,530	-323,390	3,819,360	-497,130
Kayak*	3,952,585	83,143,715	3,990,910	83,822,615
Skylite	1,364,370	4,006,240	1,473,505	4,802,305
Sunday Lake	1,198,295	3,453,630	1,279,325	3,941,270
Pilchuck 10	81,030	310,980	85,775	368,285
Otis	35,040	-122,640	274,115	3,338,655
212 Market	31,390	405,880	5,107,810	120,251,440
Groundwater:	**10,284,240**	**90,874,415**	**16,030,800**	**216,027,440**
Total	**186,570,845**	**801,634,170**	**212,536,215**	**1,248,406,215**
Exceeded target savings by:		615,063,325		1,035,870,000

System	1998-2000 gpd/ERU	2001 ERUs	2001Savings Goal gpd/ERU	Gallons	2001 Actual Savings gpd/ERU	Gallons
Lake Stevens	212	12,492	211	4,559,580	189	104,870,340
Dubuque	283	757	282	276,305	239	12,157,420
Lake Roesiger	68	391	68	0	73	-713,575
Creswell	194	3	193	1,095	184	10,950
Purchased water:	**211.8**	**13,643**	**210.8**	**4,836,980**	**188.4**	**116,325,135**
May Creek	180	388	179	141,620	174	849,720
Skylite	191	146	190	53,290	159	1,705,280
Sunday Lake	190	105	189	38,325	169	804,825
Pilchuck 10	191	5	190	1,825	137	98,550
Otis	187	4	186	1,460	180	10,220
212 Market	647	1	644	1,095	575	26,280
Groundwater:	**184.9**	**649**	**183.9**	**237,615**	**170.2**	**3,494,875**
Total	**210.6**	**14,292**	**209.6**	**5,074,595**	**187.6**	**119,820,010**

System	1998-2000 gpd/ERU	2002 ERUs	2002 Savings Goal gpd/ERU	Gallons	2002 Actual Savings gpd/ERU	Gallons
Lake Stevens	212	13,455	210	9,822,150	194	88,399,350
Dubuque	283	789	281	575,970	276	2,015,895
Lake Roesiger	68	396	67	144,540	78	-1,445,400
Storm Lake*	229	23	229	0	232	-25,185
Creswell	194	3	192	2,190	172	24,090
Purchased water:	**212.0**	**14,666**	**210.0**	**10,544,850**	**195.3**	**88,968,750**
May Creek	180	396	179	144,540	193	-1,879,020
Kayak*	362	345	362	0	363	-125,925
Skylite	191	147	189	107,310	178	697,515
Sunday Lake	190	109	188	79,570	178	477,420
Pilchuck 10	191	5	189	3,650	174	31,025
Otis	187	4	186	1,460	210	-33,580
212 Market	647	1	642	1,825	577	25,550
Groundwater:	**245.6**	**1,007**	**244.7**	**338,355**	**247.8**	**-807,015**
Total	**214.1**	**15,673**	**212.2**	**10,883,205**	**198.7**	**88,161,735**

System	1998-2000 gpd/ERU	2003 ERUs	2003 Savings Goal gpd/ERU	Gallons	2003 Actual Savings gpd/ERU	Gallons
Lake Stevens	212	14,158	209	15,503,010	209	15,503,010
Dubuque	283	903	280	988,785	307	-7,910,280
Lake Roesiger	68	406	67	148,190	89	-3,111,990
Storm Lake*	229	25	228	9,125	231	-18,250
Creswell	194	3	192	2,190	185	9,855
Purchased water:	**212.4**	**15,495**	**209.4**	**16,651,300**	**211.6**	**4,472,345**
May Creek	180	404	178	294,920	192	-1,769,520
Kayak*	362	352	361	128,480	302	7,708,800
Skylite	191	148	189	108,040	185	324,120
Sunday Lake	190	113	188	82,490	184	247,470
Pilchuck 10	191	5	189	3,650	169	40,150
Otis	187	4	185	2,920	249	-90,520
212 Market	647	1	639	2,920	514	48,545
Groundwater:	**245.6**	**1,027**	**243.9**	**623,420**	**228.2**	**6,509,045**
Total	**214.5**	**16,522**	**211.6**	**17,274,720**	**212.6**	**10,981,390**

System	1998-2000 gpd/ERU	2004 ERUs	2004 Savings Goal gpd/ERU	Gallons	2004 Actual Savings gpd/ERU	Gallons
Lake Stevens	212	14,447	209	15,819,465	203	47,458,395
Dubuque	283	963	278	1,757,475	279	1,405,980
Lake Roesiger	68	414	67	151,110	83	-2,266,650
Storm Lake*	229	54	227	39,420	174	1,084,050
Creswell	194	3	191	3,285	164	32,850
Purchased water:	**212.6**	**15,881**	**209.5**	**17,770,755**	**204.4**	**47,714,625**
May Creek	180	399	177	436,905	187	-1,019,445
Kayak*	362	357	359	390,915	270	11,988,060
Skylite	191	148	188	162,060	172	1,026,380
Sunday Lake	190	116	187	127,020	179	465,740
Pilchuck 10	191	7	188	7,665	141	127,750
Otis	187	4	184	4,380	222	-51,100
212 Market	647	1	637	3,650	433	78,110
Groundwater:	**246.2**	**1,032**	**243.2**	**1,132,595**	**212.7**	**12,615,495**
Total	**214.7**	**16,913**	**211.6**	**18,903,350**	**204.9**	**60,330,120**

System	1998-2000 gpd/ERU	2005 ERUs	2005 Savings Goal gpd/ERU	Gallons	2005 Actual Savings gpd/ERU	Gallons
Lake Stevens	212	14,974	208	21,862,040	187	136,637,750
Dubuque	283	983	277	2,152,770	257	9,328,670
Lake Roesiger	68	422	67	154,030	73	-770,150
Storm Lake*	229	123	226	134,685	191	1,706,010
Creswell	194	3	190	4,380	150	48,180
Purchased water:	**212.7**	**16,505**	**208.6**	**24,307,905**	**188.3**	**146,950,460**
May Creek	180	402	176	586,920	175	733,650
Kayak*	362	359	358	524,140	239	16,117,305
Skylite	191	148	187	216,080	158	1,782,660
Sunday Lake	190	118	186	172,280	175	646,050
Pilchuck 10	191	9	187	13,140	180	36,135
Otis	187	4	183	5,840	200	-18,980
212 Market	647	1	634	4,745	388	94,535
Groundwater:	**246.0**	**1,041**	**242.0**	**1,523,145**	**195.0**	**19,391,355**
Total	**214.6**	**17,546**	**210.6**	**25,831,050**	**188.7**	**166,341,815**

System	1998-2000 gpd/ERU	2006 ERUs	2006 Savings Goal gpd/ERU	Gallons	2006 Actual Savings gpd/ERU	Gallons
Lake Stevens	212	15,659	207	28,577,675	194	102,879,630
Dubuque	283	991	276	2,532,005	282	361,715
Lake Roesiger	68	432	66	315,360	80	-1,892,160
Storm Lake*	229	152	225	221,920	312	-4,604,840
Creswell	194	3	189	5,475	137	62,415
Purchased water:	**212.6**	**17,237**	**207.6**	**31,652,435**	**197.2**	**96,806,760**
May Creek	180	410	176	598,600	184	-598,600
Kayak*	362	360	356	788,400	263	13,008,600
Skylite	191	149	186	271,925	179	652,620
Sunday Lake	190	135	185	246,375	178	591,300
Pilchuck 10	191	9	186	16,425	214	-75,555
Otis	187	4	183	5,840	191	-5,840
212 Market	647	1	631	5,840	499	54,020
Groundwater:	**244.7**	**1,068**	**239.7**	**1,933,405**	**209.7**	**13,626,545**
Total	**214.5**	**18,305**	**209.5**	**33,585,840**	**198.0**	**110,433,305**

System	1998-2000 gpd/ERU	2007 ERUs	2007 Savings Goal gpd/ERU	Gallons	2007 Actual Savings gpd/ERU	Gallons
Lake Stevens	212	16,295	206	35,686,050	180	190,325,600
Dubuque	283	1,003	275	2,928,760	254	10,616,755
Lake Roesiger	68	434	66	316,820	77	-1,425,690
Storm Lake*	229	162	224	295,650	250	-1,241,730
Creswell	194	4	189	7,300	129	94,900
Purchased water:	**212.6**	**17,898**	**206.6**	**39,234,580**	**182.3**	**198,369,835**
May Creek	180	419	175	764,675	175	764,675
Kayak*	362	362	355	924,910	239	16,251,990
Skylite	191	151	186	275,575	186	275,575
Sunday Lake	190	142	185	259,150	170	1,036,600
Pilchuck 10	191	10	186	18,250	171	73,000
Otis	187	4	182	7,300	169	26,280
212 Market	647	1	629	6,570	573	27,010
Groundwater:	**243.9**	**1,089**	**238.2**	**2,256,430**	**197.5**	**18,455,130**
Total	**214.4**	**18,987**	**208.4**	**41,491,010**	**183.1**	**216,824,965**

System	1998-2000 gpd/ERU	2008 ERUs	2008 Savings Goal gpd/ERU	Gallons	2008 Actual Savings gpd/ERU	Gallons
Lake Stevens	212	16,726	205	42,734,930	178	207,569,660
Dubuque	283	1,002	274	3,291,570	252	11,337,630
Lake Roesiger	68	439	66	320,470	77	-1,442,115
Storm Lake*	229	166	224	302,950	250	-1,272,390
Creswell	194	9	188	19,710	117	252,945
Purchased water:	**212.6**	**18,342**	**205.6**	**46,669,630**	**180.2**	**216,445,730**
May Creek	180	429	174	939,510	170	1,565,850
Kayak*	362	364	353	1,195,740	226	18,068,960
Skylite	191	151	185	330,690	192	-55,115
Sunday Lake	190	142	184	310,980	181	466,470
Pilchuck 10	191	10	185	21,900	161	109,500
Otis	187	4	181	8,760	175	17,520
212 Market	647	1	626	7,665	363	103,660
Groundwater:	**243.5**	**1,101**	**236.5**	**2,815,245**	**193.1**	**20,276,845**
Total	**214.3**	**19,443**	**207.4**	**49,484,875**	**181.0**	**236,722,575**

Figure 6-1: Annual Amount of Water Saved by District Customers Compared to Goals

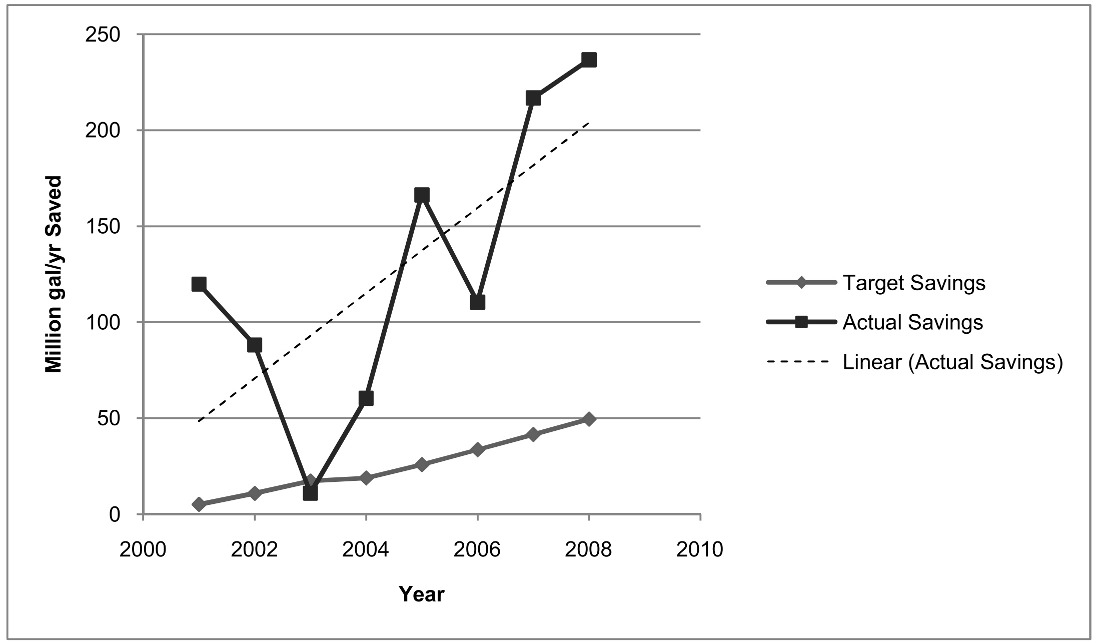


Figure 6-2: Water Supply to Lake Stevens Water System

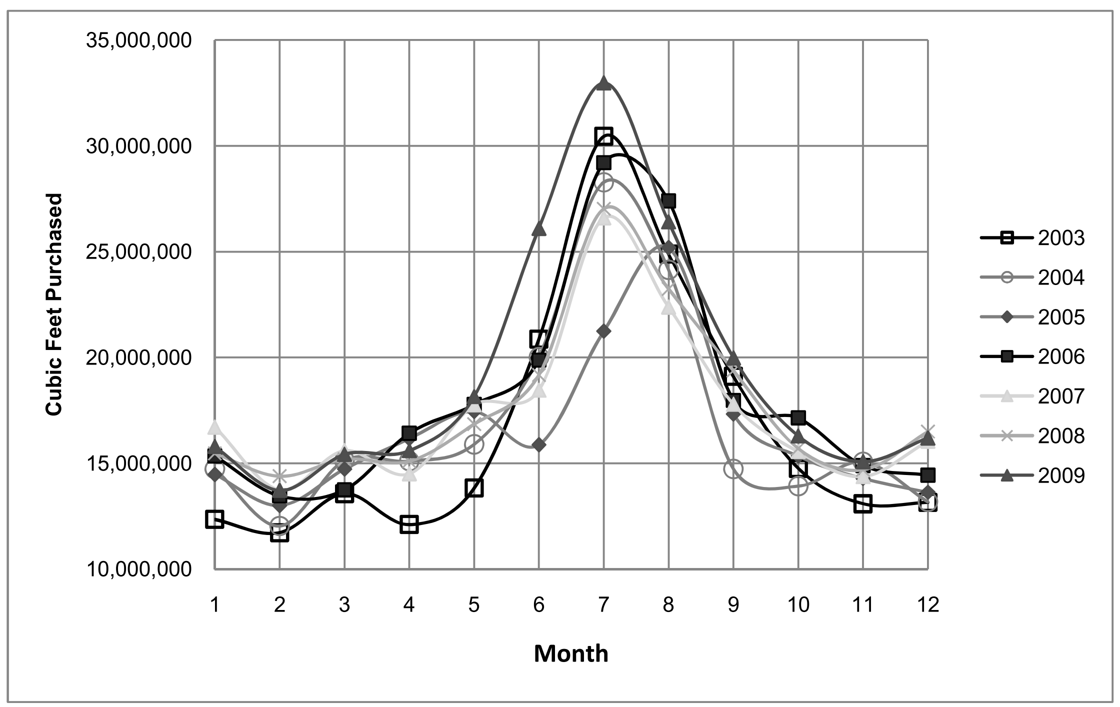


Figure 6-3: Single-Family Average Day Demand – Purchased Water Systems

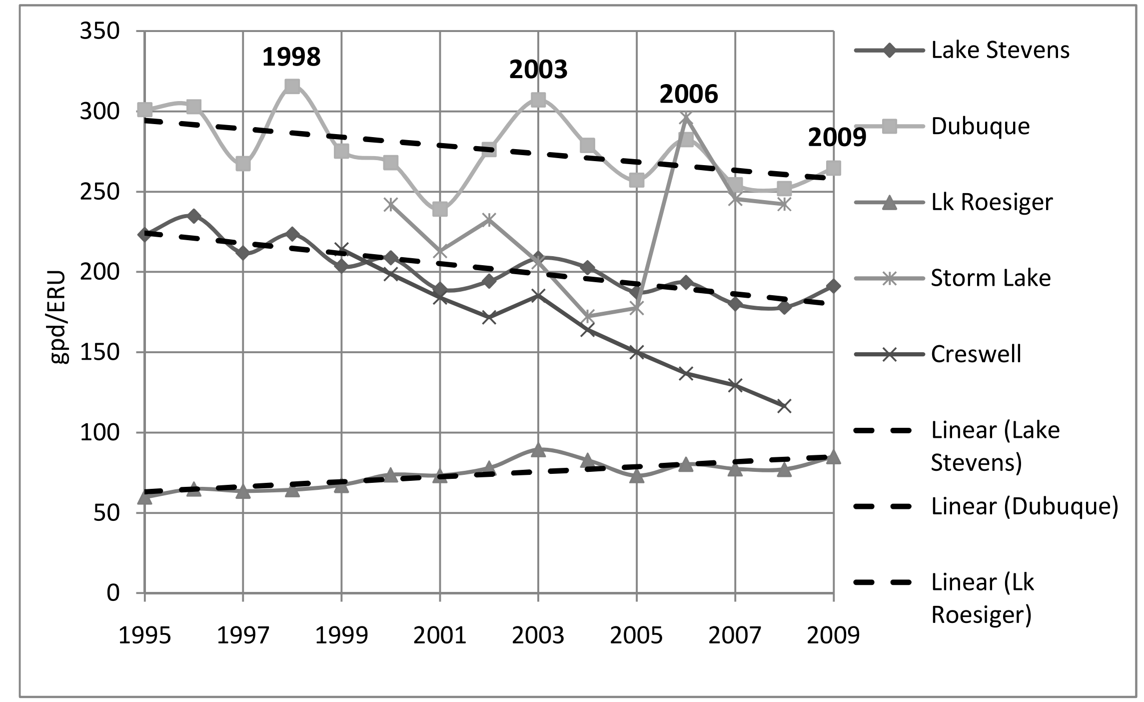


Figure 6-4: Single-Family Average Day Demand – Groundwater Systems

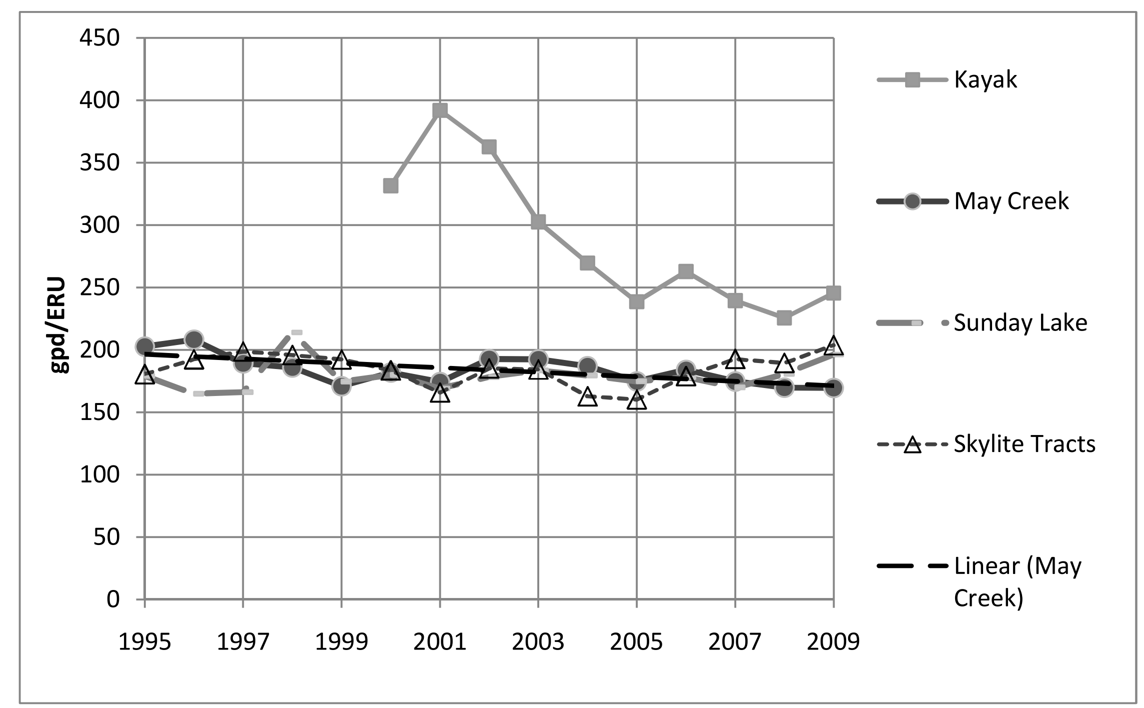


Figure 6-2 is provided to illustrate peak month production in each year. The summers of 2003, 2006, and 2009 were particularly hot and dry, as is evidenced by the highest peak production occurring in July of these years. The corresponding amount of water saved in 2003 and 2006 was less dramatic than “normal years, but water was saved nonetheless. It is impressive that the amount of water saved in 2003 was still 60 percent of the goal in a year that recorded the driest July since 1967. The annual savings in 2006 were still more than three times higher than the goal, even though July 2006 brought less than eight percent of normal precipitation and the hottest heat wave to hit the Seattle area since 1998. The water savings in 2009 have not been determined as of the time of this writing.

Figures 6-3 and 6-4 are provided to show trends in the average daily demands of District water customers since 1995. Figure 6-3 shows the ADD for customers on District systems that purchase water from Everett and Figure 6-4 shows water use on District systems that are served by wells.

Among the systems using Everett water, there is clearly a downward trend in water use by customers in the Lake Stevens, Dubuque, and Creswell water systems. The years 1998, 2003, 2006, and 2009 are labeled in this figure to show that, although water usage was higher in these years with hot and dry summers, there is still a declining trend when the years are compared to each other.

Average usage by customers in the Storm Lake system shows an increase between 2005 and 2006 that is sustained in the following years. However, the continued higher usage in 2007 and 2008 is comparable to customers in the Dubuque water system. Considering that newer developments in the Storm Lake system consist of upscale homes on large lots, water use patterns similar to the Dubuque system could be expected.

The gradual upward trend in residential customer water use in the Lake Roesiger system most likely reflects a gradual transition from seasonal to full-time occupancy of homes in the area.

Among the satellite systems served by groundwater sources, the reduction in water use by customers on the Kayak water system clearly stands out. Prior to 2003, Kayak customers were billed at a flat rate regardless of the amount of water used. The managers of the system implemented water use restrictions in the summers of 2002 and 2003 until a metered rate went into effect in July 2003. The District became the owner of the Kayak system in 2006 and has maintained a metered rate. The current water usage by Kayak customers is now comparable to the Dubuque system, which serves homes on similarly sized acreage lots.

6.8 CONSERVATION IMPACT ON THE DEMAND FORECAST

As stated earlier, the overall goal of the regional conservation program is to reduce demand for water by three percent (1.97 MGD) between 2007 and 2012. Table 6-6 (obtained from Table 5-9 in Everett’s WSP) breaks the savings goal down by year in relation to the projected regional demand for water from Everett’s filtration plant.

Table 6-6 also shows a “code component” of conservation savings, which is the estimated impact of continued efficiency improvements as older fixtures are replaced by more efficient models. Everett’s projections beyond 2012 assume code savings will continue to accumulate until they plateau around 2018, when all fixtures are assumed to be at code. The code savings of 1.8 MGD in 2012 is projected to increase to 3.3 MGD by the time the plateau is reached. Interpolating the data in Everett's WSP, this works out to an additional savings of 0.3 percent each year from 2013 to 2018.

Table 6-6: Regional Demand Reduction Due to Conservation

	2007	2008	2009	2010	2011	2012
Demand Without Conservation (ADD mgd)	59.8	61.3	62.9	64.4	66.0	67.3
Demand With Conservation (ADD mgd)	58.4	59.4	60.5	61.6	62.7	63.6
Conservation Savings (ADD mgd)	1.4	2.0	2.4	2.8	3.3	3.7
Programmatic Component	*0.9*	*1.2*	*1.4*	*1.6*	*1.8*	*2.0*
Code Component	*0.5*	*0.7*	*1.0*	*1.2*	*1.5*	*1.8*
Demand Reduction - Individual Year	2.4%	1.9%	1.7%	1.6%	1.6%	1.7%
Programmatic Component	*1.5%*	*1.4%*	*1.3%*	*1.3%*	*1.3%*	*1.2%*
Code Component	*0.8%*	*0.4%*	*0.4%*	*0.4%*	*0.4%*	*0.4%*
Demand Reduction - Cumulative	2.4%	3.2%	3.8%	4.4%	4.9%	5.5%
Programmatic Component	*1.5%*	*2.0%*	*2.3%*	*2.5%*	*2.7%*	*2.9%*
Code Component	*0.8%*	*1.2%*	*1.6%*	*1.9%*	*2.2%*	*2.6%*

Table 6-7 shows how the estimated programmatic and code savings are adapted to predict savings in the District's water systems. As discussed above, the regional program savings are expected to grow 0.3 percent each year from 2008 through 2012, and plumbing code savings are estimated bring an additional 0.3 percent savings each year until 2018. Because the regional program is expected to continue, some additional increase in programmatic savings would be reasonable beyond 2012. However, future savings will become more and more difficult to achieve. The District's estimate assumes an additional 0.1 percent programmatic savings each year through 2019 and then holds the savings steady for the next ten years. Table 6-7 shows this combination of projected savings, which are factored into the District's demand projections in Chapter 5. This approach is slightly modified from MSA's technical memorandum in Appendix 5-1, which did not include the code savings but assumed slightly greater achievements from the regional program beyond 2012.

Table 6-7: District Projected Water Savings over the Next 20 Years

	Year 1					**Year 6**				**Year 10**	**Year 15**	**Year 20**
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2024**	**2029**
Annual Increase in Program Savings	0.3%	0.3%	0.3%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0%	0%
Annual Increase in Code Savings	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0%	0%	0%
Combined Annual Increase	0.6%	0.6%	0.6%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.1%	0%	0%
Cumulative Savings	**0.6%**	**1.2%**	**1.8%**	**2.2%**	**2.6%**	**3.0%**	**3.4%**	**3.8%**	**4.2%**	**4.3%**	**4.3%**	**4.3%**

* As of January 1 each year, in addition to savings achieved as of December 31, 2008.

6.9 EVALUATING PROGRAM EFFECTIVENESS

As pointed out by the WUE Guidebook, WUE programs change for a variety of reasons. The Guidebook mentions factors that contribute to shifts in water use patterns, including drought, budget constraints, changes in demographics, and climate change. Water purveyors should monitor the progress of their WUE programs and be prepared to adjust them to stay on track.

Everett and the EWUC conservation committee have made several adjustments since the current regional program began in 2007. As pointed out in the footnote to Table 6-4, activities that planned for industrial/commercial/institutional (ICI) indoor audits and for school irrigation audits were substituted as better opportunities became available. As one example, Comcast Arena requested assistance in 2009 to switch to waterless urinals. The EWUC conservation committee agreed to redirect funds to this project, which was a good fit with program goals.

The regional program has also faced financial hurdles. The budget must be authorized each year by the Everett City Council, even though the program is largely funded from rates paid by the wholesale water customers. On at least one occasion, the EWUC supported city staff to make arguments for restoring funds that had been cut.

The progress of the regional program is monitored by Everett Public Works department on an ongoing basis. Table 6-4 is an example of the type of information provided by Everett in annual reports. The EWUC conservation subcommittee meets a couple times per year. Regular updates and discussion about the program also occur at the monthly EWUC meetings.

6.10 FUNDING THE CONSERVATION PROGRAM

The regional conservation program is funded from a portion of the water rates paid to the city of Everett by its wholesale water purveyors. The goal of the 2007-2012 regional water conservation program is to fund about $600,000 a year in regional water conservation activities that will reduce the 2012 demand for water by about 3 percent. The program is also designed to meet, or exceed, the requirements of the new Municipal Water Law. Conservation efforts supplemented by the District are paid for by single-family, multi-family, and commercial water rates.

7 Facility Analysis

This chapter evaluates facilities in the District's Lake Stevens water facilities and then evaluates the District's other systems following similar procedures. The resulting recommendations are combined in Chapter 11 to create a capital improvement program designed to meet or exceed the District's level of service standards. The District's engineering consultant, MSA, assisted with the analyses, as will be referenced throughout this chapter. The analysis excludes the Pilchuck 10, Otis, and 212 Market systems, which will not grow beyond their current uses.

The District's water facilities are evaluated in relation to the 2010, 2015, and 2029 projected water demands that were developed in Chapter 5, representing current, 6-year, and 20-year planning periods. The analyses use projected demands without additional water savings through conservation. Although the District will make its best effort to implement its water use efficiency program, this approach assures that the District adequately plans and funds improvements to support growth if conservation goals are not met. The District will periodically review actual water demands and growth patterns in comparison to estimates and will appropriately adjust the timeline of planned improvements as warranted.

7.1 LAKE STEVENS WATER SYSTEM FACILITIES ANALYSIS

7.1.1 Water Supply Facility Evaluation for the Lake Stevens System

Figure 4-2 (in Chapter 4) indicated the approximate location of taps for purchased water supply and Figure 4-3 illustrated how water is delivered from these taps into the District's water systems. Pump stations deliver 84-88 percent of the peak day water entering the Lake Stevens system, as determined from daily flow data through each tap. The remaining purchased supply is delivered directly by gravity flow from the transmission line taps. Table 4-3 listed details about each pump in the supply stations, including their rated capacities.

Pumped Supply into the Lake Stevens Water System

Most of the Lake Stevens supply pumps deliver water into the Lake Stevens-500 pressure zone. These supply taps and associated pumps must at least support the MDD, with the peak hour flow supplemented by tanks within the zone.

Table 7-1 shows how the planned pump and well improvements will keep up with demand in the Lake Stevens system for the 20-year planning period. For this analysis, a conservative assumption is made that the supply pumps will provide 90 percent of the Lake Stevens MDD. The MDD value for each year is obtained by multiplying the MDD in Table 5-8a by 90 percent. Following is a brief description of the status and condition of each of the supply pump stations.

East Hewitt is the District's oldest pump station. The wood-frame structure was constructed in 1968 and houses two vertical turbine pumps. Pump 1 was replaced in 1992, and Pump 2 is still the original 1968 pump. Although the East Hewitt pumps have been well maintained and are in good operating condition, this pump station is clearly nearing the end of its useful life. When the East Hewitt pump station is replaced as planned in 2019, its capacity will be increased from 2,000 to 3,500 gpm. This is identified as project number 100 in Chapter 11.

Table 7-1: Pumped Supply to the Lake Stevens Water System

		Maximum Day Demand (gpm)					
Pump Station[1]	**Capacity (gpm)**	**2010 Year 1**	**2015 Year 6**	**2019 Year 10**	**2024 Year 15**	**2029 Year 20**	**Excess Capacity (% / gpm)**
East Hewitt Pumps 1 & 2	2,000						
Glenwood Pumps 1 & 2	2,000						
Machias Pumps 1-3	3,000						16%
Subtotal	**7,000**	**6,050**					**950**
Soperwood Pumps 1 & 2[2]	1,500						
Lake Stevens Wells[3]	850						14%
Subtotal	**9,350**		**7,150**	**8,174**			**1,176**
Machias Pump 4[4]	1,250						
E. Hewitt additional capacity[5]	1,500						25%
Subtotal	**12,100**				**9,661**		**2,439**
Machias Pump 5[4]	1,250						17%
Subtotal	**13,350**					**11,419**	**1,913**

1 Station capacities reflect that the largest pump in the combined stations is reserved as a spare during MDD to meet the District's standard for reliability, which exceeds DOH's minimum recommendation for one spare pump at ADD demand.

2 The Soperwood pump station is currently limited to 2 hours operation each day. This will be resolved by the end of 2011, when Marysville moves their JOA-line flow control valve to a location north of the District's tap.

3 The Lake Stevens wells will operate at 1200 gpm for about 17 hours per day, which averages 850 gpm over 24 hours.

4 Each Machias pump is rated for 1,375 gpm at 110 ft TDH. The pumps currently operate at a higher point on their curve (with two pumps running and the 3rd as a spare) at an observed flow around 3,000 gpm. As pumps are added, operation will become closer to the design point, with an ultimate capacity of 5,500 gpm (4 pumps running and the 5th as a spare).

5 East Hewitt improvements will increase station capacity to 3,500 gpm (1,500 gpm in addition to the existing 2,000 gpm)

The Glenwood pump station was replaced and upgraded in 2006. Therefore, this station is relatively new and no further improvements are planned at this time.

The Machias pump station was constructed in 2002 with provision for five pumps. The station currently contains three pumps. Improvements to add Pumps 4 and 5 (project numbers 104 and 105) should be a simple matter of installing new pumps in the existing facilities. MSA recommends that the District re-examine the capacity of the tap serving this pump station to make sure it is properly sized before installing the fifth pump.

The 1997 Soperwood pump station is also in good condition with a remaining useful life that extends beyond the 20-year planning period. Operation is presently limited to 2 hours per day to coordinate with operation of a flow control valve on the upstream side of the District's JOA-line tap. Marysville is planning to move the flow control valve in 2011, after which the operation of the District's pump station will no longer be restricted.

The District is also planning to return the two Lake Stevens wells to full time service in 2012 after constructing treatment to remove iron and manganese (project number 106).

DOH recommends that water purveyors also consider providing enough supply capacity to replenish fire storage within 72 hours while supplying the MDD, but this is not a requirement. Table 7-2 shows the impact of various fire flow and storage scenarios, should the District choose to replenish storage within 72 hours after a fire flow event during the summer. The excess supply capacity in Table 7-1 for each planning horizon more than meets the additional capacity to replenish the fire storage.

Table 7-2: Optional Source Capacity to Replenish Fire Storage

Fire Flow	Duration	Volume	Flow to replenish fire storage in 72 hours
500 gpm	1 hour	30,000 gallons	7 gpm
1000 gpm	2 hours	120,000 gallons	28 gpm
2000 gpm	2 hours	240,000 gallons	55 gpm
3000 gpm	3 hours	540,000 gallons	125 gpm

Gravity Supply into the Lake Stevens Water System

Table 7-3 lists taps used for gravity supply into the Lake Stevens system, their estimated capacity, and the required capacity over the planning period. Because these taps directly serve closed pressure zones without equalizing storage, they must supply the PHD within the zones.

Table 7-3: Capacity of Gravity-Fed Transmission Taps Serving the Lake Stevens System

Tap Name	Zones Supplied	Diameter (inches)	Estimated Available Capacity (gpm)	Required Capacity		2029 Excess Capacity (gpm)
				2009 PHD (gpm)	2029 PHD (gpm)	
Cavaleros (3-Line)	Cavaleros (460) 28th St SE (360) 10th St SE (320) E. Everett (300)	8	**2,500**	183	294	**2,206**
Soperwood (JOA-Line)	Soper Hill (420) Sunnyside (300)	12	**2,375***	976	1,563	**812**
Williams Rd (3-Line)	Williams Rd (460)	12	**3,500**	289	381	**3,119**

* Capacity limited to 3.42 mgd (2,375 gpm) by agreement with Marysville. MSA estimated the physical capacity of the tap might be about 3500 gpm.

MSA estimated the tap capacities based on the size of each tap and the size of pipes near the tap. MSA also determined the required capacity from each tap by running the District's hydraulic model with projected PHD flows from Table 5-8a without conservation. The analysis indicates that the capacity of gravity flow taps to the Lake Stevens system is more than sufficient for the 20-year planning period.

The emergency standby storage for these gravity-fed zones is provided from tanks in the Lake Stevens-500 zone. The stored water is delivered through PRV stations which automatically open if pressure in a gravity-fed zone drops below set levels.

7.1.2 Booster Pump Stations within the Lake Stevens Water System

Booster pumps are used when additional pressure is needed to move water into higher elevation pressure zones within the system. The principals applied when sizing the water supply also apply to sizing booster pumps. If a booster station serves a zone containing equalizing storage, it must supply at least the MDD. If the booster station pumps into a closed zone, it must supply the PHD. In addition, if the station supports fire flow, it should provide the fire flow at MDD with the largest pump out of service. The capacities of existing pumps in the booster stations were summarized in Table 4-3. The booster stations for the Lake Stevens system are evaluated individually below.

Granite Falls Pump Station

The Granite Falls pump station serves the Granite Falls pressure zone and seven other zones that receive water through PRV stations from the Granite Falls zone. The wholesale master meters for the cities of Granite Falls and Arlington are also located in this zone. The Granite Falls zone contains equalizing storage, so the pumps only need to supply the MDD of this area. The pump station contains chlorination equipment to boost the chlorine residual to the northern extremes of the system.

The concrete masonry, metal roofed, three-room building housing the Granite Falls pumps was constructed in 1995. The station has separate rooms for a pad mounted generator and for the chlorination facilities. In 2001, two new VFD controlled pumps were installed (replacing one existing pump), and the electrical service was upgraded to increase the supply capacity. The other two pumps were replaced in 2006. The station now contains four identical pumps, each capable of supplying 1,000 gpm at 355 feet TDH. The pumps alternate in pairs, so the station is considered to have a capacity of 2,000 gpm. District crews report that it is difficult to run three pumps in this station simultaneously due to high pressure on the discharge side of the pumps.

MSA projected the 2029 MDD for zones served by the Granite Falls pump station at 3,213 gpm. Additional supply will be addressed by the proposed Getchell pump station with 2,000 gpm capacity scheduled for construction in 2022 (project number 101). In the interim, the District will examine options to manage pressure on the discharge side of the Granite Falls pumps so that three pumps can operate simultaneously.

Bosworth Pump Station

- The Bosworth pump station was constructed in 1997. The fabricated steel, below grade station pumps water from the District's Granite Falls-726 zone to the Bosworth-811 zone through two end suction pumps. Water levels in the Bosworth tank trigger pump operation.

As was indicated in Table 4-3, the capacity of the Bosworth station is 250 gpm at 120 feet of head with one pump running. The pumps alternate in a lead/lag configuration, and both pumps can run together if needed. MSA projected the 2029 MDD in the pressure zones served by the Bosworth pumps to be 175 gpm, so the current capacity is adequate for the foreseeable future.

Two water main extensions are proposed to be built in 2011 and 2012 (projects 19 and 20). These pipse will connect the Bosworth-811 and Lake Roesiger-811 zones. Water from both zones will become available through PRVs to supplement flushing and fire flows in the Granite Falls-726 zone. Figure 11-1 also shows a developer-funded project that, if constructed, will connect the northwest corner of the Bosworth-811 zone to the existing Pinnacle Ridge development in the Granite Falls-726 zone through an additional PRV station. Analysis conducted by MSA indicates that the Bosworth pumps would need to operate at 400 gpm if the new PRV to the developer project opens during extended flushing or fire flow. This is not a problem with the current pump configuration.

Hillcrest Pump Station and Glenwood Pumps 3, 4, and 5

The Hillcrest station is located on the Hillcrest tank site. The concrete masonry block building is equipped with a PACO booster pump system and was constructed in 1982. The control system was replaced in 2001 with the installation of the District's Water SCADA system. The station maintains normal and high demand flows by staging five pumps through a start on-pressure, stop on-flow control sequence. Hillcrest is the District's second oldest pump station. However, the pumps and other station facilities are still in very good condition. Future replacement of the Hillcrest station is identified as project number 102, which is scheduled for 2030 as a placeholder.

The 2002 WSP identified a need for additional pumps to meet increasing demands in the Hillcrest-580 zone. The District added the new pumps in the Glenwood pump station replacement project. The Hillcrest zone is now served by a combination of eight pumps in two pump stations. As was shown in Table 4-3 the Hillcrest and Glenwood pump stations each have a capacity of 1,500 gpm, for a combined capacity of 3,000 gpm dedicated to the Hillcrest-580 zone while reserving one 1,000 gpm pump in the Glenwood station as a spare. There is no gravity flow from storage into the Hillcrest-580 zone, so these stations must provide the PHD flow. MSA estimated the 2029 PHD in the Hillcrest zone to be 1,222 gpm.

The stations must also provide fire flow at MDD with the largest pump out of service. The District made a commitment to provide a fire flow of 2,000 gpm to an elementary school in the Hillcrest zone. The projected 2029 MDD within the zone is 770 gpm, so the pump stations must be capable of supplying at least 2,770 gpm with the largest routinely used pump out of service. As described above, this is covered by the existing facilities.

Walker Hill Pump Station

The Walker Hill booster station is located on the Walker Hill tank site and serves the Walker Hill-580 zone at the north end of Lake Stevens. The concrete masonry block building and booster pump system were constructed in 1990 to replace the old booster station located south of the tank site. A sixth pump was added in 1996 to increase fire flow capacity for the Lake Stevens School District, and a permanent pad mounted generator was installed in 1998. The pump control system was replaced in 2001 with the installation of the District's Water SCADA system. The booster station maintains normal and high demand flows by staging six pumps through a start on-pressure, stop on-flow control sequence.

Water utilities governed by the Coordination Act must supply the target fire flow when the largest capacity pump routinely used to meet daily or peak water system demands is out of service. The Walker Hill station does not have a redundant pump for the 2,000 gpm fire flow commitment to the school. When the station was designed in 1990, no one expected the school would have this need. Adding the sixth pump in 1996 was the best that could be done to address an unanticipated need with the existing facilities. Improvement project number 103, to be built in 2022, will address this issue. MSA estimates the 2029 PHD in the Walker Hill 580 zone to be 752 gpm, so the station is adequate for routine operation throughout the planning period.

Lake Cassidy Pump Station

Lake Cassidy pump station was placed into service in 2006 for the Preserve at Lake Cassidy. As was shown in Table 4-3, the Lake Cassidy station has a capacity of 2,000 gpm when one 1,200 gpm pump is held in reserve. MSA projected the 2029 PHD in this zone to be 94 gpm, and the fire flow commitment is 1,000 gpm. Therefore, this station clearly has sufficient capacity to support growth in the 20-year planning period.

7.1.3 Distribution System Evaluation for the Lake Stevens Water System

The Lake Stevens distribution system must convey water from the sources of supply to customers and to/from the storage tanks. MSA evaluated the Lake Stevens, Dubuque, and Lake Roesiger distribution systems using the District's hydraulic model. Following is a description of the criteria, results, and recommendations for the Lake Stevens water system. Recommended improvements for other systems will be presented later in this chapter.

Hydraulic Model

The current version of the hydraulic model was completed by CH2M Hill in 2007 using InfoWater version 7.0, a GIS based modeling program developed by MWH Soft. The project converted the model from EPANET and represents a significant improvement since the 2002 WSP. CH2M Hill calibrated the model based on a series of flow tests conducted in 2006.

The District periodically verifies model results with field information to ensure that it continues to be reasonably accurate. The District also regularly updates its GIS information, which serves as the basis for the model, as new facilities are constructed. MSA reviewed the model calibration by comparing model output with additional static and fire flow pressure data collected during field tests. MSA concluded that the District's model is sufficient for planning level analysis.

Water demands are distributed in the model by assigning a unit demand for each meter to the nearest pipe junction. A global demand factor is then applied to adjust system-wide demands to match the ADD determined in Chapter 5. MSA created separate demand scenarios by globally increasing the demand in the model to simulate conditions for 2009, 2019, and 2029. Peaking factors as described in MSA's Water Demand Analysis (in Appendix 5-1) were applied to adjust the demand levels to MDD for the fire flow analysis and to PHD for the pressure analysis.

Table 4 in MSA's Water Demand Analysis shows how system demands are distributed by pressure zone in the model. District staff confirmed that the demand distribution in MSA's Table 4 reflects real life by comparing it to SCADA consumption reports generated for July 2008 based on actual flow data in sub-areas of the District's systems.

MSA met with District staff to review control settings for PRVs, pumps, and tanks and adjusted these settings in the model to represent current operating conditions. In addition, MSA made sure that the pump and supply station settings reasonably matched the pump curves and pressures in Everett's transmission mains.

Evaluation Criteria

The criteria used as the basis for evaluating the distribution systems include:

- Identifying areas with service pressures below 30 psi under existing and future PHD,
- Identifying areas where required fire flow cannot be met under existing or future MDD conditions while maintaining at least 20 psi throughout the water system, and
- Identifying pipe with velocities in excess of 10 feet per second during PHD.

MSA evaluated the Lake Stevens, Dubuque, and Lake Roesiger systems for the above criteria based on 2009, 2019, and 2029 water demands by adjusting the water demand scenarios as described above. MSA conducted fire flow tests for each hydrant in these systems, consisting of over 1,592 individual fire flow analyses. The resulting available fire flow from each hydrant was compared to the assigned fire flow requirement. In general, a fire flow requirement of 1,000 gpm was used for a majority of the nodes. Flows of 1,500 gpm and 3,000 gpm were used in certain areas with higher fire flow requirements.

In addition, District staff reviewed fire flow commitments for each of its commercial and larger multi-family customers, and conducted specific hydraulic model tests at these locations.

Analysis Results and Selected Water Main Improvements

The water main improvements shown in Figure 11-1 of Chapter 11 compile the improvements recommended by MSA and District staff. Table 7-4 presents water main projects for the Lake Stevens system, sorted in the planned order of construction. The table indicates a primary reason for each project plus any additional benefits. Projects for the District's other systems are presented later in this chapter.

Table 7-4 Water Main Projects for Lake Stevens Water System

CIP#	Project Name	Primary Reason (timeframe needed)	Additional Benefits
37	20th St SE - Relocation, Phase 1	Relocation	
36	Lundeen Parkway Roundabout	Fire Flow	Coordinates with road construction
35	GF Alternate Route	Pressure (20-yr)	Coordinates with road construction
25	South Lake Stevens Road	Fire Flow	Replace and upsize old AC pipe
22	Walker Hill Booster Zone Intertie	Reliability	
26	Tom Marks Road	Fire Flow	Looping
21	20th St SE - Relocation, Phase 2	Relocation	
2	Davies Rd.	Replace Aging Pipe	Upsizes pipe diameter

Table 7-4: Water Main Projects for Lake Stevens Water System (cont.)

CIP#	Project Name	Primary Reason	Additional Benefits
3	Soperhill Road	Fire Flow	Replaces and upsizes old AC pipe
1	99th Ave SE	Replace Aging Pipe	Upsizes pipe diameter
4	Lakemont Avenue	Replace Aging Pipe	Upsizes pipe diameter
15	139th Ave NE	Pressure (6-year)	Looping
16	44th St NE	Pressure (6-year)	Looping
17	N Machias Road	Pressure (6-year)	Looping
6	123rd Avenue NE	Pressure (6-year)	Associated with new tank, looping
7	Getchell Road (84th Street NE)	Pressure (6-year)	Associated with new tank, looping
8	Getchell Rd. (84th St. NE)	Pressure (6-year)	Associated with new tank, looping
32	Bunk Foss Road	Looping	Fire Flow
33	109th Ave SE	Fire Flow	Looping
23	16th St NE	Pressure (10-year)	Looping
27	12th St SE	Looping	Reliability/redundancy
5	Lake Cassidy Transmission Main	Pressure (20-year)	Looping, reliability
12	99th Ave NE	Pressure (20-year)	Looping, reliability, pipe replacement
9	Sisco Heights Transmission Main	Pressure (20-year)	Looping, reliability
10	St Andrews Transmission Main	Pressure (20-year)	Looping, reliability
11	Burn Road	Pressure (20-year)	Looping
24	Sunnyside Blvd	Looping	Fire Flow
13	Machias Cutoff / Williams Road	Reliability	Looping, replaces and upsizes pipe
34	West Engebretson Road	Reliability	Looping

7.1.4 Storage Evaluation for the Lake Stevens Water System

The District's storage facilities must reliably support peak water demands and supply the water systems during emergencies. Following is a description of the condition, capacity, and recommended improvements for storage in the Lake Stevens system. Storage for the District's other water systems is evaluated later in this chapter. The Lake Stevens storage facilities range from 1 year to 37 years old. All of the tanks are well maintained and are in good useful condition, so none are proposed for replacement within the 20-year planning period. The basic storage tank characteristics were listed in Table 4-2 and their approximate locations were shown in Figures 4-5A and 4-5B.

- **Walker Hill Reservoirs 1 and 2 –** The Walker Hill tanks are located at the north end of Lake Stevens and provide a combined capacity of 4 MG. These tanks supply the Lake Stevens-500 zone by gravity flow and the Walker Hill-580 zone through a booster pump station. The steel tanks are 70 feet in diameter and approximately 68 feet tall. Tank 1 was constructed in 1972 and Tank 2 was completed in 1990.

- **Hillcrest Reservoirs 1 and 2 –** The Hillcrest reservoirs are located on the west side of Lake Stevens and provide the system with 6 MG of storage. The tanks supply the Lake Steven-500 zone by gravity flow and the Hillcrest-580 zone through a pump station. The steel tanks are 100 feet in diameter and 52 feet tall. Tank 1 was constructed in 1998 and Tank 2 was placed in service in 2009.

- **Granite Falls Reservoir –** The Granite Falls reservoir is located northeast of the city of Granite Falls near the Iron Mountain Quarry and provides the Granite Falls-726 zone with 2.7 MG of storage. The steel tank is 120 feet in diameter and approximately 32 feet tall and was constructed in 1995.

- **Bosworth Reservoir –** The Bosworth reservoir is located northwest of Lake Bosworth and provides the Bosworth-811 zone with 1 MG of storage. The steel tank is 46 feet in diameter and approximately 83 feet tall and was constructed in 1996.

For planning purposes, steel tank interiors and exteriors should be re-coated every 15 years. Quarterly physical inspections are performed by maintenance and operations staff to check the sanitary integrity. The staff also make note of the condition of the coatings to determine the specific timing for cleaning or re-coating. Cleaning and painting is funded in the operations and maintenance budget.

Storage Analysis Criteria

Water storage is typically comprised of the following components described below. The specific purpose and use of each component will vary from system to system.

Operating Storage

Operating storage is the volume at the top of a tank used for controls. This volume generally equates to the area between the "pump on" set point and the overflow elevation. This component represents storage that will most likely not be available as equalizing storage, fire flow storage, or standby storage.

Equalizing Storage

Equalizing storage is the volume needed to supplement water supply when customer demands exceed the installed supply capacity. Equalizing storage is sized to provide the difference between PHD and supply capacity for two and a half hours. The calculation considers the supply and demands of the zone or zones served by each tank. Equalizing storage begins at the bottom of the operating storage component. In most cases, the District's goal is to provide 40 psi to the highest meter in each pressure zone at PHD when the tank level is at the bottom of equalizing storage. In some cases, the tanks are designed to meet the DOH 30-psi standard at PHD when equalizing storage is depleted.

Standby Storage

The District's goal is to provide sufficient standby storage to supply each water system for two average days when the largest water supply is out of commission. For District systems with purchased supply, the analysis takes a conservative approach that the city of Everett's supply is a single source stemming from the fact that all of the water flows from the treatment plant at Lake Chaplain.

The top of standby storage begins as the bottom of the equalizing storage component. Water pressure must be above 20 psi at PHD at the highest meter when standby storage is depleted. Where permanently installed or portable pumping equipment with backup power can boost pressure, the standby storage can extend down to the safe operating level for pumping equipment.

Fire Flow Storage

Sufficient storage must be reserved to fight a fire anywhere in the water system. Fire flow requirements within the District's service area were listed in Section 5.7. Water pressure must be maintained above 20 psi throughout the system when the tank level is at the bottom of fire storage volume under a fire flow condition, with a MDD flow as the background condition. This volume may be split between multiple tanks serving the same pressure zone. Fire flow storage can be nested within the standby storage component.

Dead Storage

Any volume that cannot provide a minimum of 20 psi to the highest customer is considered dead storage. This unusable storage occupies the lowest portion of ground-level reservoirs.

Storage Analysis Process & Results

MSA assisted the District in analyzing storage capacity for the Lake Stevens, Dubuque, and Lake Roesiger water systems. The storage analyses for tanks within the Lake Stevens system are documented in Tables 7-6 through 7-8. The analyses show that the District will have sufficient storage in the 6-year and 20-year planning periods, provided the improvements summarized in Table 7-5 are constructed.

Table 7-5: Planned Storage Improvements for Lake Stevens Water System

CIP Project Number	Year	Description / Benefit to Storage
106	2011	Lake Stevens Treatment Plant – puts the Lake Stevens wells online full time. Reduces standby storage needs in the Lake Stevens area by providing an additional source of supply.
22	2012	Eliminates dead storage in the Water Hill tanks by adding a pressure reducing station to make water from the Walker Hill booster pumps available to the Lake Stevens 500 zone and other zones receiving water from the 500 zone in emergencies.
28	2012	Water main extension to merge the Dubuque system into Lake Stevens. Makes the Lake Stevens standby storage available to the Dubuque customers.
200	2018	Getchell Reservoir – new 9.2 million gallon reservoir serving the Lake Stevens 500 zone
201	2025	Burn Road Reservoir – new 3.6 million gallon tank serving the Granite Falls 726 zone

To create these analyses, MSA estimated water demands in each pressure zone, and then combined the demands of zones served by each tank or group of tanks. When determining the total demand of each pressure zone, the demands of upper zones were included based on the operating capacity of the booster pump stations during peak demands. Under emergency conditions, pump stations supplying the upper zones were turned off, so that each zone uses standby storage from its intended tanks. The necessary operational, equalizing, standby and fire flow storage volumes were then determined for each reservoir based on the zones that use the water in each tank.

The individual demands of the cities of Arlington and Granite Falls were considered in terms of projected demands and contractual obligations. As described in the wholesale agreements, the District provides storage for the city of Granite Falls, but not for Arlington.

Following is a description of the two proposed tanks (projects 200 and 201) that are included in the storage analyses in Tables 7-6 and 7-7:

- **Getchell Tank:** The District purchased a 5-acre site near the intersection of Getchell Road and 123rd Avenue NE for one or more future tanks in the Lake Stevens-500 Zone. The site elevation is approximately 405 feet, so tanks would likely be 97 feet tall (overflow at 502 feet elevation.) The tank diameter is assumed to be125 feet in this analysis, for a total volume of 9.2 MG. Almost half of this volume would be available for equalizing and standby storage.

- **Burn Road Tank:** The District also purchased a site for future storage at the highest elevation along Burn Road, in the Granite Falls-726 Zone. The site elevation is approximately 600 feet, so tanks will be about 126 feet tall for an overflow at 726 feet elevation. For planning purposes, future tanks are assumed to be 70 feet in diameter, with a total volume of 3.6 MG per tank, of which about 2.8 MG would be available for equalizing and standby storage. Several tanks could be located at this site.

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Table 7-6: Lake Stevens Area Storage Analysis

					These zones served from tranmsission for PHD. Only consider for SB & FS					Merges in 2012			
2010	Lake Stevens (gpm)	Hillcrest (gpm)	Walker Hill (gpm)	Lake Cassidy (gpm)	William Road (gpm)	Soper Hill (gpm)	Sunnyside (gpm)	10th St (gpm)	Cavaleros, 28th SE, & E. Everett (gpm)	Dubuque System (gpm)	Granite Falls (gpm)	Total Zone (gpm)	Intergrated System Demands
System ADD	1577.83	199.02	122.48	15.22	91.59	197.64	112.03	15.21	40.81	0	910.24	3,282	3,278
System MDD	3229.65	500.00	295.00	150.00	187.48	404.55	229.31	31.14	83.53	0	2000.00	7,111	6,722
System PHD	5139.97	733.00	400.00	150.00						0	2000.00	8,423	10,698

2015	Lake Stevens (gpm)	Hillcrest (gpm)	Walker Hill (gpm)	Lake Cassidy (gpm)	William Road (gpm)	Soper Hill (gpm)	Sunnyside (gpm)	10th St (gpm)	Cavaleros (gpm)	Dubuque System (gpm)	Granite Falls (gpm)	Total Zone (gpm)	Intergrated System Demands
System ADD	1864.67	235.21	144.75	17.99	108.24	233.57	132.39	17.98	48.23	276	1077.98	4,157	3,874
System MDD	3817.26	500.00	400.00	150.00	221.58	478.15	271.03	36.81	98.73	604	3000.00	9,578	7,945
System PHD	6068.22	833.00	495.00	150.00						1064	3000.00	11,610	12,630

2029	Lake Stevens (gpm)	Hillcrest (gpm)	Walker Hill (gpm)	Lake Cassidy (gpm)	William Road (gpm)	Soper Hill (gpm)	Sunnyside (gpm)	10th St (gpm)	Cavaleros (gpm)	Dubuque System (gpm)	Granite Falls (gpm)	Total Zone (gpm)	Intergrated System Demands
System ADD	2977.89	375.63	231.16	28.73	172.86	373.01	211.43	28.71	77.02	375	1721.55	6,573	6,187
System MDD	6096.08	833.00	495.00	150.00	353.87	763.59	432.82	58.78	157.67	819	4000.00	14,160	12,688
System PHD	9667.34	1500.00	795.00	150.00						1402	4000.00	17,514	20,121

					Build 2018
Operational Storage (OS):	Hillcrest Tank 1	Hillcrest Tank 2	Walker Hill Tank 1	Walker Hill Tank 2	Getchell Tank
Capacity (MG)	3.0	3.0	2.0	2.0	9.2
Diameter (ft)	100	100	70	70	125
Reservoir Overflow Height (ft)	52.0	52.0	68.7	68.7	97.0
Reservoir Max Water Height - Pump Off (ft)	48.0	48.0	64.0	64.0	94.0
Pump On Water Height (ft)	43.0	43.0	54.0	54.0	86.0
Reservoir Volume Per Foot Height (gal/ft)	58,752	58,752	28,788	28,788	91,800
Operational Storage (gallons):	**293,759**	**293,759**	**287,884**	**287,884**	**734,398**
Operational Storage Height (ft)	5	5	10	10	8

Equalizing Storage (ES):	**2010**	**2015**	**2029**	
PHD	8,423	11,610	17,514	<<Lake Stevens + Hillcrest + Walker Hill + Lake Cassidy + Granite Falls
Qs (See Table 7-4 for pumped supply.)	7,000	9,350	13,350	
Total Required Equalizing Storage (gallon):				
ES = (PHD-Qs)(150 min)	213,445	339,032	624,652	

Standby Storage (SB)	**2010**	**2015**	**2029**	
Total standby storage (gallons): = (2 days)*(System ADD)*(1440 min/day)	6,830,904	6,419,577	11,524,187	<< Excludes Granite Falls/Bosworth areas which have their own storage. Also, 850 gpm subtracted from ADD in 2015 & 2029 to account for Lake Stevens wells online.
ADD w/ largest source offline (gpm)	2,372	2,229	4,001	

Fire Flow Storage FS):	**2010**	**2015**	**2029**
Largest Fire Flow Requirement (gpm)	1,500	1,500	1,500
Largest Fire Flow Duration (min)	120	120	120
Fire Storage (gallons):	180,000	180,000	180,000

					After 2012 Booster Intertie		
Dead Storage (DS):	Hillcrest Tank 1	Hillcrest Tank 2	Walker Hill Tank 1	Walker Hill Tank 2	Walker Hill Tank 1	Walker Hill Tank 2	**Getchell**
Max Service Elevation	400				Leave 3 ft at bottom of tanks for pump protection.		400
Min Tank Elv for 20 psi	446						446
Min Tank Elv for 30 psi	469						469
Reservoir Base Elevation	450	450	422	422	422	422	405
Calculated Dead Storage (ft)	0.5	0.5	24	24	3	3	41.2
Tank Diameter (ft)	100	100	70	70	70	70	100
Total Unusable Capacity (gal)	29,376	29,376	695,528	695,528	86,365	86,365	3,778,479

0.5' for silt stop in Hillcrest

Summary:	**2010 Hillcrest Lead**	**2010 Walker Hill Lead**	**2015 Hillcrest Lead**	**2015 Walker Hill Lead**	**2029 Hillcrest Lead**	**2029 Walker Hill Lead**
Total Storage Volume (to pump off level) (gal)	9,325,096	9,325,096	9,325,096	9,325,096	17,954,277	17,954,277
Existing Operational Storage (gal)	587,519	575,768	587,519	575,768	587,519	575,768
Required Equalizing Storage (gal)	213,445	213,445	339,032	339,032	624,652	624,652
Required Standby Storage * (gal)	6,830,904	6,830,904	6,419,577	6,419,577	11,524,187	11,524,187
Required Fire Flow Storage * (gal)	180,000	180,000	180,000	180,000	180,000	180,000
Total Dead Storage (gal)	1,449,808	1,449,808	231,482	231,482	4,009,962	4,009,962
Total Required Storage + OS & DS (gal)	9,081,675	9,069,925	7,577,610	7,565,860	16,746,319	16,734,568
Total Surplus/ Deficit (gal)	**243,421**	**255,171**	**1,747,486**	**1,527,754**	**1,207,958**	**1,219,708**

* Fire Flow Storage nested within Standby Storage

Hillcrest, Walker Hill, Lake Cassidy and Granite Fall Systems fed through BPS

Capacity of Hillcrest BPS @ 1500 gpm
Capacity of Walker Hill BPS @ 1500 gpm
Capacity of Lake Cassidy BPS @ 2000 gpm
Capacity of Granite Falls BPS @ 2000 gpm (2010)
Capacity of Granite Falls BPS @ 3000 gpm (2015)
Capacity of Granite Falls BPS @ 4000 gpm (2029)

Future BPS demands for Hillcrest, Walker Hill, Lake Cassidy and Granite Fall pump stations

Hillcrest Zone Demands for MDD & PHD
2010 Actual MDD = 408.17 gpm - Set @ 500 gpm
2010 Actual PHD = 649.56 gpm - Set @ 733 gpm
2015 Actual MDD = 482.41 gpm - Set @ 500 gpm
2015 Actual PHD = 766.89 gpm - Set @ 833 gpm
2029 Actual MDD = 770.40 gpm - Set @ 833 gpm
2029 Actual PHD = 1221.72 gpm - Set @ 1500 gpm

Walker Hill Zone Demands for MDD & PHD
2010 Actual MDD = 251.19 gpm - Set @ 295 gpm
2010 Actual PHD = 399.75 gpm - Set @ 400 gpm
2015 Actual MDD = 296.88 gpm - Set @ 400 gpm
2015 Actual PHD = 471.95 gpm - Set @ 495 gpm
2029 Actual MDD = 474.12 gpm - Set @ 495 gpm
2029 Actual PHD = 751.86 gpm - Set @ 795 gpm

Lake Cassidy Zone Demands for MDD & PHD All flows set @ 150 gpm
2010 Actual MDD = 31.22 gpm
2010 Actual PHD = 49.69 gpm
2015 Actual MDD = 36.90 gpm
2015 Actual PHD = 58.66 gpm
2029 Actual MDD = 58.93 gpm
2029 Actual PHD = 93.45 gpm

Granite Falls Zone Demands for MDD & PHD
2010 Actual MDD = 2030.38 gpm - Set @ 2000 gpm
2010 Actual PHD = 2645.05 gpm - Set @ 2000 gpm (GF Storage supplies peak)
2015 Actual MDD = 2345.03 gpm - Set @ 3000 gpm (Assumes 3rd pump at GF BPS)
2015 Actual PHD = 3079.28 gpm - Set @ 3000 gpm (Assumes 3rd pump at GF BPS, GF Storage supplies peak)
2029 Actual MDD = 3610.15 gpm - Set @ 4000 gpm (Assumes 3rd & 4th pump at GF BPS)
2029 Actual PHD = 4760.87 gpm - Set @ 4000 gpm (Assumes 3rd & 4th pump at GF BPS, GF Storage supplies peak)

Table 7-7: Granite Falls Area Storage Analysis

2010	Granite Falls Zone	City of Granite Falls*	City of Arlington**	Engebretson	Cedar Lane	Blue Spruce	Jordan	Crest Lane	Jordan River Trail	Bosworth***	Sunset Ridge	Total Zone	Intergrated System Demands (gpm)
% of Integrated System Demands:	4.50%	6.29%	11.00%	0.19%	0.84%	1.57%	1.48%	0.02%	0.51%	1.34%	0.04%	27.77%	
System ADD	147.54	206.32	360.49	6.11	27.46	51.37	48.63	0.66	16.67	43.83	1.16	910	3,278
System MDD	302.56	422.95	739.01	12.51	58.13	105.15	99.54	1.35	34.12	89.72	2.30	1,867	6,722
System PHD	481.51	673.34	1000.00	19.91	92.51	167.34	158.41	2.16	54.31	250.00	3.66	2,903	10,698

2015	Granite Falls Zone	City of Granite Falls*	City of Arlington**	Engebretson	Cedar Lane	Blue Spruce	Jordan	Crest Lane	Jordan River Trail	Bosworth***	Sunset Ridge	Total Zone	Intergrated System Demands (gpm)
% of Integrated System Demands:	4.50%	6.30%	11.02%	0.19%	0.87%	1.57%	1.48%	0.02%	0.51%	1.34%	0.04%	27.83%	
System ADD	174.37	244.24	426.75	7.22	33.56	60.71	57.47	0.78	19.70	52	1	1,078	3,874
System MDD	357.60	500.70	874.85	14.79	68.71	124.28	117.65	1.60	40.33	106.04	3	2,209	7,945
System PHD	568.47	796.28	1000.00	23.51	109.22	197.56	187.02	2.55	64.12	250	4	3,203	12,630

2029	Granite Falls Zone	City of Granite Falls*	City of Arlington**	Engebretson	Cedar Lane	Blue Spruce	Jordan	Crest Lane	Jordan River Trail	Bosworth***	Sunset Ridge	Total Zone	Intergrated System Demands (gpm)
% of Integrated System Demands:	4.50%	6.30%	11.02%	0.19%	0.87%	1.57%	1.48%	0.02%	0.51%	1.34%	0.04%	27.83%	
System ADD	278	390	682	12	54	97	92	1	31	83	2	1,722	6,187
System MDD	571	800	1,000	24	110	198	188	3	64	169.34	4	3,131	12,688
System PHD	906	1,266	1,000	37	174	315	298	4	102	250	7	4,360	20,121

*** PUD to supply City of GF with storage per agreement**
ERU count for City demand to be based on 188 g/d/ERU (Integrated)

**** PUD not obligated to provide storage to the City of Arlington.**
Max Arlington Demand set @ 1000 gpm per Contract
Calculated Arlington Demands:
2010 PHD = 1179
2015 PHD = 1391
2029 MDD = 1397
2029 PHD = 2217

***** Bosworth system fed through BPS**
Capacity of BPS @ 250 gpm (1 pump)
PHD demands set @ 250 gpm
Forcasted Demands < 250 gpm except 2029 PHD = 276.16

	Existing	Build in 2025	Total
Operational Storage:	**Granite Falls Tank**	**Burn Rd Tank**	
Capacity (MG)	3.0	3.6	
Diameter (ft)	120	70	
Reservoir Overflow Height (ft)	32.0	126.0	
Reservoir Max Water Height - Pump Off (ft)	29.0	123.0	
Pump On Water Height	22.0	113.0	
Reservoir Volume Per Foot Height (gal/ft)	84,603	28,788	
Operational Storage (gallons):	**592,219**	**287,884**	880,103
Operational Storage Height (ft)	**7**	**10**	

Equalizing Storage:	2010	2015	2029	
PHD	2,903	3,203	4,360	<< Total Zone PHD (assumes Arlington drawing at contract limit and Bosworth pump running during peak hour)
Qs (booster stations supplying zone)	2000	3000	4000	<< 2 Granite Falls pumps running in 2010, 3 GF pumps running in 2015, Getchell pump station online starting 2022
Required Equalizing Storage (gallon):				
ES = (PHD-Qs)(150 min)	135,474	30,478	53,926	<< Cannot be negative

Standby Storage (SB) - single source	2010	2015	2029	
Total standby storage (gallons): = (2 days)*(System ADD)*(1440 min/day)	1,453,723	1,722,409	2,750,721	
Zone ADD (gpm)	505	598	955	<< Total Zone ADD minus Arlington, Bosworth, & Sunset Ridge ADD

Fire Flow Storage (FS):	2010	2015	2029
Largest Fire Flow Requirement (gpm)	3,000	3,000	3,000
Largest Fire Flow Duration (min)	120	120	120
Fire Storage (gallons):	**360,000**	**360,000**	**360,000**

Dead Storage (DS):	Granite Falls Tank	Burn Rd Tank	Total
Max Service Elevation	580	580	
Min Tank Elv for 20 psi	626	626	
Min Tank Elv for 30 psi	649	649	
Reservoir Base Elevation	694	600	
Calculated Dead Storage (ft)	0.5	26.2	<< Min 0.5 ft for silt stop in Granite Falls tank
Tank Diameter (ft)	120	70	
Total Unusable Capacity (MG)	42,301	753,105	795,406

Summary:	2010 (gallons)	2015 (gallons)	2029 (gallons)	
Total Storage Volume (to pump off level)	2,453,478	2,453,478	5,994,453	<< 2029 includes Burn Road Tank
Existing Operational Storage	592,219	592,219	880,103	
Required Equalizing Storage	135,474	30,478	53,926	
Required Standby Storage *	1,453,723	1,722,409	2,750,721	
Required Fire Flow Storage *	360,000	360,000	360,000	
Total Dead Storage	42,301	42,301	795,406	
Total Required Storage + OS & DS	2,223,717	2,387,407	4,480,156	
Total Surplus Storage (gal)	**229,761**	**66,071**	**1,514,297**	

*Standby Storage nested within Fire Flow Storage

Table 7-8: Bosworth Area Storage Analysis

2010 % of Integrated System Demands:	Bosworth 1.33%	Sunset Ridge 0.04%	**Total Zone** 1.37%	Intergrated System Demands (gpm)*
System ADD (gpm)	43.75	1.16	**44.91**	3,278
System MDD (gpm)	89.69	2.37	**92.06**	6,722
System PHD (gpm)	142.78	3.77	**146.55**	10,698

2015 % of Integrated System Demands:	Bosworth 1.33%	Sunset Ridge 0.04%	**Total Zone** 1.37%	Intergrated System Demands (gpm)*
System ADD	51.80	1.37	**53.17**	3,874
System MDD	106.19	2.81	**108.99**	7,945
System PHD	168.57	4.45	**173.02**	12,630

2029 % of Integrated System Demands:	Bosworth 1.33%	Sunset Ridge 0.04%	**Total Zone** 1.37%	Intergrated System Demands (gpm)*
System ADD	82.72	2.19	**84.91**	6,187
System MDD	169.58	4.48	**174.06**	12,688
System PHD	268.55	7.10	**275.64**	20,121

** See Table 5-8a*

Operational Storage (OS):	Bosworth Tank
Capacity (MG)	1.0
Diameter (ft)	46
Reservoir Overflow Height (ft)	83.0
Max Water Height (pump off setting) (ft)	80.0
Pump On Water Height (ft)	70.0
Reservoir Volume Per Foot Height (gal/ft)	12,432
Operational Storage (gallons)	**124,319**

Equalizing Storage (ES):	**2010**	**2015**	**2029**
PHD	147	173	276
Qs (one of two supply pumps running)	250	250	250
Required Equalizing Storage (gallon): *ES = (PHD-Qs)(150 min)*	0	0	3,846

Standby Storage (SB) - single source	**2010**	**2015**	**2029**
Total standby storage (gallons): = (2 days)*(System ADD)*(1440 min/day)	**129,330**	**153,121**	**244,535**

Fire Flow Storage Data (FS):	**2010**	**2015**	**2029**
Largest Fire Flow Requirement (gpm)	1,000	1,000	1,000
Largest Fire Flow Duration (min)	120	120	120
Fire Storage (gallons)	**120,000**	**120,000**	**120,000**

Dead Storage (DS):	Bosworth Tank
Max Service Elevation	718
Min Tank Elv for 20 psi	764
Min Tank Elv for 30 psi	787
Reservoir Base Elevation	728
Calculated Dead Storage (ft)	36
Tank Diameter (ft)	46
Total Unusable Capacity (MG)	**0.45**

Conclusion:	**2010** (gallons)	**2015** (gallons)	**2029** (gallons)
Total Storage (to pump off level)	994,552	994,552	994,552
Existing Operational Storage	124,319	124,319	124,319
Required Equalizing Storage	0	0	3,846
Required Standby Storage *	129,330	153,121	244,535
Required Fire Flow Storage *	120,000	120,000	120,000
Total Dead Storage	449,537	449,537	449,537
Total Required Storage + OS & DS	**703,186**	**726,977**	**822,238**
Total Surplus/ Deficit	**291,365**	**267,575**	**172,313**

*Fire Flow Storage nested within Standby Storage

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7.1.5 Remaining Physical Capacity in Existing Lake Stevens Facilities

The preceding sections confirm that the Lake Stevens water facilities are sufficient for current customers and that the District has a solid plan to support projected growth for the next 20 years. DOH additionally requires that the water system physical capacity be determined by evaluating the capacity of each existing system component in terms of the number of equivalent residential units (ERUs) that can be supported.

The system-wide analysis in Table 7-9 was prepared following an example created by MSA. The results indicated that the Lake Stevens system as a whole can support 3,822 ERUs in addition to the current customers. The calculations represent the combined facilities for the entire Lake Stevens water system. A description of the analysis follows the table. Sub-areas of the system were evaluated in the previous sections, resulting in identified improvements that are prioritized according to the localized needs.

Table 7-9 Lake Stevens Existing System Capacity Analysis

Demand Per ERU Basis	
Average Day Demand Per ERU (gal/day)	188
Maximum Day Demand Per ERU (gal/day)	386
Supply Capacity	
Limiting Supply Rate - Combined Supply Capacity (gal/day)	12,240,000
Maximum Day Demand Per ERU (gal/day)	386
Maximum Supply Capacity (ERU)	31,710
Existing (2009) ERUs (includes Arlington, Granite Falls, and leakage)	24,281
Remaining Available Supply Capacity (ERU)	7,429
Storage Capacity – Equalizing + Standby Storage	
Maximum Storage Capacity (gal)	9,897,168
Storage Requirement Per ERU (gal)	390
Maximum Storage Capacity (ERU)	25,377
Existing (2009) ERUs (excludes Arlington, which has its own storage)	21,555
Remaining Available Storage Capacity (ERU)	3,822
Remaining System Capacity (storage is most limiting component)	
Remaining Available System Capacity (ERU)	3,822

The 188 gpd/ERU ADD value in Table 7-9 comes from the Lake Stevens water demand projections in Table 5-8a. The MDD of 386 gpd/ERU is based on the system MDD/ADD ratio of 2.05, which was determined in Table 5-5.

The supply capacity represents the 8,500 gpm combined flow of the supply pump stations (8,500 gpm), obtained from Table 4-3 with the pumps operating continuously for 24 hours. This includes the Soperwood pump station and reserves one pump as a spare in the Machias station. Although the Soperwood station currently operates for two hours each day, this can be adjusted through coordination with the city of Marysville. The combined capacity excludes taps that currently deliver about 15 percent of the supply by gravity and excludes pumps in the Glenwood station that feed into the Hillcrest-580 zone. Even with the excluded taps and pumps, it can be seen that supply is not a limiting factor for the Lake Stevens system.

In relation to the supply capacity, it is also important to note that the city of Everett determined that their water rights should be sufficient for regional growth through at least 2036. There is no contractual limit on the amount of water that the District can purchase from Everett.

MSA determined available storage by combining the available equalizing and standby storage volumes in the Hillcrest, Walker Hill, Granite Falls, and Lake Bosworth tanks. The storage requirement of 387 gpd/ERU is two times the ADD plus current equalizing storage requirements (similar to the 2010 equalizing storage in Tables 7-6, 7-7, and 7-8) divided by the current number of ERUs. The 25,574 ERUs of storage capacity is very close to the result obtained when cross-checking against Equation 6-8 in the DOH Design Manual.

The existing number of ERUs in Table 7-9 includes the ERUs assigned for leakage and non-revenue water uses. For example, the 24,281 existing ERUs for the Lake Stevens system consists of 15,916 ERUs for single family homes, 4,962 ERUs for the multi-family and non-residential (commercial) customers, 4,194 ERUs for wholesale use by Arlington and Granite Falls, 1,588 ERUs for 6.5% leakage, and 144 ERUs for non-revenue use such as flushing. This corresponds to the existing conditions in Table 5-8a. Because the District does not supply storage for the city Arlington, the ERU equivalent for the Arlington supply is included in the source capacity evaluation but excluded from the storage evaluation.

7.2 DUBUQUE WATER SYSTEM FACILITIES ANALYSIS

As has been stated throughout this document, the District intends to merge the Dubuque water system into the Lake Stevens system within the next few years.

7.2.1 Water Supply Facility Evaluation for the Dubuque System

Under normal operation, Dubuque will continue to be supplied by existing gravity-fed taps on the Everett 3- and 5-Lines. Table 7-9 summarizes the estimated capacity of these taps. The capacity of the Dubuque supply taps is more than double the amount needed by 2029.

Table 7-10: Capacity of Gravity-Fed Taps Serving the Dubuque System

Tap Name	Zones Supplied	Diameter (inches)	Estimated Available Capacity (gpm)	Required Capacity 2010 PHD (gpm)	Required Capacity 2029 PHD (gpm)	2029 Surplus (gpm)
Dutch Hill #1 (5-Line)	Dubuque (500)	8	1,500	505	746	754
Dutch Hill #2 (5-Line)	Dubuque (500)	8	1,500	182	269	1,231
123rd Ave SE (5-Line)	Dubuque (500)	4	0*	236	349	(-349)*
Subtotal of 5-Line Taps			**3,000**	**923**	**1,364**	**1,636**
157th St SE (3-Line)	Dubuque (500)	4	1,000	26	38	962
Total of All Taps			**4,000**	**949**	**1,402**	**2,598**

* MSA estimated the capacity of the 123rd Ave Tap should be 1,000 gpm. The District has had difficulty with operation of this tap and has been considering abandoning it. Capacity is entered as 0 to illustrate the impact of not having this tap available. Water supply to this area currently comes from Dutch Hill Taps 1 and 2.

As stated in the footnote, the capacity of the 123rd Ave tap is listed as zero because the tap has not been delivering any water to the system. This tap originally served the Kla-Ha-Ya water system before it merged with Dubuque. The District will investigate hydraulics near the 123rd Ave tap to determine if the issue can be resolved or if the tap should be abandoned. The 123rd Ave tap is not essential because the area is easily served from Dutch Hill Taps 1 and 2.

7.2.2 Booster Pump Stations within the Dubuque System

The Dubuque water system has two small booster stations as described below. Fire flow is not provided in these areas, so the pumps only need to meet PHD flows.

The 157th Ave SE Booster Station serves about 30 homes in the Machias Ridge East and Panther Creek East developments. The pump and controls are installed in a daylight-drained vault that was renovated in 2001 during the integration of the Machias Ridge East water system. The District since added a backup pump and wired the station so it can be operated by a trailer mounted generator during power outages. The backup pump must be activated manually when needed. MSA estimated the 2029 PHD to be 44 gpm in this pressure zone, so the rated pump capacity of 75 gpm is sufficient for the long term. The pump is in good condition and no improvements other than routine maintenance are anticipated.

The 44th St SE Booster Station serves about 40 homes on 144th Ave SE, 143rd Ave SE, and Brookside Place. This station is also located in a vault, as was the case when the District acquired the Dutch Hill System in 1997. The District upgraded the electric service for the station in January 2002 and installed new pumps in 2008. The pumps alternate and produce 125 gpm when operating at 120 feet TDH to maintain 40 psi at the highest residence. MSA projected that the 2029 PHD for this zone is 103 gpm. No further improvements are planned for this station.

7.2.3 Distribution System Evaluation for the Dubuque Water System

MSA evaluated the hydraulics of the Dubuque system along with the Lake Stevens and Lake Roesiger water systems, as was described in Section 7.1.3. Table 7-10 summarizes the distribution improvements for Dubuque that are included in the capital improvement program. The Dubuque system also contains old pipes nearing the end of their useful life that are highlighted in orange in Figure 11-1 and targeted for replacement over the next 20 years. Project number 99 includes funding to replace the aging pipes.

Table 7-11 Water Main Projects for the Dubuque Water System

CIP#	Project Name	Primary Reason (timeframe needed)	Additional Benefits
28	South Machias Road - LS/Dubuque Intertie	Reliability (storage)	Merges two water systems (in addition to making storage available to Dubuque)
30	Dutch Hill #1 Tap	Replace Aging Pipe	Reliability & fire flow (replaces & upsizes old pipe from a critical source of supply)
31	147th Ave SE	Fire Flow (near term)	Looping
14	South Machias Road	Fire Flow	Looping
29	153rd Ave SE	Fire Flow	Replaces and upsizes old 6" AC pipe
18	44th St SE	Replace Aging Pipe	Upsizes diameter of old PVC pipe

7.2.4 Storage Evaluation for the Dubuque System

Water supply reliability in the Dubuque system currently consists of multiple taps on the Everett 5-Line and the Everett 2 & 3-Lines. If an interruption occurs at the Everett filter plant, the Dubuque system does not have access to stored water. This will be resolved when the Dubuque system is merged into the Lake Stevens system through project number 28. The Dubuque system was included in the Lake Stevens storage analysis in Section 7.1.4.

7.2.5 Remaining Physical Capacity in Existing Dubuque Facilities

The capacity analysis in Table 7-12 was prepared following methods similar to those described for Lake Stevens in Section 7.1.5. Because the Dubuque system has no equalizing storage, the supply must support the PHD. This analysis uses the DOH Design Manual equation for PHD to solve for the number of ERUs, given the available supply of 4,000 gpm from Table 7-10 and the MDD value of 578 gpd/ERU. The result shows that the supply taps can support more than four times the existing number of customers. Standby storage will become available when Dubuque is connected to the Lake Stevens system in 2012 and the taps will continue to deliver the PHD.

Table 7-12 Dubuque Existing System Capacity Analysis

Demand Per ERU Basis	
Average Day Demand Per ERU (gal/day)	265
Maximum Day Demand Per ERU (gal/day)	578
Supply Capacity – Peak Hour Demand	
Limiting Supply Rate - Combined Supply Capacity (gal/min)	4,000
Max Capacity at PHD (ERU) (using DOH Equation 5-1)	5,583
Supply Capacity – Fire Flow plus Max Day Demand	
Limiting Supply Rate - Combined Supply Capacity (gal/min)	4,000
Max Capacity at MDD + 1,000 gpm Fire Flow (ERU)	7,474
Storage Capacity	
Maximum Storage Capacity (gal)	0
Storage Requirement Per ERU (gal)	530
Maximum Storage Capacity (ERU)	0
System Capacity (considering merge with Lake Stevens in 2012)	
Limiting Factor – Supply	5,583
Remaining Available System Capacity	
Maximum System Capacity (ERU)	5,583
Existing (2009) ERUs (includes non-revenue use and leakage)	1,318
Remaining Available System Capacity (ERU)	4,265

7.3 LAKE ROESIGER WATER SYSTEM FACILITIES ANALYSIS

The Lake Roesiger water system was originally designed to serve Lake Roesiger LUD No. 12. A 1990 feasibility study established the design basis and is attached to Resolution 3510 in Appendix 02-1. The study projected 565 water connections in the LUD service area. This matches the DOH approved capacity. As of 2010, the Lake Roesiger system serves 460 total connections, most of which are occupied part time.

The 1990 feasibility study used an ADD value of 270 gpd/connection for 485 full-time customers plus 20 gpd/connection for 80 lots that are expected to remain recreational. For MDD, the study used 540 gpd/connection for houses and 300 gpd/connection for the recreational lots. Equalizing storage was estimated at 80,000 gallons and standby storage was sized for one maximum demand day (286,000 gallons). The fire flow standard at the time was 500 gpm for 60 minutes.

The initially planned hydraulic grade level of 770 feet was expected to result in static pressures from 39 psi at 680 ft elevation to 86 psi at the 570 ft lake surface. This eliminated the need for pressure reducing valves in lakefront homes, but restricted new home construction at the northeast corner of the lake to elevations below 680 feet.

The LUD included mandatory water conservation, requiring the homeowners to install low flow faucet aerators and showerheads and ultra low volume toilets before connecting to the system.

7.3.1 Water Supply Facility Evaluation for the Lake Roesiger System

As was shown in Table 4-3, the Lake Roesiger supply station contains two pumps that deliver water from Everett's 3-Line. The station was completed in 1992 and is in good condition. Each pump is rated for 450 gpm at 280 ft TDH. The pumps normally alternate, with each pump supplying 410-440 gpm while pumping from the Everett 3-line through distribution to the tanks. The Lake Roesiger 2029 MDD in Table 5-8c is estimated to be 124 gpm, so the supply station is more than sufficient to meet water demands within the planning period.

After connecting to the Lake Stevens system in 2011, the PRV station will initially be set to allow some flow from the Lake Roesiger-811 zone into the Granite Falls-726 zone on an ongoing basis to help turn over water in the Lake Roesiger tank. As water demands increase within the Lake Roesiger zone, the District will adjust the PRVs to reduce amount of water allowed to pass into the Granite Fall zone. Ultimately, the PRV station will only open to prevent low pressures during flushing and fire flow in the southern end of the Granite Falls-726 zone.

7.3.2 Booster Pumps within the Lake Roesiger System

In the course of designing the Lake Roesiger tanks, it was realized that elevation data was inaccurate for lots in the northeast corner of the LUD. It was not financially feasible to create a boosted pressure zone for this area due to the lot sizes and the fact that not all lots were requesting service. The District worked with DOH to develop an agreement for individual booster pumps. Appendix 07-1 contains a master copy of the booster agreement and a tracking list for lots currently served by individual pumps. The District's policy on individual booster facilities is located in Section 2.3.11 of the Policy Manual. The District will only considers individual booster pumps in limited circumstances as described in the policy.

7.3.3 Distribution System Evaluation for the Lake Roesiger System

The Lake Roesiger distribution system was evaluated by MSA in conjunction with the Lake Stevens and Dubuque water systems, as described in Section 7.1.3. The analysis confirmed that the Lake Roesiger water mains are appropriately sized to support anticipated growth and fire flow for the next 20 years and beyond.

Projects 19 and 20, identified in Chapter 11, will connect the Lake Roesiger system to the Lake Stevens and Pilchuck 10 water systems. Project 19 also includes an intertie for a backup supply to the City of Snohomish, which will be fed from the Granite Falls-726 zone.

7.3.4 Storage Evaluation for the Lake Roesiger System

The Lake Roesiger tanks are located northeast of the lake and provide the system with 0.4 MG of combined storage. The two concrete tanks, constructed in 1992, are each 30 feet in diameter and approximately 45 feet tall.

In the storage analysis for Lake Roesiger in Table 7-13, the ADD is adjusted to 188 gpd per ERU (from the current value of 79 gpd/ERU) to make sure that a sufficient amount of storage will be reserved for existing homes as they gradually transition from part-time to full-time occupancy. An analysis of meter records indicates that full-time resident water demands in the Lake Roesiger system are similar to the demands of Lake Stevens single-family customers.

The originally estimated build-out of 565 ERUs is still reasonable for the Lake Roesiger pressure zone. The total number of ERUs used for the storage analysis includes non-revenue and leakage volumes from Table 5-8c, which have been converted to ERUs based on 188 gpd/ERU. This analysis confirms that the Lake Roesiger tanks are still adequate for build-out of the zone.

The Lake Roesiger system was originally designed to provide 500 gpm of fire flow for 30 minutes. Table 7-13 shows that storage for two hours of fire flow at 1,000 gpm can be nested within the standby storage component. MSA used this 1,000-gpm fire flow in the hydraulic analysis of the Lake Roesiger pressure zone.

7.3.5 Remaining Physical Capacity in Existing Lake Roesiger Facilities

Table 7-14 evaluates the remaining capacity in the Lake Roesiger facilities. As in the storage analysis above, Table 7-14 assumes an average Lake Roesiger customer use of 188 gpd/ERU rather than the current ADD of 79 gpd/ERU. The 2.70 MDD/ADD system peaking factor results in a MDD value of 508 gpd/ERU, which is higher than the Lake Stevens system MDD of 386 gpd/ERU.

The analysis in Table 7-14 assumes the second supply pump will turn on to meet PHD if the number of connections increases beyond 605 ERUs. The result shows that the existing storage could support up to 647 ERUs while providing two times the ADD for standby storage. This corresponds to an additional 176 ERUs beyond the existing number of customers, which is about 42 connections more than the current DOH approval.

Table 7-13: Lake Roesiger Area Storage Analysis

	2010 (gpm)	2015 (gpm)	2024** (gpm)
System ADD (**based on 188 gpd/ERU**)*	63	68	79
System MDD (based on MDD/ADD = 2.70)	169	184	213
System PHD ([2.7*188]/1440*[1.6*ERUs+225]+18)	367	392	439
# of ERUs from Table 5-8c (includes leakage)	479	522	605

** Demand of current customers is about 43% of this value. ADD of 188 gpd/ERU reserves storage for residences to convert to full-time use.*

*** System reaches approved buildout of about 565 homes plus ~76 ERUs for leakage & flushing by 2024 (15 yrs).*

Operational Storage (OS):	Lake Roesiger Tank 1	Lake Roesiger Tank 2	Total
Capacity (MG)	0.2	0.2	0.4
Diameter (ft)	30	30	
Reservoir Height (overflow) (ft)	39	39	
Max Water Height (pump off setting (ft))*	37.0	37.0	
Pump On Water Height**	32.0	32.0	
Reservoir Volume Per Foot Height (gal/ft)	5,288	5,288	10,575
Existing Operational Storage (gallons)	**26,438**	**26,438**	52,877

** Current pump off setting is at 37 ft to allow crew response time after alarm at 38 ft if pump fails to turn off.*

*** Current pump on setting ranges seasonally 21-27 ft to promote turnover. 32 ft is planned setting after connecting to Lake Stevens.*

Equalizing Storage (ES):	2010	2015	2029
PHD	367	392	439
Qs (one of two supply pumps running)	440	440	440
Required Equalizing Storage (gallons): ES = (PHD-Qs)(150 min)	**0**	**0**	**0**
Water level at bottom of ES:	32.0	32.0	32.0

Standby Storage (SB) - single source	2010	2015	2029
Total standby storage (gallons): = (2 days)*(System ADD)*(1440 min/day)	180,104	196,272	227,480

Fire Flow Storage (FS):	2010	2015	2029
Largest Fire Flow Requirement (gpm)	1,000	1,000	1,000
Largest Fire Flow Duration (min)	120	120	120
Fire Storage (gallons)	**120,000**	**120,000**	**120,000**

Dead Storage (DS):	Lake Roesiger Tank 1	Lake Roesiger Tank 2	Corresponding water level (ft):
Max Service Elevation	735	735	
Min Tank Elv for 20 psi (top of DS)	781	781	**9**
Min Tank Elv for 30 psi	804	804	**32**
Reservoir Base Elevation	772	772	**Total DS:**
Total Dead Storage (gal)	**48,435**	**48,435**	**96,870**

Conclusion:	2010 Tank 1 & 2 (gallons)	2015 Tank 1 & 2 (gallons)	2029 Tank 1 & 2 (gallons)
Total Storage (to pump off level)	391,287	391,287	391,287
Existing Operational Storage	52,877	52,877	52,877
Required Equalizing Storage	0	0	0
Required Standby Storage *	180,104	196,272	227,480
Required Fire Flow Storage *	120,000	120,000	120,000
Total Dead Storage	96,870	96,870	96,870
Total Required Storage + OS & DS	**329,851**	**346,019**	**377,227**
Total Surplus / Deficit	**61,437**	**45,269**	**14,061**

**Fire Flow Storage nested within Standby Storage*

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Table 7-14 Lake Roesiger Existing System Capacity Analysis

Demand Per ERU Basis	
Average Day Demand Per ERU (gal/day)	188
Maximum Day Demand Per ERU (gal/day)	508
Supply Capacity	
Limiting Supply Rate – one pump running , 2^{nd} as spare (gal/day)	648,000
Maximum Day Demand Per ERU (gal/day)	508
Maximum Supply Capacity (ERU)	1,276
Storage Capacity	
Maximum Storage Capacity (gal)	243,225
Storage Requirement Per ERU (assumes 2^{nd} pump used for PHD) (gal)	376
Maximum Storage Capacity (ERU)	647
System Capacity (based on most limiting component)	
Limiting Factor – Storage	647
Remaining Available System Capacity	
Maximum System Capacity (ERU)	647
Existing (2009) ERUs (w/ non-revenue use and leakage @ 188 gpd/ERU)	471
Remaining Available System Capacity (ERU)	176

7.4 STORM LAKE WATER SYSTEM FACILITIES ANALYSIS

The feasibility study that formed the design basis for the Storm Lake system can be found with Resolution 4754 in Appendix 02-1. Storm Lake was designed to support up to 220 single family residences, and currently serves 156 homes. The project was initiated by a request from 22 homeowners in Storm Lake Ridge. The District also entered into an agreement with developers of five proposed plats to make the project financially feasible. The subdivisions included 57 lots in Storm Lake Heights, 14 lots in Summit Ridge, 20 lots in Wolfe Crest Estates, 6 lots in Highland Crest, and 15 lots in Marble Ridge. The 220 ERU design capacity allowed for 86 future lots in addition to these participants.

Figure 6-3 graphically illustrated water demands of the Storm Lake customers. In the first few years, water demands were similar to homes in the Lake Stevens water system. After new homes were built, the average customer demands began to resemble water use in the Dubuque system. Only the most recent three-year average from 2006 through 2008 (270 gpd/ERU) was used to project future water demands in Table 5-8d.

Fire flow was not a requirement at the time of the Storm Lake system design. However, the District included two hydrants for homes in the existing Storm Lake Ridge water system. Hydrants were also installed along the new transmission/distribution pipe at approximate 1,000 foot spacing.

7.4.1 Water Supply Facility Evaluation for the Storm Lake System

The Storm Lake supply station contains two pumps, each rated for 250 gpm at 260 ft of head. Because equalizing storage is available in the tank, the supply station must support the MDD. According to Table 5-8d, the 2029 projected MDD is 181 gpm, which can be supplied by one pump operating for almost 21 hours on the peak day.

7.4.2 Booster Pump Station within the Storm Lake System

The Storm Lake Ridge booster system is located at the reservoir site. It was re-built in 2001 to serve approximately 20 homes off of 72nd Place SE at a grade of 860 feet. The station is a wood-framed, metal-roofed structure that houses a packaged VFD booster pump system with a capacity of approximately 100 gpm, a master meter, and the electrical controls. There is no plan to serve additional homes beyond the approved capacity of this pump station.

The station is currently operating at a set point correlating to 850 ft HGL, or at net head of 132 ft (57 psi) at the station elevation of 718 ft. This provides a static pressure ranging between 55 and 70 psi at service meters in the zone.

The District's SCADA system records flow, pressure, and pump run time. During the particularly hot, dry summer of 2009, the peak flow was 59 gpm at a pressure of 55 psi with two of the three pumps running.

As was indicated in Table 4-3, the station contains three Grundfos pumps, each rated for 22 gpm at 143 ft. Under the current operating conditions, this allows 10 feet of head loss within the pump station.

For the 2006-8 average ADD of 270 gpd/ERU and MDD/ADD ratio of 4, the MDD is calculates as 1080 gpd/ERU. Using the DOH equation for PHD, the peak hour demand for 20 houses is 63 gpm. This is close to the 2009 recorded peak operation. There have not been any low-pressure complaints in this boosted zone.

7.4.3 Distribution System Evaluation for the Storm Lake System

The District's hydraulic model confirms that the Storm Lake water mains are adequately sized for their intended use. The water system still contains the original pipe from the 1987 Storm Lake Ridge plat. According to the feasibility study, the old pipe consists of 6,036 feet of 2-inch, 920 feet of 2.5-inch, and 1,361 feet of 3-inch schedule 40 PVC pipe, rated for 160 psi. The new tank has an overflow level 30 feet higher than the original tank for this plat. This increased the pressure by about 13 psi, with pressure approaching 100 psi at the lowest point on the old pipe. Individual pressure reducing valves were provided for existing water services that would experience pressure in excess of 80 psi.

The District has not experienced problems with the 1987 pipes, and they are not planned for replacement. The very low leakage in recent years (see Table 5-7) is further evidence that this pipe is holding up. High leakage in 2004 and 2005 was likely due to water used in construction of the new plats. If leaks and breaks begin to occur in the future, the District can add this pipe to the replacement program.

7.4.4 Storage Evaluation for the Storm Lake System

The Storm Lake tank is located near 72nd Place SE and provides the system with 0.23 MG of storage. The concrete tank, constructed in 2000, is 26 feet in diameter and approximately 40 feet tall. The tank was sized in conjunction with the source and distribution facilities to support 220 residences and to provide a minimum of 500 gpm of fire flow.

The Storm Lake storage evaluation is presented in Table 7-15. The results show that the tank is sized just about right to meet the 2029 water demands. The 246 projected ERUs in 2029 include 10 ERUs for leakage and non-revenue authorize uses. This leaves about 16 ERUs in addition to the 220 ERUs that the system was originally designed to support.

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Table 7-15: Storm Lake Water System Storage Analysis

Values from Table 5-8d	2010 (gpm)	2015 (gpm)	2029 (gpm)
System ADD	34	37	46
System MDD	134	145	181
System PHD	341	363	435
# of ERUs (includes ERUs for leakage)	182	197	246

<u>**Operational Storage (OS):**</u>	**Storm Lake Tank**
Capacity (MG)	0.2
Diameter (ft)	30
Reservoir Height (overflow) (ft)	44
Max Water Height (pump off setting (ft))	43.0
Pump On Water Height	32.0
Reservoir Volume Per Foot Height (gal/ft)	5,288
Existing Operational Storage (gallons)	**58,164**

<u>**Equalizing Storage (ES):**</u>	**2010**	**2015**	**2029**
PHD	341	363	435
Qs (one of two pumps running)	250	250	250
Required Equalizing Storage (gallons): ES = (PHD-Qs)(150 min)	**13,650**	**16,950**	**27,750**
Water level at bottom of ES:	29.4	28.8	26.8

<u>**Standby Storage (SB) - single source***</u>	**2010**	**2015**	**2029**
Total standby storage (gallons): = (2 days)*(System ADD)*(1440 min/day)	97,920	106,560	132,480
Water level at bottom of SB:	10.9	8.6	1.7

** Each well is more than capable of supporting the ADD, so minimum SB requirement is 200 gal/ERU.*

<u>**Fire Flow Storage (FS):**</u>	**2010**	**2015**	**2029**
Largest Fire Flow Requirement (gpm)	1,000	1,000	1,000
Largest Fire Flow Duration (min)	120	120	120
Fire Storage (gallons)	**120,000**	**120,000**	**120,000**

<u>**Dead Storage (DS):**</u>	**Storm Lake Tank**	**Corresponding water level (ft):**	
Max Gravity Service Elevation	670		
Min Tank Elv for 20 psi at PHD (top of DS)	716	1	for pump protection
Min Tank Elv for 30 psi at PHD	739	21	
Reservoir Base (ft elevation)	718	0	
Calculated Dead Storage (gal)	**5,288**		

** As tested in hydraulic model, level should be above 60 ft to maintain 30 psi at highest water main elev at PHD.*

Conclusion:	**2010** (gallons)	**2015** (gallons)	**2029** (gallons)
Total Storage (to pump off level)	227,370	227,370	227,370
Existing Operational Storage	58,164	58,164	58,164
Required Equalizing Storage	13,650	16,950	27,750
Required Standby Storage	97,920	106,560	132,480
Required Fire Flow Storage	120,000	120,000	120,000
Total Dead Storage	5,288	5,288	5,288
Total Required Storage* + OS & DS	**197,102**	**200,402**	**223,682**
Total Surplus / Deficit	**30,268**	**26,968**	**3,688**

**Include the larger of fire flow storage or standby storage*

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7.4.5 Remaining Physical Capacity in Existing Storm Lake Facilities

Table 7-16 presents the maximum capacity of the Storm Lake supply and storage facilities. Storage is clearly the most limiting factor, even when only one supply pump is considered in the analysis. The 267 ERU limit is greater than the 2029 projection of 246 ERUs, which includes an allowance for leakage.

The Storm Lake MDD value of 1080 gpd/ERU is the highest of all the District's water systems. This is a relatively new community, with most of the homes built between 2004 and 2006. The MDD/ADD ratio of this system might decline as landscaping for the new homes becomes more established.

If the number of customers requesting to hook up to the Storm Lake system exceeds the DOH approval limit of 220 in the future, the District could re-evaluate the system capacity at that time and ask DOH to increase the approved capacity.

Table 7-16 Storm Lake Existing System Capacity Analysis

Demand Per ERU Basis	
Average Day Demand Per ERU (gal/day)	270
Maximum Day Demand Per ERU (gal/day)	1,080
Supply Capacity	
Limiting Supply Rate – one pump running , 2nd as spare (gal/day)	360,000
Maximum Day Demand Per ERU (gal/day)	1,080
Maximum Supply Capacity (ERU)	333
Storage Capacity	
Maximum Storage Capacity (gal)	164,000
Storage Requirement Per ERU (assumes 2nd pump used for PHD) (gal)	615
Maximum Storage Capacity (ERU)	267
System Capacity (based on most limiting component)	
Limiting Factor – Storage	267
Remaining Available System Capacity	
Maximum System Capacity (ERU)	267
Existing (2009) ERUs	179
Remaining Available System Capacity (ERU)	88

7.5 CRESWELL WATER SYSTEM FACILITIES ANALYSIS

Creswell is a simple water system, with a single tap from the Everett 2/3-Lines and a 12-inch diameter water main forming the backbone of the system. As was described at the end of Section 5.2, the District is asking DOH to change the approved capacity of Creswell from "undetermined" to "unspecified" so that the system can gradually expand and merge with other water systems in the District's Integrated System service area.

7.5.1 Water Supply Facility Evaluation for the Creswell System

The projected 2029 PHD for Creswell is 81 gpm and the projected 2029 system MDD is 21 gpm. The capacity of the 8-inch diameter tap on the Everett 3-Line is about 1,500 gpm.

Therefore, the supply tap is capable of supporting the 1,000 gpm design fire flow plus MDD flow, as well as supporting the PHD. For reliability, this supply tap also has a backup connection on the Everett 2-Line.

7.5.2 Distribution System Evaluation for the Creswell System

Figure 11-1, in the Improvement Plan, illustrates how the Creswell system will eventually connect to Lake Stevens, Lake Roesiger, and Storm Lake.

The HGL of the Creswell zone is considered to be 525 feet, based on pressure in the Everett transmission lines at this location. In the long run, Creswell will become part of the Lake Stevens-500 zone. The ground elevation within the existing Creswell service area ranges from 300 to 360 feet, so the current static pressure ranges from 70 to 97 psi. Along the route of future water mains to integrate the Creswell system, the elevation ranges between 140 and 400 feet. The corresponding static pressure within the expanded zone at 500 HGL would be between 43 and 156 psi. Individual PRVs will be used where pressure exceeds 80 psi, in accordance with the Uniform Plumbing Code.

The 400-foot high point will be about 5200 feet away from the Creswell tap. If the full 1,500 gpm capacity of the tap is directed to this location under a fire flow condition, the pressure loss would be about 11 psi, for a remaining pressure of about 32 psi. During peak hour demand, the pressure drop will be hardly noticeable in the 12-inch diameter pipe. After the Creswell system connects to the Storm Lake system, pressure at this high point will be higher than 32 psi because it will be just downstream of a PRV station from the Storm Lake-760 zone.

The longest stretch of water main extension from the Creswell system will extend north and west to Lake Stevens. This extension will consist of 16,500 feet of 12-inch diameter pipe along Creswell and OK Mill Roads to the intersection with Newberg Road, and then about 6,000 feet of 16-inch diameter pipe continuing along OK Mill Road to the connection with Lake Stevens. The ground slopes downward along this route, starting at 320 feet, reducing to 280 feet at the intersection with Newberg Road, and ending at 140 feet at the Lake Stevens connection. A simple head loss calculation confirms that pressure will remain above 50 psi along this entire route, even if the full 1,500 gpm capacity of the Creswell tap is directed into this pipe.

7.5.3 Storage Evaluation for the Creswell Water System

Like the Dubuque water system, the Creswell system does not contain a storage tank. A tank would mainly cover standby storage, since the supply tap can support peak hour demand and fire flow.

DOH defines standby storage as the volume of stored water available for use during a loss of source capacity, power, or similar short-term emergency. Standby storage would mainly be used when Everett’s filter plant is out of commission. This is an extremely rare circumstance because of redundancies built into the filter plant. Loss of power is not a concern for the Creswell system because it is served by gravity flow.

The DOH Design Manual recommends standby storage to cover two average days of water demand for systems supplied by a single water source. WAC 246-290-420(5) allows a lower standard if acceptable by the customers. Customer expectations can be established by a majority vote of the water system's governing body.

Standby storage will become available when Creswell merges with other water systems in the Integrated System service area. The Improvement Plan in Figure 11-1 shows how developer-funded projects could expand Creswell until it merges with the other systems. Over the next 20 years, the District must focus its own resources on replacing aging infrastructure and other capacity-related improvements. If developer-funded projects do not complete the Creswell merger by the end of the 20-year period, the District could then consider constructing any remaining water mains to achieve this goal.

By adopting this WSP through its standard public processes, the District's Commission will satisfy the requirements of WAC 246-290-420(5) to confirm that it is acceptable to customers to forego standby storage in the Creswell system until it merges with the other water systems. This is similar to the method historically employed for the District's Dubuque water system.

7.5.4 Remaining Physical Capacity in Existing Creswell Facilities

Table 7-17 shows that the Creswell supply facilities should be sufficient for up to 1,865 ERUs. This is more than enough capacity to support growth until the Creswell system merges with the adjacent water systems.

Table 7-17 Creswell Existing System Capacity Analysis

Demand Per ERU Basis	
Average Day Demand Per ERU (gal/day)	188
Maximum Day Demand Per ERU (gal/day)	386
Supply Capacity at Peak Hour Demand	
Limiting Supply Rate (gal/min)	1,500
Max Capacity at PHD (ERU) (using DOH Equation 5-1)	3,315
Supply Capacity at Fire Flow + Max Day Demand	
Limiting Supply Rate (gal/min)	1,500
Max Capacity at MDD + 1,000 gpm Fire Flow (ERU)	1,865
Storage Capacity	
Maximum Storage Capacity (gal)	0
Storage Requirement Per ERU (gal)	376
Maximum Storage Capacity (ERU)	0
System Capacity (considering merge by 2029)	
Limiting Factor – Fire Flow + MDD (ERUs)	1,865
Remaining Available System Capacity	
Maximum System Capacity (ERU)	1,865
Existing (2009) ERUs (includes non-revenue use and leakage)	15
Remaining Available System Capacity (ERU)	1,850

7.6 MAY CREEK WATER SYSTEM FACILITIES ANALYSIS

May Creek was the first satellite water system designed and built by the District after establishing the Satellite Water System Program in 1980. It replaced a system originally constructed to serve the four divisions of May Creek Mountain View Tracts in the 1960s. May Creek is approved by DOH to serve an “unspecified” number of connections, which means the system can grow up to the number of connections justified by this WSP. Following is a summary of water service commitments to date for the May Creek water system.

Subdivision/Project Name	Year Constructed	District File #	ERUs
May Creek Mountain View Tracts	1984	WE-19	366
Loth Lumber	1989	WE-71	2
Woodhaven Court	1998	WE-381	16
Creekside	1999	WE-359	116
Mallard Homes	2000	WE-341	8
Sno. Co. Fire District #26	2002	WE-448	8
Mountain Vale	2007	WE-654	9
Creekside Vista	2008	WE-710	23
Existing meters outside of plats	Misc	-------	3
Cascade View Estates	Proposed	07-465W	21
Total Commitments:			**572**

In 2008, the District’s billing system indicated that 437 single family meters and 4 commercial meters were being read and billed. The District reported 427 total meters in the 2010 DOH Water Facilities Inventory. The meters reported on the WFI are based on an ongoing tally of meters as they are installed. Considering the discrepancy in these numbers, it appears the count of meters may be off track. The District will make an accurate determination of active services for the 2011 WFI report. In the meantime, this WSP will use the higher number.

As shown in Table 5-8g, the 4 commercial customers were equal to 25 ERUs at the beginning of 2009. When combined with leakage and unbilled uses, the system is considered to currently serve 499 ERUs. Based on the average growth between 2003 and 2008, the system is projected to grow to 658 ERUs by 2029.

7.6.1 Water Supply Facility Evaluation for the May Creek System

The May Creek system is supplied by two wells. Well 1 well drilled in 1983 and was intended to produce 277 gpm. Well 2 was drilled in 1994 to perfect the May Creek water right and is intended to produce 500 gpm.

Until recently, the May Creek system was supplied primarily from Well 2, with Well 1 held in reserve. Beginning in November 2009, the District changed the control sequence so that the two wells alternate. Recorded flow indicates that Well 1 is delivering about 250 gpm and Well 2 is delivering about 460 gpm when pumping through the 6-inch diameter fill pipe to the tanks.

Flow from Well 2 usually begins near 500 gpm when the pump turns on and the water level in the well is at its approximate static level of 6 feet below grade. The output declines to about

460 gpm as the water level stabilized to about 30 feet below grade. Because the District would prefer not to replace a perfectly good pump, this will be remedied next time the pump is replaced to assure that the ongoing flow matches the water right limit.

The projected 2029 May Creek system MDD is 164 gpm. Either well can easily satisfy this projected demand. An on-site propane powered generator is available to operate the wells during power outages.

7.6.2 Distribution System Evaluation for the May Creek System

The existing May Creek system is comprised of a single pressure zone with a hydraulic grade level of 392 feet, determined by the overflow level of the tanks. The highest ground elevation in the May Creek retail service area is 300 feet, which corresponds to a static pressure of 40 psi. The boundary of the “retail service area” was outlined in Figure 2-2. The highest currently active water service is at 265 feet elevation, with a static pressure of about 55 psi. The lowest elevation in the service area is about 210 feet, so the high end of the pressure range is about 80 psi.

A booster pump station will be needed to expand the May Creek system above 300 feet into the eastern portion of the future service area. If a subdivision occurs above this elevation, the developer will be responsible for the cost to design and build the booster station.

7.6.3 Storage Evaluation for the May Creek System

The May Creek tanks are located east of the plat of May Creek Tracts and provide the system with 0.35 MG of combined storage. The two concrete tanks, constructed in 1984, are 26 feet in diameter and approximately 45 feet tall with a base elevation at 347 feet. The analysis in Table 7-18 shows that the tanks are more than adequate to support the 658 ERUs projected by 2029.

Of particular note, the required equalizing storage is calculated with the existing Well 1 pump running, since the District is currently alternating operation of the two wells. Because either well is capable of supporting the projected 2029 MDD, the DOH recommendation to supply at least 200 gallons of standby storage per ERU applies to this case.

7.6.4 Remaining Physical Capacity in Existing May Creek Facilities

Table 7-19 shows that the existing May Creek facilities could be sufficient to serve about three times the current number of customers. Storage is currently the most limiting factor.

The analysis assumes the District will adjust the May Creek controls to put Well 1 in backup mode during summer months once the MDD begins to exceed the Well 1 capacity. This will assure that Well 2 runs when the future peak demand occurs.

When the system grows to about 1,400 ERUs, the system-wide ADD would be about 173 gpm, the system MDD would be about 350 gpm, and the PHD would be about 636 gpm. If Well 2 fails in this future scenario, Well 1 could still support the ADD, so the standby storage criteria of 200 gallons/ERU still applies. Equalizing storage would be about 20 gallons/ERU for 1,400 ERUs with Well 2 running during the peak hour.

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Table 7-18: May Creek Water System Storage Analysis

Values from Table 5-8g	2010 (gpm)	2015 (gpm)	2029 (gpm)
System ADD	62	67	81
System MDD	126	135	164
System PHD	276	290	336
# of ERUs (includes leakage)	506	542	658

Operational Storage (OS):	**May Creek Tank 1**	**May Creek Tank 2**	Total
Capacity (MG)	0.175	0.175	0.350
Diameter (ft)	26	26	
Reservoir Height (overflow) (ft)	45	45	
Max Water Height (pump off setting) (ft)	44	44	
Pump On Water Height	39	39	
Reservoir Volume Per Foot Height (gal/ft)	3,972	3,972	7,943
Existing Operational Storage (gallons)	**19,858**	**19,858**	39,716

Equalizing Storage (ES):	**2010**	**2015**	**2029**
PHD	276	290	336
Qs (with Well 1 pump running)	250	250	250
Required Equalizing Storage (gallons): ES = (PHD-Qs)(150 min)	**3,900**	**6,000**	**12,900**
Water level at bottom of ES:	38.0	37.5	35.8

Standby Storage (SB) - Well 2 out of service	**2010**	**2015**	**2029**
Total standby storage (gallons): = (200 gpd/ERU)*(# of ERUs)*	101,200	108,400	131,600

* 200 gpd/ERU is the minimum recommended storage when the sources can supply the MDD with the largest source out of service.

Fire Flow Storage (FS):	**2010**	**2015**	**2029**
Largest Fire Flow Requirement (gpm)	500	500	500
Largest Fire Flow Duration (min)	60	60	60
Fire Storage (gallons)	**30,000**	**30,000**	**30,000**

Dead Storage (DS):	**May Creek Tank 1**	**May Creek Tank 2**	**Corresponding water level (ft):**
Max Service Elevation	300	300	
Min Tank Elv for 20 psi (top of DS)	346	346	**0.5**
Min Tank Elv for 30 psi	369	369	**22.3**
Reservoir Base Elevation	347	347	**Total DS:**
Total Dead Storage (gal)	**1,986**	**1,986**	**3,972**

Conclusion:	**2010 Tank 1 & 2** (gallons)	**2015 Tank 1 & 2** (gallons)	**2029 Tank 1 & 2** (gallons)
Total Storage (to pump off level)	349,503	349,503	349,503
Existing Operational Storage	39,716	39,716	39,716
Required Equalizing Storage	3,900	6,000	12,900
Required Standby Storage *	101,200	108,400	131,600
Required Fire Flow Storage *	30,000	30,000	30,000
Total Dead Storage	3,972	3,972	3,972
Total Required Storage + OS & DS	**148,788**	**158,088**	**188,188**
Total Surplus / Deficit	**200,715**	**191,415**	**161,315**

**Fire Flow Storage nested within Standby Storage*

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As noted in the footnote of Table 7-19, the District will need to start returning a mitigation flow to May Creek when the maximum day water use exceeds 398,880 gallons. Base on current customer use patterns, the peak day use may reach this point as the system size approaches 1,000 ERUs.

This remaining capacity in the existing facilities appears to be more than sufficient for build-out of the future May Creek service area in accordance with current zoning.

Table 7-19 May Creek Existing System Capacity Analysis

Demand Per ERU Basis	
Average Day Demand Per ERU (gal/day)	178
Maximum Day Demand Per ERU (gal/day)	361
Water Right – Instantaneous Capacity*	
Limiting Supply Rate – (based on Qi = 500 gpm) (gal/day)	720,000*
Maximum Day Demand Per ERU (gal/day)	361
Maximum Supply Capacity (ERU)	1,994*
Water Right – Annual Capacity	
Limiting Supply Rate – (based on Qa = 319.5 afy) (gal/day)	285,231
Average Day Demand Per ERU (gal/day)	178
Maximum Supply Capacity (ERU)	1,602
Installed Well Pump Capacity*	
Limiting Supply Rate (gal/day) (Well 2 recorded flow = 460 gpm; Well1 in backup status during summer)	662,400
Maximum Day Demand Per ERU (gal/day)	361
Maximum Supply Capacity (ERU)	1,835*
Storage Capacity	
Maximum Storage Capacity (gal)	306,000
Storage Requirement Per ERU (for ES + SS) (gal/ERU)	219
Maximum Storage Capacity (ERU)	1,397
System Capacity (based on most limiting component)	
Limiting Factor – Storage	1,397
Remaining Available System Capacity	
Maximum System Capacity (ERU)	1,397
Existing (2009) ERUs	499
Remaining Available System Capacity (ERU)	898

* A stipulation of the water right requires that a portion the groundwater pumped be returned to May Creek whenever the daily withdrawal exceeds 398,880 gallons in a 24-hour period. The complex formula to calculate the return flow can be found in the Tulalip Settlement Agreement in Appendix 03-2. The return flow back to May Creek will reduce the capacity of the instantaneous water right component (Qi). Because the capacity based on the annual water right (Qa) and the tank volume are more limiting, the reduced instantaneous water right capacity was not determined for this table.

7.7 KAYAK WATER SYSTEM FACILITIES ANALYSIS

The District became responsible for the Kayak system in October 2006. The water system was originally approved to serve 481 ERUs. The District constructed improvements to resolve compliance issues so that DOH could restore the original approval. The improvements include a new storage tank, water treatment, a new control system, and PRV stations to divide the system into two pressure zones.

The District prepared a project report in 2008 to evaluate the capacity of the system against then-current water demands. A copy of the report is in Appendix 02-2. From 2005 through 2007, the project report found that the system ADD was 244-276 gpd/ERU, down from 358-423 gpd/ERU in 2000-2002. The high customer water demands had declined significantly after the previous owners began conservation efforts in 2002.

The 2008 project report used a conservative ADD value of 300 gpd/ERU for sizing purposes and suggested that a few more years of data should collected before confirming that the lower water demands are sustained.

This WSP uses a customer ADD of 247 gpd/ERU for the Kayak system, based on 2004-2008 single family consumption. Coincidentally, the 2009 customer ADD exactly matches the 2004-2008 average, even though the summer of 2009 set records for heat and low rainfall. Therefore, an ADD value of 247 gpd/ERU appears safe as a basis for water demand projections.

At the time of the 2008 project report, the District had made commitments for 390 water services in the Kayak area. The project report estimated that system build-out could be in the range of 462-510 ERUs depending on whether vacant lots are subdivided to their maximum potential under current zoning and on whether service is requested by lots in adjacent areas that are not claimed by other water systems.

7.7.1 Water Supply Facility Evaluation for the Kayak Water System

The Kayak water system has two active wells. Well 2 currently operates at 200 gpm and Well 3 operates at 300 gpm. From Table 5-8h, the 2009 system MDD is 176 gpm and the 2029 projected MDD is 214 gpm. The wells currently alternate in operation. Well 2 can meet the peak day demand when operating for 21 hours, and Well 3 appears to have sufficient capacity for the next 20 years. The District intends to transfer the water right from Well 1 to Wells 2 & 3 in the future, which has the potential for increasing the allowable withdrawal rate to 370 gpm.

As will be seen in the following storage analysis, this WSP recommends adjusting the controls to put Well 2 in backup mode during hot/dry summer months. It may be possible to pump from Well 2 at a higher rate, however this carries a risk of shortening the life of the well.

The District completed a treatment system for Wells 2 and 3 in 2009. It includes sodium hypochlorite and potassium permanganate chemical feed and four filter vessels containing pyrolusite media. The treatment removes manganese, iron, and hydrogen sulfide and carries a chlorine residual into the distribution system. The treatment is sized to accommodate the potential future transfer of the Well 1 water right to these wells.

7.7.2 Distribution System Evaluation for the Kayak Water System

The 2008 project report in Appendix 02-2 includes a hydraulic analyses which confirms that the minimum state pressure standard of 30 psi is met in the existing water mains at peak hour demand.

A 500 gpm fire flow for two hours is required in the Kayak Landing development, an area of half-acre lots in the middle of the system. The District attempted to build a tank that could supply this flow throughout the water system, but the cost was not financially feasible. As pointed out in the project report, with the new tank, fire flow is not available at the high points along Kayak Point Rd or near the entrance to the Kayak Point county golf course.

7.7.3 Storage Evaluation for the Kayak System

Table 7-20 presents the Kayak storage evaluation. The District's hydraulic model indicates that the water level in the tank should be kept above 60 feet during the peak hour demand to assure that pressure is above 30 psi at all service meters.

District staff are operating the system so that the well pump turns on when the tank level is at 65 feet and turns off when the level is at 72 feet. This allows two feet between the pump off and overflow levels for crew response time if the pump fails to turn off. The 7-foot operating band allows the Well 3 pump to run for at least 1.5 hours each time it turns on.

The analysis in Table 7-20 tightens the operating band by one foot and assumes that the District will put Well 2 into backup mode during the summer to assure that Well 3 will be running during the peak hour demand. Under these conditions, the water level is just at 60 feet and the end of the peak hour period for the projected 2029 water demands.

The tank might be slightly short on the recommended amount of standby storage by 2029. The project report, which formed the basis for the tank design, indicates that this is a known situation. The new 75-foot tall tank was an improvement over the previous 55-foot tall tank. It was not technically feasible to build a taller concrete tank and it was not financially feasible to build a taller steel tank. Therefore, the District made a decision to accept a slightly lower standard for the standby storage.

As pointed out by the project report, the chance of drawing the water level down to the bottom of the standby storage is remote. With the new alarm system, District staff can quickly respond to abnormal conditions before they become apparent to the customers. The new treatment facilities include a hook-up for one of the District's trailer-mounted generators, which can operate a well and the treatment equipment during extended power outages.

7.7.4 Remaining Physical Capacity in Existing Kayak Facilities

Table 7-21 evaluates the capacity of the existing Kayak water facilities in terms of the maximum number of ERUs supported by each component. This analysis makes the same assumptions used in the storage analysis. The result shows that the tank is the most limiting component and that the capacity closely matches the current DOH approval.

However, it should be pointed out that 40 of the 482-ERU capacity would be consumed by leakage and other non-revenue water use. If the operating band for the wells is raised or tightened by another foot, this would increase the equalizing storage capacity to 516 ERUs, which would be sufficient to cover the 481 approved connections plus about 7-percent leakage.

Table 7-22 evaluates additional capacity that could be achieved when the District transfers the Well 1 water right to Wells 2 & 3 and increases the pumping rate of Well 3 to 370 gpm. The resulting 578 ERU capacity could equate to about 537 residential services with about 7 percent leakage.

Table 7-20: Kayak Water System Storage Analysis

Values from Table 5-8h	2010 (gpm)	2015 (gpm)	2029 (gpm)
System ADD	69	72	83
System MDD	177	186	214
System PHD	391	407	457
# of ERUs (includes ERUs for leakage)	400	420	483

Operational Storage (OS):	**Kayak Tank**
Capacity (MG)	0.3
Diameter (ft)	26
Reservoir Height (overflow) (ft)	74
Max Water Height (pump off setting (ft))	72.0
Pump On Water Height	66.0
Reservoir Volume Per Foot Height (gal/ft)	3,972
Existing Operational Storage (gallons)	**23,830**

Equalizing Storage (ES):	**2010**	**2015**	**2029**
PHD	391	407	457
Qs (one of two wells running)	300	300	300
Required Equalizing Storage (gallons):			
ES = (PHD-Qs)(150 min)	**13,650**	**16,050**	**23,550**
Water level at bottom of ES:	62.6	62.0	60.1

Standby Storage (SB) - two wells*	**2010**	**2015**	**2029**
Total standby storage (gallons): = 200 gal/ERU minimum	80,000	84,000	96,600
Water level at bottom of SB:	42.4	40.8	35.7

** Each well is more than capable of supporting the ADD, so minimum SB requirement is 200 gal/ERU.*

Fire Flow Storage (FS):	**2010**	**2015**	**2029**
Largest Fire Flow Requirement (gpm)	500	500	500
Largest Fire Flow Duration (min)	120	120	120
Fire Storage (gallons)	**60,000**	**60,000**	**60,000**

Dead Storage (DS):	**Kayak Tank**	**Corresponding water level (ft):**	
Max Service Elevation	450		
Min Tank Elv for 20 psi at PHD (top of DS)	500	36	per hydraulic model
Min Tank Elv for 30 psi at PHD	524	60	per hydraulic model
Reservoir Base (adjusted to USGS contours)	464	0	
Calculated Dead Storage (gal)	**142,979**		

** As tested in hydraulic model, level should be above 60 ft to maintain 30 psi at highest water main elev at PHD.*

Conclusion:	**2010** (gallons)	**2015** (gallons)	**2029** (gallons)
Total Storage (to pump off level)	285,957	285,957	285,957
Existing Operational Storage	23,830	23,830	23,830
Required Equalizing Storage	13,650	16,050	23,550
Required Standby Storage *	80,000	84,000	96,600
Required Fire Flow Storage *	60,000	60,000	60,000
Total Dead Storage	142,979	142,979	142,979
Total Required Storage + OS & DS	**260,458**	**266,858**	**286,958**
Total Surplus / Deficit	**25,499**	**19,099**	**-1,001**

**Fire Flow Storage nested within Standby Storage*

NOTE: Elevations in this table are based on USGS contours in the District GIS system. Surveyed elevations are about 10 ft higher (474' at base of tank & 460' at highest service).

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Table 7-21 Kayak Existing System Capacity Analysis

Demand Per ERU Basis	
Average Day Demand Per ERU (gal/day)	247
Maximum Day Demand Per ERU (gal/day)	640
Water Right – Instantaneous Capacity	
Limiting Supply Rate – (based on Qi = 300 gpm) (gal/day)	432,000
Maximum Day Demand Per ERU (gal/day)	640
Maximum Supply Capacity (ERU)	675
Water Right – Annual Capacity	
Limiting Supply Rate – (based on Qa = 156 afy) (gal/day)	139,258
Average Day Demand Per ERU (gal/day)	247
Maximum Supply Capacity (ERU)	564
Installed Well Pump Capacity	
Limiting Supply Rate (gal/day) (Well 3 recorded flow = 300 gpm; Well2 in backup status during summer)	432,000
Maximum Day Demand Per ERU (gal/day)	640
Maximum Supply Capacity (ERU)	675
Storage Capacity – Equalizing Storage Only	
Maximum Storage Capacity (gal)	23,832
Related Peak Hour Demand (gpm) ES = (PHD-300 gpm)*150	459
Maximum Equalizing Storage Capacity (ERU) (using DOH eq. 5-1)	482
Storage Capacity – Equalizing plus Standby	
Maximum Storage Capacity (gal)	119,000
Storage Requirement Per ERU (for ES + SS) (gal/ERU)	250
Maximum Storage Capacity (ERU)	476
System Capacity (accepting 197 gal/ERU for Standby Storage)	
Limiting Factor – Equalizing Storage	482
Remaining Available System Capacity	
Maximum System Capacity (ERU)	482
Existing (2009) ERUs (includes leakage)	396
Remaining Available System Capacity (ERU)	86

Table 7-22 Kayak Capacity if Well 1 Water Right is Transferred to Wells 2 & 3

Demand Per ERU Basis	
Average Day Demand Per ERU (gal/day)	247
Maximum Day Demand Per ERU (gal/day)	640
Water Right – Instantaneous Capacity	
Limiting Supply Rate – (based on Qi = 370 gpm) (gal/day)	532,800
Maximum Day Demand Per ERU (gal/day)	640
Maximum Supply Capacity (ERU)	832
Water Right – Annual Capacity	
Limiting Supply Rate – (based on Qa = 228 afy) (gal/day)	203,545
Average Day Demand Per ERU (gal/day)	247
Maximum Supply Capacity (ERU)	824
Installed Well Pump Capacity	
Limiting Supply Rate (gal/day) (Well 3 = 370 gpm; Well2 in backup status during summer)	532,800
Maximum Day Demand Per ERU (gal/day)	640
Maximum Supply Capacity (ERU)	832
Storage Capacity – Equalizing Storage Only	
Maximum Storage Capacity (gal)	23,832
Related Peak Hour Demand (gpm) ES = (PHD-370 gpm)*150	529
Maximum Equalizing Storage Capacity (ERU) (using DOH eq. 5-1)	578
Storage Capacity – Equalizing plus Standby	
Maximum Storage Capacity (gal)	119,000
Storage Requirement Per ERU (for ES + SS) (gal/ERU)	250
Maximum Storage Capacity (ERU)	476
System Capacity (accepting 165 gal/ERU for Standby Storage)	
Limiting Factor – Equalizing Storage	578
Remaining Available System Capacity	
Maximum System Capacity (ERU)	578
Existing (2009) ERUs (includes leakage)	396
Remaining Available System Capacity (ERU)	182

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7.8 <u>SUNDAY LAKE WATER SYSTEM</u> FACILITIES ANALYSIS

The District prepared a project report in June 2010 to determine the capacity of the Sunday Lake water system after additional water rights were obtained. Appendix 05-2 contains a copy of the report. The Sunday Lake water system was originally approved to serve up to 186 homes. The project report justifies that the system now has capacity for 278 ERUs. This WSP evaluates the capacity of the Sunday Lake system following the methods applied to the District's other water systems.

7.8.1 Water Supply Facility Evaluation for the Sunday Lake System

The Sunday Lake water system is served by a single well. As described in the project report, the installed pump can operate at 130 gpm to match the recently increased water rights limit.

Table 5-8i projected the Sunday Lake water demands with the same customer ADD values used in the project report. This assumes the first 128 Sunday Lake customers use 170 gpd/ERU and subsequent customers use 245 gpd/ERU on an average day. If the system grows at a rate of 4 percent per year, it will reach its approved capacity by 2025.

The demand analysis in Table 5-8i determined that the well capacity of 130 gpm can support up to 297 residential services plus an allowance of 20 ERUs (6.3%) for leakage and non-revenue use. The 278-ERU approval requested by the 2010 project report reserved some of the well capacity to replenish fire storage within 72 hours while supplying the MDD. This optional recommendation can be re-examined as the number of customers approaches the DOH approved capacity.

7.8.2 Booster Pumps within the Sunday Lake System

The Sunday Lake booster station capacity was evaluated in the 2010 project report. The report determined that the booster pumps could support up to 120 ERUs in the boosted zone while providing 500 gpm fire protection. About 50 lots have been created in the boosted zone, and 28 of those lots have been developed with homes. The District will monitor new developments in the boosted zone to assure that the total connections do not exceed 120 ERUs, or that additional pump capacity is designed and constructed if there is a greater demand for water service in this zone.

7.8.3 Distribution System Evaluation for the Sunday Lake System

The 2010 project report justified that the existing water mains are sufficient for the foreseeable needs of the Sunday Lake system.

7.8.4 Storage Evaluation for the Sunday Lake System

The Sunday Lake reservoir is located west of 254th Street NW and provides the system with 0.2 MG of storage. The concrete tank is 26 feet in diameter, approximately 50 feet tall and was constructed in 1995.

Table 7-23 evaluates the capacity of the tank in relation to water demand projections from Table 5-8i. For the 2029 demand, the tank adequately provides equalizing storage while maintaining a water level high enough to assure greater than 30 psi at the highest water service during peak hour demand. However, the standby storage dips into the dead storage component.

The project report determined that the tank can support up to 283 ERUs, including a provision for leakage, while maintaining the bottom of the standby storage component above 9 feet to assure at least 20 psi at the highest service with a peak hour demand flow.

7.8.5 Remaining Physical Capacity in Existing Sunday Lake Facilities

Because new customers of the Sunday Lake system will use more water than existing customers (due to larger lot sizes), the customer ADD and MDD values will increase as the system grows. As a starting point to evaluate existing facility capacity in terms of ERUs, Table 7-24 uses the ADD and MDD values for 283 customers as a starting point since it appears that storage may be the most limiting factor from the above discussion.

Table 7-24 uses a MDD/ADD peaking factor of 2.89 to match the peaking factor that was used in Table 5-8i. This is slightly less than the 3.0 peaking factor used in the project report.

The result confirms that the combination of available equalizing and standby storage is currently the most limiting factor for the Sunday Lake system. If the District chooses to provide less than the recommended amount of standby storage, then the next most limiting factor would be meeting the peak day demand with the 130 gpm well capacity.

So, if the District wishes to serve more than 278 ERUs from this system, an emphasis on conservation with a particular emphasis on the peak day demand could be beneficial for this system. Also, the District could consider drilling and equipping a backup well to reduce the recommended amount of standby storage.

Table 7-23: Sunday Lake Water System Storage Analysis

Values from Table 5-8i	2010 (gpm)	2015 (gpm)	2029 (gpm)
System ADD	20	26	47
System MDD	55	71	130
System PHD	202	234	345
# of ERUs (includes ERUs for leakage)	156	191	318

Operational Storage (OS):	**Sunday Lake Tank**
Capacity (MG)	0.2
Diameter (ft)	26
Reservoir Height (overflow) (ft)	50
Max Water Height (pump off setting) (ft)	49.0
Pump On Water Height (ft)	46.0
Reservoir Volume Per Foot Height (gal/ft)	3,972
Existing Operational Storage (gallons)	**11,915**

Equalizing Storage (ES):	**2010**	**2015**	**2029**
PHD	202	234	345
Qs	130	130	130
Required Equalizing Storage (gallons): ES = (PHD-Qs)(150 min)	**10,800**	**15,600**	**32,250**
Water level at bottom of ES:	43.3	42.1	37.9

Standby Storage (SB) - single source	**2010**	**2015**	**2029**
Total standby storage (gallons): = 2 days*ADD(gal/min)*1440(min/day)	57,600	74,880	135,360
Water level at bottom of SB:	28.8	23.2	3.8

Fire Flow Storage (FS):	**2010**	**2015**	**2029**
Largest Fire Flow Requirement (gpm)	500	500	500
Largest Fire Flow Duration (min)	60	60	60
Fire Storage (gallons)	**30,000**	**30,000**	**30,000**

Dead Storage (DS):	**Sunday Lake Tank**	**Corresponding water level:**	
Max Service Elevation	340		
Min Tank Elv for 20 psi at PHD (top of DS)	389	9	see Project Report
Min Tank Elv for 30 psi	410	30	see Project Report
Reservoir Base Elevation	380	0	
Calculated Dead Storage (gal)	**35,745**		

Conclusion:	**2010** (gallons)	**2015** (gallons)	**2029** (gallons)
Total Storage (to pump off level)	194,610	194,610	194,610
Existing Operational Storage	11,915	11,915	11,915
Required Equalizing Storage	10,800	15,600	32,250
Required Standby Storage *	57,600	74,880	135,360
Required Fire Flow Storage *	30,000	30,000	30,000
Total Dead Storage	35,745	35,745	35,745
Total Required Storage + OS & DS	**116,060**	**138,140**	**215,270**
Total Surplus / Deficit	**78,550**	**56,470**	**-20,660**

**Fire Flow Storage nested within Standby Storage*

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Table 7-24 Sunday Lake Existing System Capacity Analysis

Demand Per ERU Basis	
Average Day Demand Per ERU (gal/day)	211
Maximum Day Demand Per ERU (gal/day)	610
Water Right – Instantaneous Capacity	
Limiting Supply Rate – (based on Qi = 130 gpm) (gal/day)	187,200
Maximum Day Demand Per ERU (gal/day)	610
Maximum Supply Capacity (ERU)	307
Water Right – Annual Capacity	
Limiting Supply Rate – (based on Qa = 100.5 afy) (gal/day)	89,721
Average Day Demand Per ERU (gal/day)	211
Maximum Supply Capacity (ERU)	425
Installed Well Pump Capacity	
Limiting Supply Rate (130 gpm) (gal/day)	187,200
Maximum Day Demand Per ERU (gal/day)	610
Maximum Supply Capacity (ERU)	307
Storage Capacity – Equalizing Storage Only	
Maximum Storage Capacity (gal)	63,552
Related Peak Hour Demand (gpm) ES = (PHD-130 gpm)*150	554
Maximum Equalizing Storage Capacity (ERU) (using DOH eq. 5-1)	650
Storage Capacity – Equalizing plus Standby	
Maximum Storage Capacity (gal)	147,000
Storage Requirement Per ERU (for ES + SS) (gal/ERU)	523
Maximum Storage Capacity (ERU)	281
System Capacity	
Limiting Factor – Equalizing plus Standby Storage	281
Remaining Available System Capacity	
Maximum System Capacity (ERU)	281
Existing (2009) ERUs (includes leakage)	150
Remaining Available System Capacity (ERU)	131

7.9 SKYLITE WATER SYSTEM FACILITIES ANALYSIS

The District accepted ownership of the Skylite system from an association of Skylite Tracts property owners in 1992 (see Resolution 3756). The Skylite water system was constructed in the 1960s and approved for 167 connections, based on consideration that the lots would be primarily recreational in nature. The system consisted of a single well containing two submersible pumps, a single 1,000-gallon pressure tank, and a distribution system comprised of approximately 9,700 feet of 4-inch and 2-inch diameter Class 160 PVC. Design shortcomings became apparent as recreational uses transitioned into residential occupancy.

The District's first improvements to the system included locating all valves and returning them to operational condition, replacing the service lines, and installing meters. The District developed a spare parts inventory to facilitate emergency repairs on the distribution system with minimal interruption. To further improve reliability, the District moved the pump house electrical service to direct service from Mann Road, because power lines on Mann Road were often energized when lines in the tract were out due to limb or tree damage. For the next step, the District purchased and installed a propane-powered emergency generator with an automatic transfer feature.

The District built a 106,000-gallon concrete storage tank in 1997 and completed a booster pump system in 1999 to deliver water from the tank into the system. One fire hydrant is available for the local fire department to fill tanker trucks directly from the tank. These improvements included sprayers to aerate the water as it enters the tank. Aeration strips naturally occurring carbon dioxide and raises the pH to reduce the corrosiveness of the water toward copper plumbing. The aeration treatment successfully brought the Skylite system into compliance with the Lead and Copper Rule. The District subsequently began continuous chlorination in 2002.

In 2007, the District further modernized the Skylite pump house. The booster pumps were replaced by variable frequency drive pumps, which enabled the removal of the large pressure tanks. This freed up space to replace the 11-kW generator with a 47-kW generator and to move the chlorine equipment into a dedicated chemical feed room. The 2007 improvements also integrated the Skylite system with the District's SCADA control system, which has been a superb operational advance.

7.9.1 Water Supply Facility Evaluation for the Skylite System

The existing well pumps were installed by the Skylite Tracts association in 1982 and 1986. The design intended each pump to provide 60 gpm at 150 ft TDH. Since the District began continuously recording flow and discharge pressure from the wells, it is observed that the primary well pump is actually delivering water at about 47.5 gpm with a discharge pressure of about 31 psi. The operating TDH is around 96 feet, when factoring in the well drawdown at about 24 feet below ground. The second pump is producing slightly less water at about 45 gpm and 27 psi, which correlates to about 86 ft TDH.

The peak day demands captured in 2008, 2009, and 2010 were 66,800 gallons, 68,400 gallons, and 65,000 gallons respectively. The summer of 2009 broke records for heat and dryness. For the peak day on July 19, 2009, from midnight to midnight, the tank level began and ended at the same level. Therefore, the primary well pump just barely kept up with this peak day demand by operating continuously at an average flow of 47.5 gpm.

The water demand projections in Table 5-8j assume an existing system MDD of 67,430 gallons (47 gpm over 24 hours), which falls within the range of recent experience. If the Skylite system grows to the currently approved 167 connections, Table 5-8j projects the 2029 MDD would increase to 74,500 gallons, or 52 gpm.

When the time comes to replace the well pumps the District will select a pump that matches the intended design of 60 gpm at 150 ft TDH. If the well pump had been operating at 60 gpm in 2009, then it would have operated for 19 hours on that peak day. At the projected 2029 MDD of 74,500 gallons, a 60 gpm pump would run for about 21 hours on a peak day. Replacing the well pumps is not identified in the improvement program in Chapter 11 because it will not be a major expense. The pump replacement will be covered under the District's operations and maintenance budget when needed. In the meantime, the District plans to make a targeted effort toward conservation in the Skylite system for reasons that will be discussed in Section 7.9.5.

The original water system design with two pumps in one well was a historical practice that allowed water systems to be built without storage. Now that Skylite has a storage tank, the District can consider replacing the two well pumps with a single pump. The storage analysis in Section 7.9.3 will test this scenario. According to the water right, the District can install a well pump that produces up to 100 gpm. The District will carefully consider this when selecting a new pump in relation to the available water level drawdown in the well. For planning purposes, it is clear that the future well pump will produce at least 60 gpm.

7.9.2 Booster Pump Station within the Skylite System

Booster pumps deliver water from the storage tank to the entire Skylite distribution system. The pumps are each rated for 60 gpm at 150 ft TDH (65 psi), like the original intended capacity of the well pumps, which had satisfactory served the community for years before the tank was added to the system. The pumps are currently set to operate at 60 psi and normally alternate every 6 hours. Both pumps operate together when needed for peak hour demands. Because the single fire hydrant in the Skylite system is not connected to the distribution pipes, the booster pumps only need to deliver the PHD flow.

As shown in Table 5-8j, the current PHD is calculated to be 132 gpm and the 2029 projected PHD is calculated to be 142 gpm. Considering the rated capacity of the booster pumps, this suggests that the existing pumps might be hard pressed to keep up with the peak hour demand. In 2008-2010, recorded performance on the peak days shows that the booster pumps sufficiently matched the customer demands while meeting the 30 psi standard at all service meters. Planned conservation efforts may help to reduce the peak hour demand within the safe operating band of the booster pumps. These pumps were new in 2007, so they have a long remaining life. However, if capacity issues become apparent, the District has sufficient funds in its operations and maintenance budget to replace these relatively small pumps if necessary.

7.9.3 Distribution System Evaluation for the Skylite System

As indicated earlier, the Skylite distribution system consists of about 9,700 feet of 4-inch and 2-inch diameter Class 160 PVC pipe. To keep the cost affordable for Skylite customers, the District did not replace the distribution pipes.

The District created a hydraulic model while designing the initial water system improvements. For an estimated peak hour demand of 190 gpm and pressure of 44 psi leaving the well/tank site, the model indicated that the lowest pressure in the distribution system would be 38 psi. Therefore, the pipes are adequately sized to deliver the peak hour demand without excessive pressure losses.

Leakage in the Skylite system exceeded 10 percent in 2007 and 2008, but returned to a low value after a leak was found and repaired in August 2008. A 10% leakage rate in the Skylite system equates to only about 2 gpm. The District will continue to closely monitor leakage in the Skylite system. At this time, the frequency of pipe breaks does not warrant replacement. Although the District has not targeted pipes in the Skylite system for replacement, the District could prioritize these pipes in its water main replacement program if excessive leakage becomes a persistent problem.

7.9.4 Storage Evaluation for the Skylite System

The Skylite Tracts reservoir provides the system with 0.1 MG of storage as well as aerating the well water to reduce the levels of carbon dioxide in the ground water as a corrosion control measure. The concrete tank is 30 feet in diameter and approximately 20 feet tall and was constructed in 1997. Tables 7-25 and 7-26 evaluate the storage capacity under two scenarios, first with the existing well pumps and then with a single well pump supplying 60 gpm.

For the existing pumps scenario, if one of the pumps breaks down, the second pump can supply the system while a replacement pump is ordered and delivered to the site. The well pumps can be pulled and re-installed within a single 8-hour work day. 200 gallons/ERU of standby storage could support the system for about 12 hours on a peak day or 25 hours on an average day. The 30,000 gallons of "surplus" storage under the existing conditions could be considered "source storage" if the peak day exceeds the capacity of the existing well pumps before a larger pump is installed. For example, if the peak day demand averages 52 gpm while the well pump produces 47.8 gpm, the surplus storage could supplement the well for about 4.5 days without dipping into the standby storage. The District intends to set its controls so that only the larger well pump operates during hot and dry summer months, with the second well pump available to automatically turn on if the first pump fails to start.

The second scenario in Table 7-26 shows that the tank will also be sufficient with a single future well pump producing 60 gpm. The tank is large enough to support the system for two average days if the single well pump breaks down unexpectedly. Toward the end of the 20-year planning period, the storage may be short by about 2,000 gallons. However, as will be discussed in the next section, it is unlikely that the system will actually grow to the indicated number of ERUs.

Table 7-25: Skylite Water System Storage Analysis with Two Well Pumps

Values from Table 5-8j	2010 (gpm)	2015 (gpm)	2029 (gpm)
System ADD	22	22	24
System MDD	47	48	52
System PHD	132	135	142
# of ERUs (includes ERUs for leakage)	167	171	184

Operational Storage (OS):	Skylite Tank
Capacity (MG)	0.1
Diameter (ft)	30
Reservoir Height (overflow) (ft)	20
Max Water Height (pump off setting) (ft)	18.0
Pump On Water Height (ft)*	16.0
Reservoir Volume Per Foot Height (gal/ft)	5,288
Existing Operational Storage (gallons)	**10,575**

Equalizing Storage (ES):*	2010	2015	2029
PHD	132	135	142
Qs*	47.5	47.5	47.5
Required Equalizing Storage (gallons): ES = (PHD-Qs)(150 min)	**12,675**	**13,125**	**14,175**
Water level at bottom of ES:	13.6	13.5	13.3

** Assumes the controls are set so that the larger well pump is the lead during summer months.*

Standby Storage (SB) - two well pumps*	2010	2015	2029
Total standby storage (gallons): = 200 gal/ERU minimum	33,400	34,200	36,800
Water level at bottom of SB:	7.3	7.0	6.4

** Each well pump can support the ADD. If one well pump breaks down, the second pump will supply the system while a replacement pump is ordered and delivered. 200 gal/ERU of standby storage gives enough time to pull out and re-install the pumps.*

Fire Flow Storage (FS):	2010	2015	2029
Largest Fire Flow Requirement (gpm)	500	500	500
Largest Fire Flow Duration (min)	60	60	60
Fire Storage (gallons)	**30,000**	**30,000**	**30,000**

Dead Storage (DS):	Skylite Tank	Corresponding water level:	
Max Service Elevation	160		
Min Tank Elv for 20 psi at PHD (top of DS)	151	1	Entire distribution is
Min Tank Elv for 30 psi	151	1	supplied by booster
Reservoir Base Elevation	150	0	pumps.
Calculated Dead Storage (gal)	**5,288**		

Conclusion:	**2010** (gallons)	**2015** (gallons)	**2029** (gallons)
Total Storage (to pump off level)	95,178	95,178	95,178
Existing Operational Storage	10,575	10,575	10,575
Required Equalizing Storage	12,675	13,125	14,175
Required Standby Storage *	33,400	34,200	36,800
Required Fire Flow Storage *	30,000	30,000	30,000
Total Dead Storage	5,288	5,288	5,288
Total Required Storage + OS & DS	**61,938**	**63,188**	**66,838**
Total Surplus / Deficit	**33,240**	**31,990**	**28,340**

**Fire Flow Storage nested within Standby Storage*

Table 7-26: Skylite Water System Storage Analysis with One Well Pump

Values from Table 5-8j	2010 (gpm)	2015 (gpm)	2029 (gpm)
System ADD	22	22	24
System MDD	47	48	52
System PHD	132	135	142
# of ERUs (includes ERUs for leakage)	167	171	184

Operational Storage (OS):	Skylite Tank
Capacity (MG)	0.1
Diameter (ft)	30
Reservoir Height (overflow) (ft)	20
Max Water Height (pump off setting) (ft)	18.0
Pump On Water Height (ft)*	16.0
Reservoir Volume Per Foot Height (gal/ft)	5,288
Existing Operational Storage (gallons)	**10,575**

** With a 2 ft on/off level differential, a 60 gpm well pump would operate at least 3 hours during each cycle.*

Equalizing Storage (ES):	2010	2015	2029
PHD	132	135	142
Qs*	60.0	60.0	60.0
Required Equalizing Storage (gallons): ES = (PHD-Qs)(150 min)	**10,800**	**11,250**	**12,300**
Water level at bottom of ES:	14.0	13.9	13.7

** Assumes the current well pumps are replaced with a single pump that produces at least 60 gpm.*

Standby Storage (SB)-single well pump	2010	2015	2029
Total standby storage (gallons): = 2 days*ADD(gal/min)*1440(min/day)	63,360	63,360	69,120
Water level at bottom of SB:	2.0	1.9	0.6

Fire Flow Storage (FS):	2010	2015	2029
Largest Fire Flow Requirement (gpm)	500	500	500
Largest Fire Flow Duration (min)	60	60	60
Fire Storage (gallons)	**30,000**	**30,000**	**30,000**

Dead Storage (DS):	Skylite Tank	Corresponding water level:	
Max Service Elevation	160		
Min Tank Elv for 20 psi at PHD (top of DS)	151	1	Entire distribution is
Min Tank Elv for 30 psi	151	1	supplied by booster
Reservoir Base Elevation	150	0	pumps.
Calculated Dead Storage (gal)	**5,288**		

Conclusion:	2010 (gallons)	2015 (gallons)	2029 (gallons)
Total Storage (to pump off level)	95,178	95,178	95,178
Existing Operational Storage	10,575	10,575	10,575
Required Equalizing Storage	10,800	11,250	12,300
Required Standby Storage *	63,360	63,360	69,120
Required Fire Flow Storage *	30,000	30,000	30,000
Total Dead Storage	5,288	5,288	5,288
Total Required Storage + OS & DS	**90,023**	**90,473**	**97,283**
Total Surplus / Deficit	**5,155**	**4,705**	**-2,105**

**Fire Flow Storage nested within Standby Storage*

7.9.5 Remaining Physical Capacity in Existing Skylite Facilities

Table 7-27 evaluates the Skylite water rights and existing facilities to determine the maximum number of ERUs that can be served. As can be seen in the table, the water consumption by the existing customers actually exceeds the annual limit of the water right. Table 7-28 shows that the customer ADD would need to be reduced from its current value of 186 gpd/ERU to 159 gpd/ERU to bring the water system into compliance with the water right.

In comparison to the District's other water systems and to water demands in the Puget Sound region, the water demands of the Skylite customers are actually very reasonable. The District has not research why the annual limit of the water right is so restrictive in relation to the number of lots that the well was intended to serve, but it may have to do with the anticipated recreational nature at the time of the original development.

At this time, the Skylite system serves 151 homes. The original plat contained 185 lots, but the water system approval was set at 167, most likely due to some of the lots being in the flood plain. At this time, there appears to be only about 7 potential future connections within the existing service area. One lot is community owned, another lot already contains a house served by a well, and the remaining five lots are owned by existing customers that have their homes on adjacent lots. When communicating with the community and designing the improvements in the 1990s, the District committed that it would refrain from expanding the system outside of the lots that it was originally intended to serve considering the facility limitations.

The District will focus conservation efforts on the Skylite system in the next few years to see if the annual customer use can be reduced to the 159 gpd/ERU target to bring the system into compliance with the water right. The District will also put a halt to any new connections on the system unless the customer usage can be reliably reduced to the lower target levels in Table 7-28. Out of the 7 potential remaining future services, the District may have a commitment to one lot that has an installed service with an inactive meter. For the remaining six lots, the District does not believe it has made any commitment to the lot owners to provide water service.

Table 7-27 Skylite Existing System Capacity Analysis

Demand Per ERU Basis	
Average Day Demand Per ERU (gal/day)	186
Maximum Day Demand Per ERU (gal/day)	417
Water Right – Instantaneous Withdrawal Limit	
Limiting Supply Rate – (based on Qi = 100 gpm) (gal/day)	144,000
Maximum Day Demand Per ERU (gal/day)	417
Maximum Supply Capacity (ERU)	345
Water Right – Annual Withdrawal Limit	
Limiting Supply Rate – (based on Qa = 29.7 afy) (gal/day)	26,514
Average Day Demand Per ERU (gal/day)	186
Maximum Supply Capacity (ERU)	142
Installed Well Pump Capacity	
Limiting Supply Rate (47.5 gpm) (gal/day)	68,400
Maximum Day Demand Per ERU (gal/day)	417
Maximum Supply Capacity (ERU)	164
Storage Capacity – Equalizing plus Standby	
Maximum Storage Capacity (gal)	79,320
Storage Requirement Per ERU (for ES + SS) (gal/ERU)	438
Maximum Storage Capacity (ERU)	181
System Capacity	
Limiting Factor – Annual Water Right Limit (ERU)	142
Remaining Available System Capacity	
Maximum System Capacity (ERU)	142
Existing (2009) ERUs (includes leakage)	166
Remaining Available System Capacity (ERU)	-24

Table 7-28 Target Skylite Customer ADD to Comply with Annual Water Right Limit

Number of Connections	ERUs for leakage & non-revenue use	Total ERUs	Customer ADD (gpd/ERU) to remain within annual water right limit	Notes
151	15	166	159	This matches the current number of meters
158	16	174	152	This would cover the remaining vacant lots in the existing service area outside of the flood plain.
167	17	184	144	This would cover the approved number of connections.

8 Source of Supply

The District's sources of supply include surface water purchased from the city of Everett and groundwater supplies from the District's own wells. This section discusses the condition and capacity of these supplies, the water rights and wellhead protection programs (WHPP) associated with the groundwater supplies, and any recommended improvements for the District's wells.

8.1 SURFACE WATER

All of the District's surface water is currently purchased from Everett. Everett's supply system and the District's wholesale supply connections are described in Chapter 4. The District's agreements with Everett are summarized in Section 3.3 and can be found in Appendix 3-2.

8.1.1 Surface Water Rights

The District holds four water rights jointly with Everett that relate to the operation of the District's Jackson Hydroelectric Project. Those rights are described in Table 8-1. Everett has other surface water diversion and storage rights associated with its municipal source of supply. Everett has four diversion rights on the Sultan River, one diversion right on Chaplain Creek, and one storage right for the Sultan River. Existing water rights on the Sultan River are sufficient to meet forecast demands for Everett and its wholesale customers until about 2036. More detailed information about each of the city's water rights can be found in the City of Everett's 2007 WSP.

Table 8-1: Jointly Held Surface Water Rights

File #	Cert #	Name	Priority Date	Purpose	Qi (cfs)	Qi_A (gpm)	Qa_A (afy)
S1-*07097C	732	SnoPUD/ City of Everett	5/3/1946	Power Generation	556.0	249,549.5	
R1-00733C	7096	SnoPUD/ City of Everett	5/3/1946	Power/ Municipal			113,700.0
S1-23398C	S1-23398C	SnoPUD/ City of Everett	6/15/1979	Power/ Municipal	556.0		
R1-23397C	R1-23397C	SnoPUD/ City of Everett	6/15/1979	Power Generation			39,560.0
				Subtotal	**1,112.0**	**249,549.5**	**153,260.0**

The District also holds a certificated surface water right (S1-07584C) to withdraw water from Lake Stevens, which was the original water supply to the District's Lake Stevens system. This surface water right is listed with the District's groundwater rights in Table 8-3, at the end of this chapter. The District has an ongoing interest in retaining this right to meet future demands within the District's Lake Stevens service area.

8.1.2 Surface Water Supply Yield

Everett performed a detailed yield analysis as part of its 2007 WSP. The analysis showed that the city's surface and groundwater rights can meet average day water demands until about 2036 and maximum day demands until about 2046. Although the Sultan River and Spada Reservoir can adequately supply future demands, the city is considering several alternatives for improving reliability or augmenting its existing supplies. These include development of the Snohomish River Regional Water Authority (SRRWA) water right (formerly Weyerhaeuser Kraft Mill Water Right), reuse, groundwater, and desalination. A more detailed discussion of the city's yield analysis and alternative sources of supply may be found in the city's 2007 WSP.

8.1.3 Surface Water Shortage Response Plan

Everett has a Water Shortage Response Plan in the event of unplanned or projected water shortages. The Spada Reservoir has a one-year supply of water to meet retail and wholesale demands and the Chaplain Reservoir has sufficient water for 60 days of normal water use. Under emergency conditions, the Chaplain Reservoir could be extended to 120 days of supply. Everett's complete Water Shortage Response Plan is provided in the appendices of its 2007 WSP.

In addition, the District has an Emergency Drought Response Plan (see Appendix 8-1 of this WSP). The District's emergency plan identifies the range of demand and reduction actions that are available and defines the triggers by which decisions are made during a low-water event. The Emergency Drought Response Plan is designed to meet the needs of the District and its water customers, in addition to achieving three goals: 1) ensure an adequate supply of high quality water is maintained throughout the event; 2) ensure adequate stream flows are maintained for fish and wildlife habitat; and 3) where feasible, maintain adequate storage in the Spada Reservoir for generation of hydroelectric power.

8.1.4 Watershed Plans

WRIA 5 - Stillaguamish Basin

Watershed planning has not been conducted in WRIA 5. However, in consultation with Washington State Department of Fish and Wildlife and the Tribes, Ecology developed recommendations for instream flows and closures. Ecology adopted the Instream Resources Protection and Water Resources Program Rule (Chapter 173-505 WAC) in August 2005. The rule established instream flows for 32 rivers or streams in the basin, reserved a limited amount of groundwater for future domestic use, reserved a limited amount of water for stock watering, established maximum limits for withdrawals from nine water sources, closed lakes and ponds to new diversions, (except for domestic use), and closed numerous rivers and streams to new uses unless the use qualifies under identified exceptions.

The rule was developed by the Department of Ecology in conjunction with the Stillaguamish River Implementation Review Committee (SIRC). SIRC committee members consisted of representatives from the Stillaguamish Indian Tribe, regional salmon recovery groups, federal and local governments.

WRIA 7 – Snohomish Basin

Watershed planning has not been conducted in WRIA 7. A Phase 1 watershed grant application was prepared with the Tulalip Tribes and the city of Everett as co-leads, but was never perfected and grant funding was not awarded. WRIA 7 is part of the Central Puget Sound Regional Unit.

8.1.5   General Hydrology / Fishery Conditions

Because of the size of the District's retail and future service areas, its water systems and sources can be found in both the Snohomish and Stillaguamish River Basins.

Snohomish River Basin (WRIA 7)

The Snohomish River Basin, located on the western slope of the Cascade Mountains, has a total area of about 1,900 square miles in Snohomish and King Counties. The basin is bounded on the north by the Skagit and Stillaguamish River basins, and on the south by the Sammamish and Cedar River basins. The Snohomish River is formed by the confluence of the Skykomish and Snoqualmie Rivers near Monroe. The Snohomish River flows for 21 miles in northwesterly direction and discharges into Possession Sound. In the lower third of the valley, the river discharges into several distributary channels, principally Ebey, Steamboat, and Union Sloughs. The Pilchuck River joins the Snohomish River just upstream of the city of Snohomish, and is the only sizeable tributary below the confluence of the Snoqualmie and Skykomish Rivers.

The Snoqualmie and Skykomish Rivers each host one population of threatened Chinook salmon. The Snohomish watershed is also home to threatened bull trout, in addition to Skykomish and Snoqualmie River Coho. Populations of chum, pink, and sockeye salmon, as well as steelhead, also inhabit the Snohomish River system. Urbanization has resulted in loss of off-channel habitat, such as oxbows. Efforts are underway in the Snohomish River basin to reconnect off-channel habitat, restore bank edges, and riparian forests in strategic locations in order to improve salmonid population health and production.

Stillaguamish River Basin (WRIA 5)

The Stillaguamish Basin drains an area of approximately 700 square miles and includes more than 3,112 miles of river, streams, and marine shore habitat. The river enters Puget Sound at Stanwood, 16 miles north of Everett in northern Snohomish County. The basin/watershed drains into both Port Susan and Skagit Bay. It is also part of the Whidbey Basin, which includes Skagit Bay, Saratoga Passage, Port Susan, and Deception Pass.   The Stillaguamish Basin can be divided into three general regions: the North Fork, South Fork, and Lower Mainstem. The two forks join at Arlington, 18 river miles from the mouth. Pilchuck, Deer, Boulder, and Canyon Creeks are the four largest tributaries to the Stillaguamish River system.

Chinook salmon inhabit the mainstem, North Fork, and South Fork of the Stillaguamish River, as well as several of the basin's larger tributaries (Pilchuck, Jim, Canyon, Squire, French, Deer and Boulder Creeks). Two distinct coho salmon populations reside in the basin: the Stillaguamish and Deer Creek. The former is considered a mixture of native and non-native fish due to historic releases of hatchery coho salmon. In addition to Chinook and coho salmon populations, the Stillaguamish basin also hosts populations of Chum Salmon, Pink Salmon, Steelhead Trout, Sockeye Salmon, and Sea-Run Cutthroat Trout. Four local populations of bull trout reside in the Stillaguamish Basin: the North Fork Stillaguamish, the South Fork Stillaguamish River, Canyon Creek, and upper Deer Creek.

The Stillaguamish River has experienced deterioration in water quality from sources such as commercial and non-commercial farms, failing septic systems, land clearing and road surface run-off. Multiple state, local, and federal agencies are working with Snohomish County to address water quality issues. In addition, the Stillaguamish Tribe has conducted significant monitoring efforts in the upper basin to document temperature, dissolved oxygen, turbidity, and other factors.

8.2 GROUNDWATER

The District has 12 wells that serve seven District-owned and operated retail/satellite water systems and its Lake Stevens water system. The water rights associated with the District's wells are authorized to provide municipal and community domestic water supply; however, the latter (i.e., community domestic) rights now qualify as water rights for municipal water supply purposes pursuant to RCW 90.03.015(4). The District relies on the certificated water rights issued for these wells to meet the customer supply requirements of its satellite/retail service areas, with the exception of the Lake Stevens water system which also has access to Everett's wholesale water supply.

Overall, the District's wells are in good condition. Aquifer levels and daily production records are collected, recorded, and reviewed for indications of reduced well efficiency. Well rehabilitation will be considered in the event of unacceptable losses of well efficiency. Well replacement will be considered if well rehabilitation is not appropriate or fails to improve a well's efficiency.

The water rights and list of sources for each of the District's water systems are described in Table 8-3 at the end of this chapter. More detailed information about the wells can be found in Table 4-6 of Chapter 4. The District's Water Right Self Assessment (WRSA) table documenting production and capacity can be found in Appendix 8-2. An overview of the wellhead protection program, source aquifer systems, basin planning status, and the water rights associated with each of the District's wells follows.

8.2.1 Wellhead Protection Program

Wellhead Protection Program Requirements

The 1986 Amendment to the Federal Safe Drinking Water Act required that all states establish a Wellhead Protection Program (WHPP). In Washington State, the program was officially adopted by DOH in July 1994. The WHPP requirement applies to all Group A public water systems that use wells or springs. The goal of the WHPP is to prevent contamination of groundwater sources used for drinking water. The strategy to attain this goal involved three main components:

- Delineation of wellhead protection areas

- Inventory of potential contaminant sources
- Management of wellhead protection areas (WHPAs) to prevent contamination

WAC 246-290 stipulates that every purveyor of public drinking water shall have a WHPP as part of its WSP or management program. The WHPP shall contain, at a minimum, seven elements for each individual well within a water system's boundaries. These elements are:

1. A completed susceptibility assessment
2. Delineated wellhead protection areas for each well with 1-, 5-, 10-year time of travel boundaries
3. A listing of known and potential groundwater contamination sources that may pose a threat to the water-bearing zone
4. Documentation of purveyor's notification to all owners/operators of known and potential sources of groundwater contamination within the WHPA
5. Documentation of purveyor's notification to all regulatory agencies and local governments of the WHPA boundaries and the finding of the WHPA inventory
6. A contingency plan for providing an adequate supply of potable water in the event that groundwater contamination occurs in the temporary or permanent loss of main source of supply
7. Documentation of coordination with local emergency responders, including notification of WHPA boundaries, results of susceptibility assessments, inventories of findings, and contingency plans

The District's Wellhead Protection Plan can be found in Appendix 9-1.

Wellhead Protection Program Description

The District owns and operates seven Group A water systems which use well sources: May Creek, Skylite Tracts, Sunday Lake, Two Twelve Market & Deli (Moa/Holbeck), Kayak, Lake Stevens, and Pilchuck 10. The location of each system is shown on Figure 1-4 in Chapter 1.

Individual WHPPs developed by the District for each of the active Group A systems are included in Appendix 9-1. A WHPP prepared in 2006 by the prior owner of the Kayak water system is also included in the appendix. A WHPP has not yet been developed for the Pilchuck 10 or Lake Stevens water systems. Pilchuck 10 became classified as a Group A water system in 2009, but is expected to be merged into the District's Lake Stevens system before 2013. The District, intends to develop a WHPP for its Lake Stevens System and to update the plans for its other well sources over the next six years.

In recent years, the District has used and maintained its Lake Stevens wells primarily as standby/ reserve sources of supply due to water quality issues. In 2009, the District moved forward with plans to prepare a study and pre-design report for the treatment of the Lake Steven wells. The District is now in the process of final design of a treatment/filtration facility that will enable full use of the Lake Stevens wells. Once the treatment facility is approved by DOH, the District intends to include the Lake Stevens Wells within its WHPP.

A Susceptibility Assessment Survey Form is required of public drinking water purveyors for each Group A well it owns and operates as the initial step in the WHPA process. The assessment form provides information on well construction and production, local aquifer characteristics, and local potential contamination sources. DOH responds to the surveys with a susceptibility rating that establishes the level of monitoring requirements for Volatile Organic Compounds (VOCs) and Synthetic Organic Compounds (SOCs). A variety of waivers can be applied for to reduce or eliminate monitoring and sampling requirements. Based on review of the Susceptibility Assessment Survey Form, DOH issued a Susceptibility Waiver rating for each system well. Wells with "Moderate" or "High" ratings are also rated for Pesticide Vulnerability. DOH susceptibility and vulnerability ratings issued for each system is listed in Table 8-2.

Table 8-2: Susceptibility Ratings for District Satellite Water Systems

System	Suscepti-bility Rating	Pesticide Vulnerability Rating	No. of Potential Contaminant Sources	WHPA Length (ft)	WHPA Width (ft)	Well Screen Depth (ft)	Surface Seal Present
May Creek	Moderate	Low	2	5,800	1,000	90-151	Yes
Skylite	High	Moderate	1	1,000	700	38-48	No
Sunday Lake	Low	N/A	1	1,450	700	364-431	Yes
Kayak	Low	N/A	2	2,396	2,396	340-400	Yes
212 Market	Low	N/A	5	300	300	93-108	Yes

N/A = Not Applicable

As indicated, the Sunday Lake, Kayak, and Two Twelve Market & Deli (Moa/Holbeck) wells have a low susceptibility to surface sources of contamination and have not been given pesticide vulnerability ratings. This is primarily due to their relatively deep completions, verifiable presence of a surface seal, and local hydrogeologic conditions that help protect the aquifer from surface sources of contamination.

The May Creek System is moderately susceptible to surface sources of contamination and has low pesticide vulnerability. The May Creek System wells have moderate completion depths, verifiable surface seals, and moderately protective overlying sediments.

The Skylite Tracts well is highly susceptible to surface sources of contamination and is moderately vulnerable to pesticide contamination. It is completed between depths of 38 and 48 feet and has no record of a surface seal. Overlying sediments appear to be fine-grained glacial till, which to some degree, protect the underlying aquifer from surface sources of contamination. Without a verifiable surface seal, this well cannot be considered for sampling waiver reduction.

Wellhead Protection Areas (WHPAs) were delineated for each active system using EPA WHPA (Code 2.2) module GPTRAC. The purpose of the delineation is to describe the size and shape of that portion of an aquifer contributing groundwater to a well or well field. Maps of the delineated WHPAs are included with the WHPPs in Appendix 9-1. The length and width of the delineated WHPAs are listed in Table 8-2.

An inventory of potential contaminant sources within the delineated WHPAs was conducted by searching all governmental databases and conducting a field survey. The purpose of the field survey is to verify the locations of activities appearing on the governmental lists with potential to contaminate and identify other existing potential contaminant sources. The number of potential contaminant sources identified within each delineated WHPA is listed on Table 8-2. The locations of the identified sources are shown on the WHPA maps.

Three potential contaminant sources have been identified within the May Creek WHPA. They are disinfection facilities at the pump station, septic systems of nearby residences, and power transmission lines within the 10-year time of travel (TOT) area.

The only contaminant sources identified within the Skylite Tracts and Sunday Lake WHPA are septic systems of nearby residences.

Five potential contaminant sources have been identified within the Two Twelve Market & Deli (Hoa/Holbeck) WHPA. They include two gas station/convenience stores with buried fuel tanks, nearby transportation routes, a septic system, and a buried tank used to hold water for fire protection purposes.

The WHPP completed by the previous owner of the Kayak system identifies septic systems and residential access roads as potential contaminant sources. Lots in the area are mostly five acres in size. The WHPP found that the six-year TOT area overlapped eight lots and that the one-year TOT overlapped 14 lots. Since becoming responsible for the Kayak system, the District removed a diesel storage tank from the well site, but added storage of sodium hypochlorite and potassium permanganate in a new treatment building. Triple containment is provided for these chemicals, consisting of double-walled storage tanks inside concrete containment basins.

Although a greater number of potential contaminants exist within the Two Twelve Market & Deli (Moa/Holbeck) WHPA, the most vulnerable of the District's Group A satellite water systems is the Skylite Tracts system. This is due mainly to the well's shallow completion and lack of surface seal. However, this well is surrounded by a concrete pad and located inside a building, which provides some measure of protection.

As required by the State's WHPP, the District notified owners of property with potential contaminant sources of their presence within a WHPA. All federal, state, and local regulatory agencies with jurisdiction over the water systems have been advised regarding the delineated WHPAs and potential contaminant sources. Contingency and emergency response plans have been developed for each system to ensure availability of safe drinking water in the event contamination occurs within or near a WHPA.

8.2.2 Snohomish County Hydrogeology

The geology within Snohomish County has been formed by processes related to glaciers and mountain building in western Washington. Many of the recent deposits are the result of continental glacial ice that advanced into the Puget Sound region several times during the Pleistocene Epoch (between 2 million and 10,000 years ago). The most recent period of glaciation, the Vashon Stade, began approximately 15,000 years ago.

Materials deposited during the Vashon glacial period are generally well-preserved and represent the principal hydrogeologic units associated with the District's groundwater sources in terms of their importance as the primary aquifer and confining layers for groundwater supply purposes. Although groundwater occurs in all of the hydrogeologic units, groundwater is more readily transmitted within aquifer units, which are saturated permeable geologic units capable of transmitting a usable quantity of water. Confining units restrict the movement of groundwater.

Seven principle hydrogeologic units were defined within the Snohomish County Coordinated Water System Plan (CWSP). The hydrologic units were defined based on the lithology of the unconsolidated materials and the stratigraphic and hydrologic relations between adjacent units. In general, the aquifers are comprised of coarse-grained deposits, and the confining layers are comprised of fine-grained, well-compacted deposits. The unconsolidated geologic deposits (which include all the glacial and interglacial deposits) were classified into four aquifers and two confining beds and the underlying rock was classified as a confining layer that is present at the base of the groundwater system.

The two upper aquifers are the alluvium (Qal) and the Vashon Recessional Outwash (Qvr). In many areas, these two units are hydrologically continuous and act as a single aquifer. The confining unit underlying the recessional outwash is the Vashon Till (Qvt). Underlying the till is the Vashon Advance Outwash (Qva), which is the principle aquifer in Snohomish County in terms of areal extent and groundwater usage. The Transitional Beds (Qtb) are the confining unit that underlies the Advance Outwash. Below the transitional beds is a unit of Undifferentiated Sediments (Qu). The Undifferentiated Sediments are heterogeneous and are not well-defined, but are generally course-grained and have been lumped together as a single aquifer unit. At the base of the Undifferentiated Sediments is the bedrock (tb) which acts as a confining layer below the unconsolidated deposits. The bedrock consists of a variety of rocks including volcanic, conglomerate, sandstone, limestone, and other types.

Snohomish County Topography

Snohomish County contains several plateaus that are separated by river valleys. This topography is typical of the Puget Sound region, reflecting glacial and river activity of the past. The primary river valleys are oriented in an east-west direction and are occupied by the Snohomish River, the north and south forks of the Stillaguamish River, and the Skykomish River. Other significant lowland areas include the Pilchuck River valley and the Marysville trough, of which are primarily oriented in a north-south direction.

8.2.3 District Aquifer Sources

As noted above, seven principle hydrogeologic units have been identified within Snohomish County and more specifically described in the Snohomish County CWSP. The following section discusses those units where District groundwater wells are located.

East Stanwood Aquifer

The East Stanwood aquifer (ESA) occurs in the advance outwash deposits and extends from northeast of Stanwood to northwest of Arlington on the plateau above the Stillaguamish River. The aquifer ranges in thickness from 50 to several hundred feet thick. Transmissivity and hydraulic conductivity range from 25,000 to 100,000 gpd/ft and 50 to 200 ft/day respectively. Individual wells in the aquifer may yield up to 1,000 gpm near the southern margins and less than 50 gpm towards the north. The direct surface recharge potential to most of the ESA is low except along the southern margins where the Advance outwash deposits are exposed at the surface. The overlying till or underlying aquifers are the primary sources of recharge. Existing development of the aquifer is estimated at 3 mgd. Potential future development capacity is estimated to be 3 mgd. Overall groundwater quality is considered good.

The potential vulnerability of the ESA to contamination from land uses is generally low, except along the southern margins where the aquifer is exposed at the surface. The land above the ESA has been zoned Rural, except in the urbanized western area near Stanwood and Cedarhome. The District operates one Group A water system with a well that taps the Stanwood aquifer: the Sunday Lake Water System; and one Group B system; the 212th Street Market & Deli Water System.

Skykomish Aquifer

The Skykomish aquifer (SkA) occurs in the Alluvial deposits and extends east-west from Monroe to Gold Bar in the Skykomish River valley. Individual wells in the aquifer may yield up to 2,000 gpm. The aquifer ranges from 10 to 100 feet in thickness. The estimated transmissivity and hydraulic conductivity range from 50,000 to 300,000 gpd/ft and 1,000 to 1,500 ft/day, respectively. The direct surface recharge potential to most of the SkA is high. Induced recharge from the Skykomish River and other surface water bodies is a significant source of recharge during high river stages. The aquifer discharges water to the river during the summer months. Overall groundwater quality is considered good.

Existing development of the aquifer is estimated to be six mgd and potential future development capacity is estimated to be four to nine mgd. The District operates two Group A water systems with wells that tap the Skykomish Aquifer:. the May Creek Water System and the Skylite Tracts Water System.

Tulalip Aquifer

The Tulalip aquifer (TuA) occurs in the advance outwash deposits and extends from the south of Stanwood to northwest of Marysville in the Tulalip Plateau west of the Marysville Trough. The Tulalip aquifer has been studied for designation as a sole source aquifer. It is estimated to be from fifty to several hundred feet in thickness. Transmissivity and hydraulic conductivity are estimated to range from 25,000 to 100,000 gpd/ft and 50 to 200 ft/day respectively. The direct surface recharge potential to most of the TuA is low except along the margins where the advance outwash deposits are exposed at the surface. The overlying till or underlying aquifers are the primary sources of recharge.

Existing development of the aquifer is estimated at two mgd. Potential future development capacity is estimated to be one to four mgd. Overall, the groundwater quality of the Tulalip aquifer is considered to be good. The District operates one Group A water system with wells that tap this aquifer: the Kayak Point Water System (acquired in 2006).

Getchell-Snohomish Aquifer

The Getchell-Snohomish aquifer (GSA) occurs in the advance outwash of deposits and extends from south of Arlington to Snohomish on the Getchell-Snohomish Plateau to the east of the Marysville Trough. The Pilchuck River valley forms the eastern boundary, although there may be some indirect hydraulic connections with the Lakes aquifer below the Pilchuck River. The aquifer ranges from fifty to several hundred feet thick. Transmissivity and hydraulic conductivity range from 25,000 to 100,000 gpd/ft and 50 to 200 ft/day respectively. The aquifer may produce well yields up to 1,200 gpm. The direct surface recharge potential to most of the GSA is low except along the western and southern margins where the advance outwash deposits are exposed at the surface. Induced recharge from surface water bodies are not a significant source of recharge. Overlying till or underlying aquifers are the primary sources of recharge.

Existing development of the aquifer is estimated at 0.5 mgd. Potential future development capacity is estimated to be 0.5 to 4.5 mgd. Overall, groundwater quality of the GSA is considered to be good. The District operates one Group A water system with wells that tap this aquifer: the Lake Stevens Water System (back-up wells); and a Group B System - the Otis Water System.

Lakes Aquifer

The Lakes aquifer (LA) occurs in the advance outwash deposits and extends from south of Granite Falls to Monroe, bordered by the Pilchuck River valley on the west, and extending southeast to Gold Bar above the Skykomish River valley. The aquifer becomes thinner and discontinuous to the east and has an indefinite eastern boundary where depth to bedrock is shallow. There may be some indirect hydraulic connection with the Getchell-Snohomish aquifer below the Pilchuck River. The Newburg sole source aquifer has been designated for the northern portion of the aquifer. The aquifer is estimated to be fifty to several hundred feet in thickness. Transmissivity and hydraulic conductivity are estimated at 25,000 to 200,000 gpd/ft and 100 to 500 ft/day, respectively. Wells completed in the aquifer may yield up to 1,200 gpm.

The direct surface recharge potential to most of the aquifer is low except along the western and southern margins where the advance outwash deposits are exposed at the surface. Recharge from the overlying till or underlying aquifers is the primary source of recharge. Overall groundwater quality is considered to be good. Existing development of the aquifer is unknown, but is estimated to be .025 mgd. Potential future development capacity is estimated to be one to three mgd. The District operates one Group A water system with wells that tap this aquifer: the Pilchuck 10 Water System.

8.3 RETAIL WATER SERVICE AREA / FORECAST WATER RIGHTS

The District's Retail Water Service Area, which is described in Chapter 2, includes seven satellite systems served by groundwater and five systems in the Lake Stevens Integrated water system area that receive treated surface water purchased from Everett. All water demand for these systems, with the exception of systems in the Lake Stevens Integrated area, is provided by eleven existing water rights with a total maximum instantaneous flow rate (Q_i) of

3,774 gpm and a total annual maximum volume (Q_a) of 2,502.1 acre-feet. At this time, the District has sufficient water supply from both its groundwater rights and its Everett wholesale supply to meet its six and twenty-year demand horizons. Consequently, the District has no need at this time to apply for new water rights. The existing water rights of the sources serving the District's Retail Service Area are shown in Table 8-3.

Water Right Self-Assessment forms are provided in Appendix 8-2. The existing and projected consumption in these tables is based on the projected water demands from the tables at the end of Chapter 5. In the process of preparing these assessments, it was discovered that existing consumption in the Skylite water system slightly exceeds the annual withdrawal limit of the water right. The District will conform its beneficial use to the authorized annual quantity for the Skylite water right and if necessary, refrain from making any further connections to the Skylite system until it is clear that this issue has been resolved.

District satellite/retail water systems, Skylite Tracts, Two-Twelve Market & Deli (Moa/Holbeck), and Pilchuck 10, are non-expanding systems, operating at or near their capacity under the applicable water right or current DOH regulations. May Creek is an expanding water system with sufficient capacity to serve several hundred additional connections under its authorized water right. Use of the entire May Creek water right for domestic consumption has been constrained somewhat by a settlement agreement entered into by the District and Tulalip Tribe in 1999 as a condition of the Tribes' dismissal of its objection to a proposed change application. The agreement stipulates that a portion of the groundwater pumped shall be returned to May Creek (as mitigation for groundwater withdrawal impact) when the peak daily groundwater withdrawal rate exceeds 277 gpm within any calendar day (398,880 gpd). The current average daily withdrawal rate is 62 gpm. The system has source capacity to meet anticipated growth and demand past 2015.

8.4 GROUNDWATER SYSTEM EXPANSIONS / ADDITIONS

Subsequent to preparation of the District's 2002 Water System Plan (WSP), the District acquired the Kayak Point Water system in 2006. It also moved forward with plans to expand the capacity of its Sunday Lake Water System through the use of previously acquired water right and the water right change process. Recent developments involving these water systems are summarized below. The District's groundwater rights are listed in Table 8-3.

8.4.1 Sunday Lake Water System

In 1996, the District searched for a regional groundwater source of supply north of Granite Falls with the intent of pooling acquired water rights into one major additional source of supply. Although the initial exploration failed to produce adequate quantities of water, the District continued to explore strategies that could increase its groundwater supply in this area. In 2009, those efforts resulted in the District securing a change in point of withdrawal for one of the acquired rights (i.e., Blue Spruce Water District – G1-*09636)) to its existing Sunday Lake Water System Well (G1-27418), in exchange for the voluntary relinquishment of other acquired groundwater rights.

Pursuant to the water right change, the District's Sunday Lake groundwater rights were increased to 130 gpm (Qi) and 100.5 afy (Qa). Due to the new primary/additive water right quantities, the Sunday Lake Water System can now serve additional homes, provide a more cost-effective option to the development of exempt wells, and improve local streamflow conditions. The expanded system capacity supplements the District's Granite Falls Regional Water Supply Project and its extensions (1992 to date), which has allowed the District to connect approximately 250 homes that were previously supplied by individual exempt wells.

8.4.2 Kayak Water System

In 2006, the District acquired the Kayak Point Water System which it now operates as a retail/satellite system. At the time of the District's acquisition, Kayak Point owned three wells, held three certificated groundwater rights(G1-23278C, G1-24415C, and G1-25989C), and was serving approximately 364 connections. The Kayak Point certificated groundwater rights were quitclaimed to the District as a condition of the system acquisition and are reflected in its updated water right table(s). It is the District's future intention to change the point of withdrawal of Kayak Point Well No.1 (G1-23278C) to either Kayak Point Well 2, or drill a replacement well for this source.

Prior to the District's acquisition, the Kayak Point Water Development Company completed a study identifying needed improvements, including a 75-foot tall by 26-foot diameter tank to replace two shorter tanks. The District moved ahead with this capital project which once completed enabled reliable service to 481 connections. On June 30, 2009, the Washington State Department of Health (DOH) approved the project construction report and reinstated the design approval of the Kayak Point System to serve 481 equivalent residential units. Such service can occur within the quantities authorized by the Kayak Point Water Rights which total 300 gpm (Qi) and 156 afy (Qa).

In the fall of 2009, Snohomish County requested that the District provide retail water service to the Kayak Point Golf Course Clubhouse from its Kayak Point Water System. Although the Clubhouse is currently served by an existing well and domestic water right, the delivery of potable supply from this source has been unreliable due to frequent power outages that affect the well and Clubhouse property. In the fall of 2010, Snohomish County further requested that the District provide potable supply to its Kayak Park restroom facilities.

In order to address public health and safety issue related to both request, the District is proposing to expand the place-of-use of two of its Kayak Point water rights (G1-22415 and G1-25989C) through this water system plan update so the District can serve the Clubhouse and Kayak Park. This retail service area/place-of-use expansion is more fully described in Chapter 2.3.7 and Figure 2-2. Both retail service area/place-of-use expansion requests have been determined by the District to not be inconsistent with the 2005 County Comprehensive Land Use Plan, the applicable zoning regulations, designated population allocation, and is within the capacity of the Kayak Point water rights and related system capacity. Such a service area expansion may therefore occur in accordance with RCW 90.03.386(2).

Table 8-3: Existing and Forecast Groundwater Rights for Retail Service Area

Permit or Certificate No.	Priority Date	Source Name/ Well No.	Flow Rate (Q_i) (cfs) or (gpm)	Annual Quantity (Q_a) (acre-feet/yr)	Well Capacity (cfs) or (gpm)	Purpose of Use	Additive or Non-Additive
May Creek G1-20625C	05/17/1973	Wells 1 & 2	200	319.5	500	Municipal	Additive
May Creek G1-*09360C Cert.#6488-A	04/04/1968	Wells 1 & 2	300	15	500	Municipal	Additive
Skylite Tracts G1-22033C	08/05/1974	Well 1	100	29.7	100	Community Domestic	Additive
Sunday Lake G1-27418C	02/09/1994	Well 3	100	40.5	130	Municipal	Additive
Sunday Lake G1-*09636C Cert.#07295	08/06/1968	Well 3	30	60	130	Municipal	Additive
Pilchuck 10 G1-26382C	11/14/1991	Well 1 + Dug Well	33	5.4	22	Multiple Domestic	Additive
Otis	n/a	Well 1	33	Exempt (5.6)[1]	33	Domestic	Additive
212 Market & Deli	n/a	Well 1	4	Exempt (5.6)[1]	4	Domestic	Additive
Kayak G1-23278C	12/20/1978	Well 1	70	72	70	Community Domestic	Additive
Kayak G1-24415C	12/14/1983	Well 2	57	42	300	Community Domestic	Additive
Kayak G1-25989C	11/29/1990	Wells 2 & 3	300	156[2]	300	Community Domestic	Additive Non-Add
Lake Stevens S1-*07584C	12/28/1946	Lake Stevens	0.5 cfs 224 gpm	362	224	Domestic	Additive
Lake Stevens G1-*00782C Cert. #168-A	03/23/1948	Well 1	1,200	700	1,200	Municipal	Additive
Lake Stevens G1-*00783C Cert.#169-A	03/23/1948	Well 2	1,200	700	1,200	Municipal	Additive
		Total	**3,774 gpm**	**2,502.1 afy**			

[1] Exempt well quantities are not included in water right table Qi/Qa calculations

[2] 57 gpm and 42 afy out of the 300 gpm and 156 afy quantities are covered by GWC G1-24415C.

9 Operations & Maintenance Overview

9.1 OPERATIONS PROGRAM

This chapter summarizes District goals and procedures to maintain water system reliability, performance, and water quality under routine and emergency conditions. Operations manuals and forms referenced in this chapter can be found in the appendices.

The goals and procedures referenced herein are reviewed periodically to respond to new or revised regulations; updated best management practices (BMPs); system modifications; and revisions in tools, equipment, and techniques. This chapter and referenced documents do not contain troubleshooting guidelines or manuals for individual pieces of equipment or treatment facilities. Such guidelines and manuals are retained at the District's Water Operations Facility and at the site of the specific equipment or treatment facilities.

9.2 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

9.2.1 Senior Manager, Operations, Maintenance, & Engineering

The Senior Manager for Water Resources Operations, Maintenance, & Engineering manages the operation, maintenance, engineering and related planning, design, and construction activities of the District's water systems. This position manages the implementation of the capital improvement plans for the water utility including design, construction, inspection, land surveys, material requirements, and right-of-way acquisitions. In addition, this position serves as or supervises the licensed Operator-in-Charge of the District's water systems. The current Senior Manager has Washington State certifications for CCS, WTPO-IT, WDM 4, and is a registered professional Civil Engineer in the State of Washington.

9.2.2 Water Superintendent

The Water Superintendent manages daily activities related to the operation, maintenance and related construction activities of the District's water systems to ensure compliance with all state and federal regulations. This position coordinates water quality testing, reporting, and record keeping ensuring compliance. This position can optionally serve as or supervise the licensed Operator-In-Charge of the District's water systems in lieu of the Senior Manager position. The current Water Superintendent has Washington State certifications for CCS, WDS, and WDM 3.

9.2.3 Water Foremen

Three Water Foremen work under the direction of the Water Superintendent. One position is responsible for system operations, a second responsible for system maintenance, and the third foreman position is responsible for construction, repair and 'heavy' maintenance (projects requiring construction equipment such as backhoe, dump truck, vacuum excavator, etc). The foremen oversee the water field crew in the performance of their work. The foremen are responsible for conducting the day-to-day operation, maintenance and repair of the water system, including treatment facilities. The Water Foremen's current certifications are listed in Table 9-1.

9.2.4 Water Maintenance and Operations Crew

Currently, the Water Crew includes ten journeyman Water Distribution Specialists and one Construction Inspector. Table 9-1 lists the current people on the water crew, including foremen and supervisors, their years of experience, current employment classifications and state certifications held.

The Water Crew, including the Water Foremen, perform routine and emergency maintenance, operations, repair and construction of the District's water systems, including collection of water quality samples and maintenance of all water treatment and pumping facilities. Crew members are available on a 24-hour/7-day basis to respond to emergencies (refer to Section 9.8.3 for a description of the District's emergency on-call system).

While all current crew members are journeymen, the District also has a two-year apprentice program, which requires passing the State Water Distribution Specialist 1 exam, to progress into the Water Distribution Specialist (WDS) classification. When a person reaches the WDS classification, further progression from WDS-1 to WDS-6 is available through accumulating sufficient experience.

The organization charts in Chapter 1 identify the structure of the Water Resources Division. Responsibilities for water system operations and maintenance are as follows:

Table 9-1 Years of Experience and Waterworks Certifications

Name	Title	Years of Experience	Certifications
Dale Aschenbrenner	Water Foreman	27	CCS, WDS, WTPO-1, WDM 3
Arlee Barker	Water Distribution Spec 6	17	WTPO-IT, WDM-3
Peggy Coker	Water Distribution Spec 6	13	CCS, WDS, WTPO-2
Lee Ervin	Water Distribution Spec 2	4	CCS, WDM-1
Brett Gehrke	Water Superintendent	17	CCS, WDS, WDM 3
Jon Grenfell	Water Distribution Spec 6	23	CCS, WDS, WTPO-2, WDM-4
Tom Heaphy	Water Distribution Spec 6	20	CCS, WTPO-IT, WDM-3
Alan Luna	Water Distribution Spec 3	9	CCS, WDS, WDM-3
Zach McKinney	Water Distribution Spec 6	13	CCS, WDS, WTPO-2, WDM-2
Mark Price	Water Distribution Spec 6	24	CCS, WTPO-1, WDM-2
Jim Rose	Construction Inspector	35	CCS, WTPO-1, WDM-2
Ryan Schank	Water Distribution Spec 6	13	CCS, BAT, WTPO-1, WDM-3
Scott Schuller	Water Foreman	24	CCS, WDS, WTPO-2, WDM-3
Howard Smith	Water Foreman	34	CCS, WDS, WTPO-1
Jamin Udman	Water Distribution Spec 6	14	CCS, BAT, WDS, WTPO-2,WDM-2
Brant Wood	Senior Manager	19	CCS, WTPO-IT, WDM-4, PE

9.2.5 Administrative Support

Administrative support is provided by two Water Service Liaisons, two Water Utility Administrators, and two Water Utility Associates. These positions coordinate schedules and maintain PC-based records of the department's activities. Job functions include maintaining daily operational records, documenting preventive maintenance work, generating work orders, responding to customer requests and complaints, payroll, accounts payable and receivable, and other administrative duties associated with maintenance and operation of the District's water systems. The Water Utility Administrators are WDS certified.

9.3 PERSONNEL CERTIFICATION

WAC 248-55 requires public water systems to have a responsible state-certified Operator-in-Charge. The Senior Manager for Water Resources Operations, Maintenance, and Engineering serves as or supervises the licensed Operator-in-Charge of the District's water systems. Certified personnel are required for positions that are in direct charge of public water systems or major segments of the system responsible for monitoring or improving water quality. The Water Superintendent serves as or supervises the licensed WTPO Operator-in-Charge of the District's treatment facilities. Field personnel have one or more state certificates. A listing of personnel certifications can be found in Table 9-1.

All certified personnel must renew their certificates annually and demonstrate continued professional growth in the field by accumulating three related college credits, or Continuing Education Units (CEUs) every three years. The District's Operations budget includes sufficient funding to ensure that all certified personnel meet CEU requirements.

9.4 ROUTINE OPERATIONS AND PREVENTIVE MAINTENANCE

The District's goal is to follow a routine schedule of operating, monitoring and maintaining facilities within its water systems. The established schedule considers the features, use and critical role of each component, the number of customers served, failure or breakdown history, availability of staff resources and industry standards for maintenance.

If work schedules cannot be completed in a timely manner, the Water Superintendent evaluates established priorities, adjusts schedules, or revises staffing assignments to ensure that important work is completed. The District's computerized maintenance management system tracks completion of work orders and any outstanding work. Exceptions are reviewed by the Sr. Manager.

In addition to visits by crew members, the District's Supervisory Control and Data Acquisition (SCADA) system electronically acquires data and monitors several status conditions at key pump stations, treatment facilities, master meters and reservoirs. Key parameters at reservoirs include water level, rate of fill or draw, intrusion, high or low alarms and status of electric power. At pump stations, key parameters include pump status, pressure, flows, intrusion, power failure, and chlorine residual where treatment is provided. At treatment facilities, key parameters include injection rates, chemical usage, pressure, flows, intrusion, power failure, and chlorine residual. When an alarm is received, a crew member is dispatched to evaluate and correct the problem. The District's SCADA system is discussed in more detail in Section 9.4.10.

Refer to Table 9-2 for a summarized maintenance frequency description for each type of District facility.

Table 9-2 Facility Maintenance Schedule (Target Frequencies)

Facility	Tasks	Continuous (SCADA)	Weekly	Bi-Weekly	Monthly	Quarterly	Annual	Other
1. Wells	Security Visit			♦				
	Production Records	♦		♦				
	Water Table	♦			♦ (Manual	Check)		
	Vibration Test						♦	
	Thermal Imaging						♦	
2. Reservoirs	Security Visit			♦				
	Climb, Ladder, Hatch, Vent				♦			
	Interior Inspect (raft)							♦ 2 yrs
	Interior Cleaning							♦ 5 yrs
	Exterior Cleaning							♦ 3-5 yrs
	Coating Inspection (steel)							♦ 2 yrs
	Re-paint (steel)							♦ 15 yrs
3. Transmission & Distribution	Flush Looped Mains							♦ 2 yrs
	Flush Dead Ends					♦	♦	♦ As needed
	Operate Isolation Valves							♦ 2 yrs
	Hydrant Maintenance							♦ 2 yrs
	Main Line PRV Maintenance						♦	
4. Pump Stations	Security Visit		♦					
	Pumping Records	♦	♦	♦	♦			
	Lubrication					♦	♦	
	Vibration Test						♦	
	Thermal Imaging						♦	
5. Treatment	Security Visit		♦					
	Disinfectant Residual	♦						

9.4.1 Wells

The District operates wells at Sunday Lake, May Creek, Lake Stevens (standby/backup wells), Pilchuck 10, Two Twelve Market & Deli, Otis, Kayak, and Skylite Tracts. The goal is to visit wells weekly (see Table 9-2). Routine maintenance of wells includes monitoring production and regularly recording of depth to the water table. With the exception of Kayak Well 3, all wells are equipped with "submersible" pumps, which prevent an operator from routinely determining the condition of the pump and motor. All of the wells are metered. Pump flow rate and well draw-down data can be compared to pump manufacturer's data to provide an indication of the pump's condition.

9.4.2 Reservoirs

The District's goal is to visit each reservoir bi-weekly, including a "walk around" inspection for security and structural condition. The District's construction standard for reservoirs includes a chain-link security fence and a climbing ladder with a lockable shield to prevent unauthorized access. If unusual activity is noticed during a routine visit, the reservoir is climbed to check the condition of the access hatch and vent.

Monthly, the goal is to climb each reservoir to observe the condition of the ladder, access hatch, vents, exterior coating, intrusion alarm, and other monitoring equipment. All access hatches are locked and designed to prevent entry of contaminants. Screens on the vents are checked at this time. The hatch is opened annually to allow a visual inspection of the interior coating, and to observe any unusual conditions.

Bi-annually, it is the goal to insert a sanitized raft into each steel reservoir, so that a more thorough inspection of the interior coating can be completed. It is desirable that on a five-year interval, each reservoir be taken out of service so the interior can be pressure-washed and the condition of the reservoir and its coating can be closely inspected.

However, this has not always been feasible where redundant reservoirs or water sources are not available. In these circumstances, firms are available to clean a reservoir while full of water. The CIP as detailed in the Water System Plan, has addressed redundancy in critical pressure zones, which will allow existing steel reservoirs to be taken out of service for recoating. It is anticipated that steel reservoirs will be recoated as needed on about a 15-year schedule.

9.4.3 Transmission and Distribution Pipelines

The District operates over 382 miles of pipelines, ranging in size from 3/4-inch to 30-inches in diameter. Materials include cast iron, asbestos cement, ductile iron, PVC and a small amount of galvanized and wrapped steel.

As water travels through the distribution system, its quality can be adversely affected. There are several factors that contribute to this, including: 1) water age (measured by the time it takes the water to travel from the source to the end user); 2) type and age of pipe (and associated corrosion by-products); 3) diminished disinfection residual, which contributes to bacteria growth in pipelines; 4) formation of disinfection by-products (DBPs); 5) cross-connections; and 6) methods used to repair main breaks.

Deterioration of water quality in the distribution system may be noticed and reported by customers as a “stale or musty” odor, an objectionable taste or color, or high turbidity (cloudiness). Water quality testing can also detect the formation of DBPs or bacterial contamination.

Common methods of dealing with these issues includes looping of piping to avoid “dead-end” mains, separating fill and outlet piping at reservoirs to circulate water, changing reservoir and pump “set points” seasonally, changing valving to occasionally “re-route” water, replacing corroded older mains, and routine main flushing where dead-ends or low-flow conditions cannot be avoided. In addition, a cross-connection control program (see Appendix 10-5) and careful repair of broken mains are required.

Currently, the District’s distribution system includes about 1,012 dead-end mains. The hydraulic model was used to establish the travel time to the extreme ends of those pipelines, and other zones within the system which are distant from the source of supply. The model was also used to optimize flushing time and valve alignment, to achieve the best results for the least quantity of flushing water. Finally, the model was also used to predict how “closing loops” (where feasible), will affect water age.

The District’s routine main flushing program will focus on several parameters, including; dead-end mains, areas with the longest travel times or “oldest water,” areas where routine monitoring shows low disinfectant residuals, and where water quality testing shows high results for HPC or DBPs. “Alert” and “Action” levels will be established for these parameters, to trigger remedial action to bring the parameter into an acceptable range.

Flushing frequency is based on the water quality parameters; however, as a minimum the District’s goal is to flush every dead-end main annually and all mains bi-annually. For those areas needing more frequent flushing, use of automated blow-offs are under consideration.

The District employs methods for repairing main breaks that minimize the potential for contaminants entering the distribution system, such as maintaining positive pressure in the main whenever possible. Other techniques include use of a spray disinfectant, lowering the water table below the level of open pipes, flushing after the repair, and follow-up bacterial testing as needed.

Another goal for distribution system maintenance and repair is a reduction in the percentage of “unaccounted-for” water, including leakage. This effort includes replacing older service meters, using SCADA to evaluate overnight flows, scheduled leak detection efforts, calibration and testing of source meters, and prompt repair of leaks when identified. Monthly production reports are routinely compared with total water sales to evaluate the effectiveness of these efforts.

9.4.4 Supply Pump Stations and Booster Pump Stations

In addition to continuous SCADA monitoring, supply and booster pump stations are visited weekly, depending upon the system and critical nature of the pump station. Routine checks include security, logging of pump condition, hour meter readings and suction/discharge pressures. In larger pump stations, the District intends to begin annual vibration monitoring to better review and document the condition of the pumps. In addition, it is the District's goal to scan the pumps and control equipment bi-annually with thermal imaging scopes to look for electrical "hot spots" that may indicate loose connections, shorts, contamination, or deterioration of electrical components.

9.4.5 Treatment Facilities

All purchased surface water is treated at the Everett filtration plant, which includes filtration, disinfection, fluoridation, and pH/alkalinity adjustment. As such, the District is not responsible for operation of major treatment facilities; however, water treatment (iron and manganese removal and disinfection) is provided at several locations and may increase as additional remote/satellite water systems are assumed by the District.

Currently, the May Creek, Pilchuck-10, Two Twelve Market & Deli and Skylite Tracts water systems are treated with sodium hypochlorite and facilities for injecting sodium hypochlorite have been provided at the Granite Falls Pump Station to ensure that chlorine residuals are maintained in the extremities of the District's Integrated System. These treatment facilities are checked routinely and are equipped with continuous chlorine residual monitors. In addition the Granite Falls Pump Station includes a "feedback loop," which adjusts the chlorine feed rate to maintain the desired amount. Records of chemical additions are retained and copies are sent to the DOH monthly.

The Sunday Lake and Kayak systems include treatment for removal of iron and manganese using sodium hypochlorite and potassium permanganate, followed by pressure filtration. These facilities are monitored continually by SCADA, and effectiveness of treatment is checked weekly at representative points in the distribution system. Monthly treatment reports are submitted to DOH.

9.4.6 Pressure Reducing Stations

The District has approximately 42 "main line" pressure reducing stations, and low control valves between pressure zones. The District's design standards include the provision of strainers ahead of the pressure reducing valves (PRVs), which reduces malfunctions in the valves. The PRVs are checked and maintained on a set schedule.

9.4.7 Fire Hydrants

The District owns over 2,300 hydrants and the number increases annually due to acquisition of satellite systems, new developer construction, District initiated projects, and/or replacements of older systems. When new hydrants are installed or as existing hydrants are acquired as part of a satellite system, each is tested and entered into the District's maintenance database.

Hydrants that are damaged, provide insufficient flow, or do not function properly are promptly repaired, upgraded or removed from service. If the District is unable to provide timely upgrades to an acquired satellite system having hydrants with deficient flows, the District contacts the applicable fire department to advise of the diminished flow, or the District may choose to remove the hydrant or disable the 'steamer port' until hydraulic improvements are made to increase the available flow (all other feasible alternatives are evaluated before the District removes a hydrant from service).

While the District's goal is to exercise all hydrants annually (which would require operation and maintenance of over 190 hydrants per month), actual performance has not met this goal. To improve this, the District's goal is to encourage fire districts to systematically inspect the District's hydrants within their protection areas and report any deficiencies. In order to minimize damage from water hammer and to improve data provided from fire districts, the District's goal is to routinely meet with the training officer from each fire district to provide information regarding proper hydrant use and possible adverse affects (water hammer), resulting from improper hydrant operation.

9.4.8 Valves

The District's systems include over 6,772 "main line" valves, and as growth and development occur, dozens of new valves are added annually. All existing and new valves are included in the District's mapping system and database. A structured valve maintenance program has been established, dedicating budgetary and staff resources to valve maintenance. The District also coordinates with state, county and city road departments so that as pavement overlay projects are scheduled, valves are raised or adjusted to prevent valves from being 'paved over' and potentially 'lost.'

While the District's goal has been to routinely operate each valve at least every two years, this has not always been feasible. In addition, the District's main flushing program incorporates operation of valves.

9.4.9 Main Flushing

The main flushing program was discussed under Section 9.4.3.

9.4.10 SCADA Network (Supervisory Control and Data Acquisition)

The District's SCADA system controls and monitors 43 supply and booster pump stations, wells, treatment facilities, master meters and reservoir sites within the District's water service area. Radio-based status changes are transmitted from each site to a base station located at the Lake Stevens Water Operations Facility. The SCADA system also forces a poll of each site every hour to assure that the site has not lost communication ability. Status conditions include information on pumps, rate of flow, power, security, pressure, water levels and more. If conditions do not match identified parameters, an alarm is sent, which immediately "pages" operations personnel. The operations person on-duty is provided with a laptop computer that, via modem, allows the operator to view the nature of the alarm and respond accordingly.

9.4.11 Staffing

Currently, the District has 20,026 water services with an operations crew of 14 people, for a ratio of one person for every 1,430 services. As the population and number of systems grow, crew size will be evaluated and adjusted to ensure that proper operation, maintenance and customer service is provided.

9.5 WATER QUALITY SAMPLING

The provision of safe drinking water to the District's customers is the issue that overrides all other tasks and functions. The water quality standards are established by the federal

Environmental Protection Agency (EPA), and are implemented and enforced by the Washington State Department of Health (DOH). The District is committed to working cooperatively with EPA and DOH to achieve compliance and ensure safe water for its customers. See Chapter 10 for additional details about the District's water quality program.

9.6 CROSS CONNECTION CONTROL PROGRAM

Since cross-connections can result in contamination of drinking water, DOH has established the minimum requirements for a utility's cross-connection control program. See Section 10.7 for additional details.

The District's Cross-Connection Program is also detailed in Section 2.10 of the District's Policies and Procedures Manual for Administration of Water Services.

9.7 DISTRICT VEHICLES

The District's vehicle fleet includes a number of vehicles and construction equipment used in operating, maintaining and repairing water systems. It is the District's goal to maintain sufficient staff, vehicles and equipment to respond to two simultaneous emergencies, such as main breaks. If sufficient equipment is not available, the Water Utility can obtain additional equipment from the District's Electric Utility, or rent equipment from a number of firms in the area. The District also maintains an on-call emergency contract with a local contractor to deal with emergencies that cannot be handled with District personnel or vehicles.

9.8 VULNERABILITY ASSESSMENT AND EMERGENCY PROCEDURE

The District has adopted both a Business Continuity Plan, which is inclusive of all of the District's departments and a departmental specific Emergency Response Plan (ERP). The Business Continuity Plan uses a modified Incident Command Structure (ICS) corresponding to its normal organizational structure and reporting relationships. This modified ICS approach allows for the coordination of the District's various departments, and the sharing of resources between the power, generation and water utilities. The Water Utility's Emergency Response Plan (ERP) is a guide for personnel to identify the utility's most vulnerable facilities, property, customers and/or services. Included in the ERP are operating procedures, emergency alert rosters, equipment suppliers/technical representatives, adjacent facilities/ utilities and a contingency plan.

In the event of an emergency that exceeds the capabilities of the Water O&M crews, staff from the District's Water Engineering and Administration groups provide additional support. Further, under the Business Continuity Plan, the resources of the entire District (including the Electric Utility which serves over 320,000 accounts), are available to respond to an emergency. The Water Utility maintains a close relationship with other District departments such as Transportation (additional vehicles and mechanics), Facilities (carpenters and electricians), Communications (radio and portable communications), Customer Service and Dispatch Departments (dispatch during evenings and weekends), and the Electric System's flagging crew. Key Water Utility staff receive training in both the Business Continuity Plan and the departmental specific ERP. Both the Business Continuity Plan and the Water Utility's ERP are on file at the Water Operations Facility.

9.8.1 Vulnerability Assessment and Rating

A vulnerability assessment (VA) considers the susceptibility of key water system components to damage, harm or failure from a variety of potential sources and emergency conditions, including; 1) natural causes (earthquakes, severe weather, floods); 2) equipment failures (breakdowns, power failure, corrosion, wearing out); and 3) man-caused (accidents, fire, dig-ups, chemical spills, vandalism, terrorism).

In addition, a VA considers the magnitude of the potential impact on customers, availability of backup facilities and methods to detect the potential or actual failure. Finally, the VA considers the probability of damage or harm, and plans should prioritize and address the most likely scenarios.

The major components of the District's water systems include; 1) sources of water supply (wells, Everett transmission pipelines); 2) pump stations (supply and booster); 3) transmission and distribution mains; 4) water treatment; and 5) reservoirs.

Sources of Water Supply

Five of the District's water systems (Lake Stevens/Integrated, Dubuque, Storm Lake, Creswell, and Lake Roesiger) are supplied by one or more of Everett's transmission lines. In 2010, these systems accounted for over 94 percent of the District's water customers and two wholesale customers (cities of Arlington and Granite Falls). The District's other systems (Sunday Lake, 212 Market & Deli, Otis, Pilchuck 10, Skylite Tracts, Kayak and May Creek) are supplied by wells. In addition, the Lake Stevens/Integrated System has standby/backup wells available.

Since over 94 percent of the District's customers are served by one or more of Everett's three transmission lines, a disruption in Everett's supply would have a major impact on the District. The city of Everett has performed a VA for its system and is engaged in a multi-year effort to reduce their vulnerability, including replacement of older sections of transmission lines. Where feasible, the District has connections to two or more of Everett's lines, so the loss of any one transmission line would not disrupt service. In addition, the District has wells capable of up to 2,400 gpm to supplement the supply to the Lake Stevens/Integrated system.

The loss of Everett's water supply would require an immediate response to activate backup wells, and notify customers to significantly curtail demand, so that water already in storage reservoirs, (supplemented by the backup wells), could address demands until service from Everett is restored.

Well supplies are susceptible to contamination from spills, nearby sources of pollution, or drought conditions resulting in an extraordinary decline in the water table. The District's Wellhead Protection Plan (Appendix 9-1) has identified potential sources of contamination in the vicinity of each well, which if a "release" of pollution occurred, could result in groundwater contamination. The program requires that the District notify those responsible for such potential sources of contamination of the existence of the well in expectation that the District would be informed if a leak or spill occurred. Since groundwater contamination usually spreads fairly slowly, advance notice of a spill would give the District time to respond before the contamination actually reached the well.

Where a responsible party or “owner” cannot be readily identified (such as for a potential spill from an overturned truck), the Wellhead Protection Plan requires that the District work with emergency response agencies (Washington State Patrol, Department of Transportation, Snohomish County, Department of Ecology), to inform those agencies of the existence of wells, thus if a spill were to occur, the responding agencies would notify the District.

Finally, the Wellhead Protection Plan requires that residents in the vicinity of wells be advised that contamination or spills on the ground surface may contaminate a well. The intent is that those living closest to such wells will be responsible stewards, and report sources of potential contamination to the District.

The District monitors the water table in all of its wells monthly, so during severe drought conditions, the District would have advance knowledge if the water table were declining to very low levels, which would prompt efforts to restrict water usage. None of the District’s wells are within the 100-year floodplain of a major stream.

Based on the VA summarized in Appendix 9-2, the water sources are most vulnerable to natural disasters such as earthquake, flood, landslide, drought and equipment failures.

Pump Stations (Supply and Booster)

The District has supply pump stations (SPS) drawing water from Everett’s pipelines and booster pump stations (BPS) which supply water to customers at higher pressure zones as detailed in Chapters 2 and 5.

The VA indicated that pump stations were most susceptible to disruption from power outages followed by equipment breakdown. To mitigate for this, redundant pumps are provided and at several of the SPSs and the larger BPSs are equipped with a transfer switch and a plug to run the pumps using a portable generator. The Water Utility owns six generators (two trailer mounted, two portable and two fixed) which are fueled by gasoline, diesel and propane. In the event of an extended power outage, the portable generators would be transported to various sites, to activate the pumps.

Transmission and Distribution Mains

The District’s water systems include over 382 miles of pipelines. The distribution system is most susceptible to damage from “dig-ups,” “water hammer,” earthquakes and corrosion/deterioration of piping materials. To mitigate for this, the District’s construction standards specify the use of Class 52 ductile iron pipe for new and replacement construction, which is the type of pipe that is least susceptible to damage. In addition, the District’s CIP includes a systematic approach for replacing the most susceptible transmission and distribution mains (AC, steel, and galvanized).

Since there is a considerable amount of these types of pipe within the District’s systems, the replacement program has established the following priorities: 1) where failures (leaks and main breaks) are most frequent; 2) where new construction (roads, sidewalks, other utilities) impacts older mains; 3) where physical conditions (actual or potential landslides) jeopardize mains; 4) where mains have insufficient capacity to supply current or anticipated demands; and 5) when a main has deteriorated with age.

Water Treatment

Treatment is provided at Sunday Lake and Kayak (iron and manganese removal), May Creek, Pilchuck-10, Two Twelve Market & Deli and Skylite Tracts and Granite Falls BPS (chlorination).

The VA indicated that the treatment facilities are most susceptible to earthquakes, mechanical breakdown, corrosion, power failure, and chemical spills.

To mitigate for this, secondary containment is provided to retain any chemical spills, corrosion resistant equipment components are used, and the facilities are visited and maintained routinely.

Reservoirs

The District has a combination of steel and concrete reservoirs as described in Chapters 2 and 5. The primary threats to reservoirs are earthquakes, vandalism, and unauthorized entry. Tall structures are more vulnerable to earthquakes than shorter facilities. All reservoirs have been built in accordance with applicable seismic codes, and are secured with chain link fencing, ladder locks and locks on access hatches. The District has installed intrusion alarms, motion detectors, and lighting at several sites to discourage and detect unauthorized use of ladders.

Should a major power outage occur within a water service area, water reservoir levels and intrusions would still be monitored by SCADA using backup batteries.

In the event that the security of a reservoir is violated (climbed, and the hatch opened), the affected reservoir(s) would be “valved off” and the water would be tested before the facility would be placed back into service.

9.8.2 Other Factors for Dealing with Emergencies

Security

Security must be in place to protect system integrity, deter or delay access, and alert personnel who will respond appropriately. All pumping and treatment facilities, control equipment and storage reservoirs are securely fenced and locked when they are unattended. The major facilities are equipped with intrusion sensors and intrusions are alarmed, and monitored via SCADA. In addition, staff routinely visits facilities, and neighbors have been asked to report any unusual activity at the District’s facilities.

Availability of Personnel

Trained staff is available to respond to emergencies 24 hours a day, 7 days a week. The District’s 24 by 7 Dispatch Center contacts the Water Utility’s on-call duty person, who then responds to after-hour emergencies. The Dispatch Center maintains lists of available specialized personnel; including engineering, warehousing, environmental, transportation and other support personnel if their assistance is needed in an emergency. If more people are needed, staff from the District's Electric Utility would be available to assist (spill response, safety, heavy equipment operators, flaggers, etc).

Communications

District staff utilize conventional and cellular telephones, mobile radios, e-mail, fax or mail services to stay in contact with each other. A Corporate Communications Department is available to notify customers and the news media of emergency conditions in the water system. Mobile radios and telephones are installed in all vehicles. A personnel roster with assigned radio call numbers, pagers, home and cell phone numbers has been provided for all staff. The District's Dispatcher is equipped to communicate with all field personnel listed in the roster (see Table 9-3) by cellular phone, mobile radio or landline.

Table 9-3 Emergency Notification Numbers

(Area Code is 425 Unless Indicated)

Name	Title	Office Phone	Mobile Phone
Emergency Notification Roster – PUD Staff During Business Hours			
24- hour System Dispatch	After Hours Number	783-5040	N/A
Water Operations Facility	Day Time Number	397-3000	N/A
Kim Moore	AGM, Water Resources	783-8606	530-6936
Brant Wood	Sr. Manager, Water Resources Ops	397-3003	750-3954
Zeda Williams	Sr. Manager, Administration	397-3001	239-5576
Eric Schneider	Sr. Engineer	397-3032	293-7218
Al Cohen	Sr. Engineer	397-3033	879-5580
Karen Heneghan	Sr. Engineer	397-3037	206-841-9117
Brett Gehrke	Water Superintendent	397-3005	359-0403
Scott Schuller	Water Foreman	397-3052	239-0794
Howard Smith	Water Foreman	397-3050	239-6471
Dale Aschenbrenner	Water Foreman	397-3051	239-5763
Jim Rose	Construction Inspector	397-3038	339-6998
Arlee Barker	Water Distribution Specialist	397-3000	418-6830
Mark Price	Water Distribution Specialist	397-3000	238-3153
Jamin Udman	Water Distribution Specialist	397-3000	879-6704
Peggy Coker	Water Distribution Specialist	397-3000	879-2464
Ryan Schank	Water Distribution Specialist	397-3000	501-0596
Jon Grenfell	Water Distribution Specialist	397-3000	238-5279
Zach McKinney	Water Distribution Specialist	397-3000	238-0897
Tom Heaphy	Water Distribution Specialist	397-3000	239-2651
Lee Ervin	Water Distribution Specialist	397-3000	327-4499
Alan Luna	Water Distribution Specialist	397-3000	367-2017

Table 9-3: Emergency Notification Numbers (continued)

(Area Code is 425 Unless Indicated)

Name	Title	Office Phone	Mobile Phone
Emergency Notification Roster – PUD Staff During Business Hours (cont.)			
Joe Jirak	Engineering Tech	397-3030	263-0022
Misty Stevens	Water Service Liaison	397-3016	N/A
Laurie Wade	Water Service Liaison	397-3014	N/A
Lois Stone	Water Utility Associate	397-3015	N/A
Jane Eckstrom	Water Utility Associate	397-3010	N/A
Jennifer Mason	Water Utility Administrator	397-3013	N/A
Tracy Boggs	Water Utility Administrator	783-1704	N/A
City and County Agencies – Emergency Contacts During Business Hours			
City of Lake Stevens		334-1012	N/A
Snohomish County Sheriff		911 or 388-3393	N/A
Snohomish County Emergency Management		388-5060	N/A
Snohomish County Public Works		388-3488	N/A
Snohomish County Health District		339-5200	N/A
Snohomish County Fire Districts:			N/A
No. 4 – Snohomish		911 or 360-568-2141	N/A
No. 8 – Lake Stevens		911 or 334-3034	N/A
No. 12 – Marysville		911 or 360-363-8500	N/A
No. 26 – May Creek		911 or 360-793-1335	N/A
Lake Stevens Sewer District		334-8588	N/A
DOH NW Regional Office		253-395-6750	N/A

Interties

The District maintains two emergency interties with systems other than the city of Everett; a 6-inch emergency intertie with the city of Marysville at 40th Street NE and 71st Avenue NE; and an intertie with the city of Gold Bar and is located at May Creek Road. While these interties are rarely used, they would be available for mutual aid in the event of a major emergency.

Auxiliary Power

As discussed previously, auxiliary power is available to all of the District's critical facilities through the use of emergency generators:

1. The Water Operations Facility is equipped with a standby generator, which is capable of providing power to the entire site. Telcom, computer, radio, and SCADA capabilities remain operational during power outage events. The site is equipped with an automatic transfer switch that transitions from normal line power to the standby generator during a power outage event.

2. A trailer mounted 100kw diesel generator, stored at the Hillcrest booster pump station, normally acts as a direct standby power supply to the Hillcrest pump station, but could be transported to serve other pump stations if needed. The site is equipped with an automatic transfer switch that transitions from normal line power to the standby generator during a power outage event.
3. A stationary 100kw diesel generator is stored at the Walker Hill reservoir to serve the Walker Hill booster pump station. The site is equipped with an automatic transfer switch that transitions from normal line power to the standby generator during a power outage event.
4. A trailer mounted 100kw generator is stored at the Lake Roesiger pump station, and it would be available to serve other pump stations if needed. The site is equipped with an automatic transfer switch that transitions from normal line power to the standby generator during a power outage event.
5. A 10kw stationary propane-fueled generator supplies emergency power to the Skylite Tracts water system. The site is equipped with an automatic transfer switch that transitions from normal line power to the generator standby during a power outage event.
6. A 200kw stationary diesel generator provides emergency power to the Granite Falls pump station. The site is equipped with an automatic transfer switch that transitions from normal line power to the generator standby during a power outage event.
7. The Lake Stevens well site has no emergency power backup but is equipped to accept connection to a mobile generator.
8. The Soperwood supply pump station, Machias pump station, Glenwood booster pump station, Bosworth booster pump station, Storm Lake supply pump station, Storm Lake booster pump station. The May Creek and Kayak well sites do not have emergency power backup on site, but are equipped with a plug and transfer switch to rapidly accept power from a trailer-mounted generator.
9. Two trailer-mounted 10kw diesel generators are located at the Water Operations Facility, and can be dispatched to booster pump station sites as needed during power outage events.
10. A small gasoline generator is located at the Pilchuck 10 water system.

Materials, Supplies, and Technical Representatives

The District maintains a large inventory of routine and emergency materials and supplies at the Water Operations Facility and at strategic remote locations. The District also coordinates with other utilities and vendors to maintain an inventory of materials and supplies, including emergency repair parts at District facilities and/or at vendor sites.

9.8.3 Contingency Plan

Emergency Roster

Emergency rosters listing contact phone numbers for District staff and other local/state agency personnel during business hours are included as Table 9-3. The District maintains a listing of personal telephone numbers should there be an emergency after regular business hours. A copy of these, with telephone numbers, is kept on file by District management and Electric System Dispatch personnel. Field personnel are assigned standby responsibilities on a rotating basis for after-hour callouts. Additional personnel are called as necessary based on the severity of the emergency.

Department of Health Notification

The Sr. Manager or designee will immediately notify DOH, in the event a water shutdown is required for more than 24 hours, or where water quality is determined to be unacceptable, or in any instance where public health is threatened.

Priorities

Where there is damage to District facilities, the Sr. Manager or designee will assess damages and prioritize operational efforts, repairs and/or reconstruction.

The order of priority includes:

1. Preservation of public health and safety: During an emergency, a water system serves a dual role of providing water for public health (consumption, sanitation and food preparation), and public safety (fire protection). The District would strive to satisfy both roles; however, the District's primary focus would be in support of public health.
2. Water quantity and quality: The District strives to provide a high quality product at all times, however, during extreme conditions, "boil water" orders, or manual "dosing" of chlorine in reservoirs could be used if water was available but its quality was unreliable. The priority would be to use the safest possible source of water and keep users informed.
3. Service delivery: The District would first focus on providing service to major population centers, hospitals, nursing homes, emergency centers (shelters, control centers). Subsequently, efforts would shift focus to less populated residential areas and businesses.

Location of Activities and Responsibilities

Large incidents or disasters may trigger the activation of the District's Emergency Operations Center (EOC). The EOC will be located in the Commission Meeting Room at the Snohomish County PUD Electric Headquarters building (2320 California Street, Everett WA. 98201). Should the Electric Headquarters building be unavailable, the EOC will be located in the Central Conference Room at the District's Operations Center (1802 75th St SW, Everett WA 98203).

The District's Assistant General Manager (AGM) of Water Resources will keep the Board of Commissioners and the General Manager apprised of the current status of all emergency situations and as appropriate, may request the activation of the EOC.

In the event of a District-wide emergency (including the Electric Utility), the District's AGMs will convene as the Crisis Management Team and will:

1. Analyze the situation and requests for assistance;
2. Establish priorities for District response;
3. Provide short-term planning (i.e., employee direction, return to work, restoration of work, media campaign);
4. Receive and evaluate reports and assessments from the Emergency Operations Center (EOC);
5. Structure requests for outside assistance;
6. Provide for the continuation of business and the resumption of business.

The Sr. Managers will report to the Water Operations Facility, or if required, the EOC and will:

1. Receive and record damage and injury assessments;
2. Coordinate the engineering response;
3. Coordinate the District's activities with outside organizations and agencies;
4. Coordinate requests for assistance from outside organizations and agencies;
5. Coordinate the treatment and movement of the injured;
6. Provide notification to and from families;
7. Work with Corporate Communication to communicate with the media, the public, and with District employees;
8. Direct damage mitigation, repair, and alternate site selection;
9. Document the use of District resources during the emergency;
10. Provide status summaries, as requested.
11. Coordinate with the Crisis Management Team;

The Water Superintendent will report directly to the Water Operations Facility and will:

1. Assess the disaster;
2. Keep the Water Sr. Managers informed;
3 Direct emergency operations;
4. Oversee repair operations;
5. Work closely with the Water Foremen for allocations of materials, equipment and personnel.

The Water Foremen will work closely with the Water Superintendent and will:

1. Assess system damage;
2. Make contact with end users regarding health and safety matters;
3. Direct the water field crew in implementing and completing repairs and/or reconstruction;
4. Document actions taken by the field crew;
5. Work closely with the Warehouse Storekeeper for allocation of materials, equipment, and supplies.

The Water Field Crew will:

1. Assist in assessing system damage and parts/supplies needed to effect repairs;
2. Assess remaining, undamaged equipment and supplies;
3. Execute repairs;
4. Maintain contact with Water Foreman.

Warehouse Storekeeper will:

1. Work closely with Water Foremen to ensure adequate materials, equipment, and supplies are allocated;
2. Work closely with the District's Warehouse Department to ensure sufficient materials, equipment, and supplies are available.

The Water Engineering Group will:

1. Assist in assessing system damage;

2. Assist in assessing remaining, undamaged equipment and supplies;
3. Maintain contact with Operations Sr. Manager;
4. Assess water quality and possible remediation;
5. Assist Operations Sr. Manager in establishing priorities.

The Water Administrative Services Group will:

1. Answer the telephone at the Water Operations Facility;
2. Maintain contact with the field crew through the use of mobile radios, telephone, cellular phone, and/or pagers;
3. Assist in documenting actions;
4. Be responsible for keeping the District's Customer Service Department informed;
5. Assist in answering customer inquiries from the Electric Building.

10 Water Quality and Compliance

10.1 WATER QUALITY

The provision of a safe and reliable supply of water to Snohomish County PUD customers is of highest priority. All functions including administrative services, engineering design, and operations/maintenance serve to maintain and/or enhance water quality; all other functions are secondary to that task.

To provide for this, high quality facilities are constructed, operation and maintenance programs are implemented, and programs such as cross-connection control are put into place to protect and enhance water quality. Those issues have been discussed in other chapters of this Water System Plan.

The purpose of this chapter is to discuss the program that is in place to monitor water quality. Since water quality can be adversely affected in a number of ways, the monitoring program is the final test of how well the systems have been designed, operated, and maintained. Further, this chapter identifies anticipated emerging water quality issues so the District continues to be a leader in responding to water quality issues before they become requirements.

10.2 WATER QUALITY MONITORING - INTEGRATED SYSTEM

Drinking water quality is regulated in the United States by the Environmental Protection Agency (EPA). Under provisions of the Safe Drinking Water Act (SDWA), the EPA may delegate primary enforcement responsibility for water quality control to each state. The state of Washington has primacy, and the Department of Health (DOH) is the agency responsible for implementing drinking water regulations at least as stringent as the federal regulations. State drinking water regulations can be more stringent than federal regulations, but they cannot be less stringent. The current and future water quality regulations and their potential impact to the Snohomish County PUD are discussed in this chapter.

10.3 CURRENT REGULATIONS

The state of Washington, which maintains primacy over drinking water regulations, has published the Washington Administrative Code (WAC). The Washington drinking water regulations are contained in Chapter 246-290 of the Washington Administrative Code. WAC 246-290-300(2)(a) specifies the following:

> When one public water system sells water to another public water system, the purveyor of the selling system shall conduct source monitoring required by the chapter for sources under their control.

WAC 246-290-300(2)(b) specifies the following:

> "Distribution system monitoring. The purveyor of a system that receives and distributes water shall perform distribution-related monitoring requirements. Monitoring shall include, but not be limited to, the following:
>
> (i) Collect coliform samples . . .;

(ii) Collect disinfection by-product samples . . .;

(iii) Perform the distribution system residual disinfectant concentration monitoring … as required under WAC 246-290-451or 246-290-694…;

(iv) Perform lead and copper monitoring under 40 CFR 141.86, 141.87, and 141.88;

(v) Perform the distribution system monitoring in accordance with 40 CFR 141.23(b) for asbestos if applicable.

(vi) Other monitoring as required by the department.

As a wholesale customer of the city of Everett, the District's Integrated System is required to comply with the specific drinking water regulations listed above. In general, the District must comply with regulations that apply to finished water impacts associated with chlorine in the distribution system. For the District's purchased water supply, the city of Everett is responsible for maintaining and documenting compliance with all requirements covering source water monitoring, MCLs for specific compounds, filtered water quality, and disinfection contact time.

The following is the District's compliance status for those regulations for which the District is responsible for demonstrating compliance within its Integrated System.

10.3.1 Total Coliform Rule (TCR) and Coliform Monitoring Plan (CMP)

The District maintains two separate Coliform Monitoring Plans. The first plan addresses the District's Surface Water Systems, the second covers District-owned Groundwater Systems. Both plans can be viewed in Appendix 10-1. The latest versions of the CMP states that the District will collect a minimum of 50 samples per month from 50 designated areas within the Integrated System. Sites in both the Lake Stevens Integrated and other District-owned systems were selected to ensure that representative sections of the distribution system are used for bacterial sampling. These same sites are used for monitoring of disinfection residuals in the distribution system. A subset of these sites is also used to monitor Disinfection By-Products and Heterotrophic Plate Counts.

The TCR requires purveyors to periodically review and evaluate the potential need to change sample locations in order to account for distribution system changes that may have occurred, and/or are expected to occur over time. This approach will ensure that as a system expands representative monitoring will be achieved on an ongoing basis.

10.3.2 Disinfection By-Product (DBP)Rule and DBP Monitoring Plan

D/DBPR Stage 1: The District has been monitoring DBPs, including Trihalomethanes (THMs) and Haloacidic Acid 5 (HAA5) in the distribution system for many years in order to maintain compliance with the existing DBP standards. TTHM sample results, collected from the Lake Stevens Integrated System, have ranged in concentrations from 24.5 to 61 ppb, with an average concentration of 40.7 ppb (2002 through 2009). HAA5 samples collected during the same time period ranged from 12.7 to 49.4 ppb with an average concentration of 29.4 ppb. Therefore, the District has consistently met the current MCL of 80 ppb for Total THMs and 60 ppb for HAA5's.

The District's Stage 1 D/DBP monitoring plan uses four sites in the Lake Stevens Integrated System for DBP sampling. The sites are all located downstream of where water is rechlorinated at the Granite Falls booster pump station (GFBPS). The plan was originally written in 2002, and although minor updates have been made to reflect changes in monitoring sites, additional revision of the plan is needed. The monitoring plan includes the Lake Stevens Integrated System, and monitoring locations within other District-owned water systems with DBP monitoring requirements. The Stage 1 Disinfection Monitoring Plan can be viewed in Appendix 10-2.

To select the Stage 1 sites within the Lake Stevens Integrated System, hydraulic modeling studies were conducted. “Time of travel” hydraulic modeling studies (up to 400 hours of residence time in the distribution system), indicated that the water age at all four sites is greater than 50 percent of the maximum residence time. The site with the maximum residence time is Site # 25, 2020-155th Ave NE, as shown in the coliform sampling plan. In addition to DBP monitoring, monthly chlorine residuals are collected at all 50 routine coliform monitoring sties, and an automatic, continuous chlorine residual analyzer is installed at the GFBPS.

In addition to the Lake Stevens Integrated Water System, the District is the owner of ten Group A Systems with varying Disinfection By-Product monitoring requirements. The following is a summary of Stage 1 D/DBP results listing the range detected and the five year average of results (2005 to 2009).

Table 10-1: Other Group A Water Systems D/DBP Monitoring Results

Surface Water Systems:		Range:	Five-year Average:
Dubuque	HAA5: TTHM:	12.7 - 39 ppb 25.1 - 47.1 ppb	25.5 ppb 31.8 ppb
Creswell (Formerly Butterfield)	HAA5: TTHM:	18.5 - 38.4 ppb 17 - 58 ppb	25.9 ppb 31.4 ppb
Lake Roesiger	HAA5: TTHM:	9.8 - 43.2 ppb 21.3 - 47.7 ppb	22.5 ppb 38.7 ppb
Storm Lake	HAA5 : TTHM:	19.1 - 44.8 ppb 25.7 - 47.7 ppb	26.3 ppb 40.4 ppb
Groundwater Systems:			
212th Market	HAA5: TTHM:	0 - 1.9 ppb 5.6 - 10.2 ppb	1.4 ppb 10.5 ppb
*Kayak Estates	HAA5: TTHM:	4.7 - 4.7 ppb 11.3 - 11.3 ppb	4.7 ppb 11.3 ppb
May Creek	HAA5: TTHM:	0 - 1.4 ppb 0.6 - 4.0 ppb	0.9 ppb 1.9 ppb
Pilchuck - 10	HAA5: TTHM:	1.0 - 2.8 ppb 2.7 - 7.8 ppb	1.7 ppb 5.2 ppb
Skylite Tracts	HAA5: TTHM:	0 - 1.2 ppb 0 - 1.5 ppb	0.1 ppb 40.4 ppb
Sunday Lake	HAA5: TTHM:	7.7 - 27.8 ppb 6.1 - 58.9 ppb	18.4 ppb 39.7 ppb

**Disinfection of the Kayak Water System began in August of 2009.*

D/DBPR Stage 2: The Stage 2 Disinfectants and Disinfection By-Products Rule (Stage 2 DBP) and the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2) were both published in the Federal Registry in January 2006. The Stage 2 DBP rule applies to all public water supplies that treat with a primary or residual disinfectant other than UV. The rule requires all systems to evaluate their distribution systems, identifying locations with high levels of disinfection byproducts that will become the sampling sites. The rule also requires systems to meet the MCLs for the TTHM and HAA5 as an average at each of the new monitoring locations instead of as a system-wide average as was allowed with the Stage 1 DBP. Due to the diversity of water systems owned by the District, multiple paths were followed in meeting the requirements of the Stage 2 Disinfectants and Disinfection By-Products Rule. The District conducted system specific studies and obtained 40/30 and Very Small System (VSS) Waivers, where applicable. A summary of District's Stage 2 requirements and monitoring schedules can be viewed in Appendix 10-2.

10.3.3 Surface Water Treatment Rule

Of the requirements stipulated by the SWTR, only one requirement is applicable to the District. The majority of the burden of compliance with the SWTR lies with the city of Everett, the water supplier.

Under the SWTR, the District is required to demonstrate detectable residual chlorine concentrations in at least 95 percent of the samples collected in a calendar month. The District gathers information on measured free chlorine residuals at the coliform sampling points which are located throughout each of the District's systems.

From the available data for surface water systems served by the District in 2005 through 2009, measured free chlorine residuals have ranged from 0.11 to 2.2 mg/L. Data for groundwater systems have measured 0.10 to 1.74 mg/L in the same time period. Thus, the District has maintained compliance with the applicable requirement of the SWTR. Provided that no significant changes in water quality or chlorine dosing levels occur, the District will continue to comply with the requirement.

10.3.4 Lead and Copper

The city of Everett organized and managed a group sampling effort to demonstrate compliance with the Lead and Copper Rule. During a six-month period in 1992, a total of 26 water districts and cities participated in the Everett Consecutive System Sampling Plan. From the data for this period, the 90th percentile lead concentration was 0.013 mg/L and the 90th percentile copper concentration was 0.79 mg/L. Therefore, the results demonstrated compliance with both the lead and copper limits. The District continues to participate in the Everett Consecutive System Sampling Plan for Group A surface water systems. Refer to Table 10-2 for historical 90th percentile results.

The Lead and Copper Rule dictates that sampling for the District's groundwater systems be conducted every third year. Sampling for the Kayak, May Creek, Skylight Tracts, and Sunday Lake systems have yielded results for lead in the range from Not Detected (ND) to 0.012 ppm. Results for copper ranged from 0.009 to 0.404 ppm. All results were well below established MCL's. One exception is the Pilchuck 10 water system. In the May 2010 preliminary Lead and Copper sampling, two of the five homes sampled exceeded the MCL for copper. After consulting with the Department of Health and considering various options such as additional treatment to the groundwater source, the District decided to modify an existing capital improvement project, which will bring a surface water source of supply to the Pilchuck 10 water system. This capital water main extension project is scheduled for 2011.

Table 10-2: Everett Regional Lead & Copper Monitoring Results

	90th Percentile (mg/L)	
Sample Period	**Lead**	**Copper**
1993	0.010	0.407
1996	0.008	0.371
1997	0.006	0.186
2000	0.003	0.130
2003	0.003	0.068
2006	0.003	0.072
2009	0.003	0.188

10.4 WATER QUALITY MONITORING – OTHER GROUP A SYSTEMS

The District samples and monitors water quality in accordance with the State Drinking Water Regulations for Group A Public Water Systems, Chapter 246-290 WAC. The water quality monitoring requirements for the District are presented in Appendix 10-3. The monitoring requirements vary depending on the source of water for the specific system (Everett source or groundwater).

As source water supplier for the District's Integrated, Dubuque, Creswell, Lake Roesiger, and Storm Lake systems, the city of Everett is responsible for the monitoring of any source water quality parameters. The District's water quality monitoring requirements for surface water systems consist of asbestos, bacteriological monitoring, chlorine residual, lead and copper, DBPs, and other parameters as directed by the EPA or DOH. Groundwater monitoring consists of asbestos, bacteriological monitoring, chlorine residual, lead and copper, DBPs, VOCs, SOCs, IOCs, radionuclides, and other parameters as directed by the EPA or DOH.

Based on the population served by each Group A system, the District is required to collect a minimum number of bacteriological samples monthly. These routine samples are collected throughout the District's service area and are representative of water quality throughout the distribution system. Both the surface and groundwater plans can be viewed in Appendix 10-1. Historic records of bacteriological monitoring samples are recorded and maintained on file for five years.

DBP compliance monitoring is conducted in accordance with DOH WAC 246-290-300(6), and has been completed successfully by the District over the past several years. It is not anticipated that compliance status will change in the future.

10.5 CONSUMER CONFIDENCE REPORTS & PUBLIC NOTIFICATION RULE

Under the SDWA 1996 Amendments, community water systems are required to provide an annual Consumer Confidence Report (CCR) on the source of their drinking water and levels of any contaminants found. The annual report must be supplied to all customers prior to July 1 of each year and must include:

- Information on the source of drinking water;
- A brief definition of terms;
- If regulated contaminants are detected, the maximum contaminant level goal (MCLG), the maximum contaminant level (MCL), and the level detected;
- If an MCL is violated, information on health effects;
- If EPA requires it, information on levels of unregulated contaminants; and
- Arsenic education language (which applies to the Sunday Lake system only).

As a wholesale supplier, the District must also provide its wholesale customers with the necessary water quality data and other related information needed to prepare their own CCRs by April 1st of each year.

The District's first CCR was distributed in 1999, and has been delivered to customers every year since. The District currently produces two separate Consumer Confidence Reports; the first report addresses the Lake Stevens Integrated System and all other surface water Group A systems. The second report is written for customers who receive water from groundwater sources. The CCRs mailed to District customers in June of 2010 and the most recent city of Everett CCR can be viewed in Appendix 10-4.

While the CCR provides annual "state-of-the-water" reports, the Public Notification Rule directs utilities in notifying customers of non-acute and acute violations when they occur. In the event that District results for coliform or chlorine residual exceed a maximum contaminant level, the District is required to notify the Department of Health in accordance with WAC 246-290-495.

Public notification is designed to protect public health. As a public water supplier, the District is required by law to prepare and distribute public notification to consumers. Public notification is required by the District if any of the following conditions apply;

- The District violates a drinking water quality or monitoring requirement;
- Is operating under a variance or exemption;
- Has any situation that poses a public health risk, such as a disruption in service;
- Receives an order from the Office of Drinking Water;
- Fails to comply with an ODW order;
- Receives a red operating permit.

Public notification timing and distribution requirements depend on the level of threat associated with the violation or event, such as:

Tier 1 (Immediate Notice, Within 24 Hours) Notice as soon as practical or within 24 hours via radio, TV, hand delivery, posting, or other method specified by the Department of Health, along with other methods if needed to reach persons served. The District must also initiate consultation with DOH within 24 hours. DOH may establish additional requirements during consultation.

Tier 2 (Notice as Soon as Possible, Within 30 Days) Notice as soon as practical or within 30 days. Repeat notice every three months until violation is resolved. Notices shall be delivered via mail or direct delivery. DOH may permit alternate methods. The District must use additional delivery methods reasonably calculated to reach other consumers not notified by the first method.

Tier 3 (Annual Notice) Notice within 12 months; repeated annually for unresolved violations. Notices for individual violations can be combined into an annual notice (including the CCR, if public notification requirements can still be met). Notices shall be delivered via mail or direct delivery.

10.6 EMERGENCY RESPONSE PROGRAM

Back-up facilities and safety procedures for the major elements of the water system were previously identified under Chapter 9 (Operations & Maintenance) of this Water System Plan. A comprehensive Emergency Response Plan and Business Continuity Plan have been prepared by the District. The following elements are being included in the ERP:

- Vulnerability analysis of major facilities;
- Emergency operations procedures;
- Inventory of material, supplies and chemicals;
- Emergency contacts and phone numbers;
- Interagency agreements.

10.7 CROSS-CONNECTION CONTROL PROGRAM

The Snohomish County PUD Board of Commissioners adopted Resolution 2535 which declares cross-connections that endanger water quality to be unlawful, and which requires the installation of backflow prevention devices. This resolution adopts the Washington State regulations and the American Water Works Association guidelines regarding cross-connection control. A copy of the resolution is contained in Appendix 10-5. A Water Resources engineer within the organization has been assigned the task of further developing and implementing this program.

10.8 ANTICIPATED WATER QUALITY REGULATIONS

As drinking water regulations are continuously changing, it is important that District staff continue to anticipate and track the development of these regulations. A few regulations on the horizon are as follows:

10.8.1 Total Coliform Rule Revisions

Currently, the EPA is proposing revisions to the 1989 Total Coliform Rule. The proposed revisions require systems that have an indication of coliform contamination in the distribution system to assess the problem and take corrective action that may reduce cases of illnesses and deaths due to potential fecal contamination and waterborne pathogen exposure.
This proposal also updates provisions in other rules that reference analytical methods and other requirements in the current TCR (e.g., Public Notification and Ground Water Rules).

10.8.2 Radon

EPA proposed new regulations to reduce the public health risks from radon on November 2, 1999 in the Federal Register (64 FR 59246). The proposed standards will apply to community water systems that regularly serve 25 or more people and that use groundwater or mixed ground and surface water (e.g., systems serving homes, apartments, and trailer parks). They will not apply to systems that rely on surface water where radon levels in the water are very low. The proposal will provide states flexibility in how to limit exposure to radon by allowing them to focus their efforts on the greatest radon risks - those in indoor air - while also reducing the risks from radon in drinking water.

The unique multimedia framework for this proposed regulation is outlined in the Safe Drinking Water Act as amended in 1996. The proposed regulation offers two paths to compliance:

- First Option:
  The state can choose to develop enhanced state programs to address the health risks from radon in indoor air -- known as Multimedia Mitigation (MMM) programs -- while individual water systems reduce radon levels in drinking water to 4,000 pCi/L (picoCuries per liter), or lower. EPA is encouraging states to adopt this option because it is the most cost-effective way to achieve the greatest radon risk reduction.
- Second Option:
  If a state chooses not to develop an MMM program, individual water systems in that state would be required to either reduce radon in their system's drinking water to 300 pCi/L or develop individual local MMM programs and reduce levels in drinking water to 4000 pCi/L. Water systems already at or below 300 pCi/L standard would not be required to treat their water for radon.

10.9 LABORATORY CERTIFICATION

The District uses state-certified laboratories for sample analyses.

10.10 WATER QUALITY SAMPLING & VIOLATION RESPONSE PROCEDURES

This provision of providing safe drinking water to the District’s customers is the issue that overrides all other tasks and functions. The water quality standards (Maximum Contaminate Levels – MCLs) are established by the federal Environmental Protection Agency (EPA), and are implemented and enforced by the Washington State Department of Health (DOH). The District is committed to working cooperatively with EPA and DOH to achieve compliance and ensure safe water for its customers.

10.10.1 Monitoring

The frequency, number, and type of water quality tests required of the District’s different systems vary. The District’s coliform monitoring plans are found in Appendix 10-1, while other water quality monitoring requirements can be viewed in Appendix 10-3. As population growth occurs and as additional requirements are imposed, the District adjusts the quantity and frequency of samples collected to conform to regulatory requirements.

10.10.2 Reporting and Public Notification

The results of required water quality testing are provided to the District and DOH by the testing laboratories. Annually, the District's water customers are also informed of the test results through distribution of an annual Consumer Confidence Report (CCR) (see Appendix 10-4). The CCR lists results of the tests that have been performed, including any violations of MCLs.

10.10.3 Customer Inquiries and Record Keeping

The District is dedicated to providing good customer service and timely responses to customer inquiries. Inquiries are documented and tracked using a District-supported software system and the data is used to establish trends, focus maintenance and flushing efforts, and to obtain valuable feedback from customers. In addition, the District logs various inquiries relating to leaks, main breaks, pressure, and other service issues.

10.11 TREATMENT AND MONITORING VIOLATION PROCEDURES

The District has established procedures in conformance with WAC 246-290-495 (Public Notification) for cases when the system violates a primary water quality standard or fails to meet treatment, monitoring, and analytical testing requirements (see Appendix 10-6 for sample notifications).

Public notices must provide a clear explanation of the violation, adverse health effects, remedial action being taken, and steps the consumers should take to minimize risk. Notices are to be distributed by newspaper notice, by direct mail, or hand-delivery within specific time frames depending on the nature of the violation. If the violation is for acute coliform, nitrate, waterborne disease outbreak, or other acute violation determined by the DOH, there would be broadcast media announcements within 72 hours of the violation. The District closely coordinates all public notifications with DOH and the Snohomish County Health Department.

11 Improvement Plan

The District's Capital Improvement Plan (CIP) is designed to maintain and/or improve water service over the next 20 years while accommodating planned growth. Recommended improvements from previous chapters are summarized to form the CIP in Table 11-1, found at the end of this chapter. Funding alternatives and potential rate impacts are discussed in Chapter 12.

The CIP includes major improvements, but does not include site-specific improvements to serve individual developments, which are typically designed and funded by the developers. This chapter includes background information about the CIP, such as prioritization and basis for estimated cost, as well as a summary of the most significant improvements.

11.1 PRIORITIZATION

The District refines the CIP annually. During each annual update, all proposed CIP projects are evaluated, prioritized, funded, and scheduled accordingly. The planned improvements fall into several categories:

- Improvements driven and funded by development. These are initially scheduled based on growth projections, but are implemented when specific developments are proposed.
- Rehabilitation and replacement of aging facilities. These improvements are initially scheduled based on the useful life of pipes and facilities. The schedule is adjusted when annual operation and maintenance costs, including staff time, could be significantly reduced by updating a facility.
- Operation and maintenance improvements for reliability and enhanced level of service.

11.2 BUDGET LEVEL COST ESTIMATES

Budget level cost estimates were prepared for each recommended improvement based on 2010 dollars. The cost estimates include the following allowances:

- 20 percent contingency for unknowns;
- Average sales tax for past historical jobs in our service area (ranges from 7.9 percent to 8.2 percent); and
- 34 percent engineering, legal, environmental, and administration allowance for pump station and reservoir construction, and a 24 percent allowance for water main projects.

These estimates are intended to evaluate and plan for the proposed improvements. Because all costs are provided in 2010 dollars, future costs must be adjusted at the time of construction to account for inflation and changing market conditions.

The final cost of each project will depend on actual labor and material costs, site conditions, productivity, competitive market conditions, final project scope, implementation schedule, and other variables. As a result, final construction costs will differ from the presented estimates. Because of these factors, project feasibility and funding must be reviewed carefully prior to making specific financial decisions. Before final budgets are developed, the cost of the planned projects should be estimated using project-specific data.

11.3 SUMMARY OF MAJOR IMPROVEMENTS

11.3.1 Overall Water System

Improvements that will benefit the overall water system include:

- **Control System (SCADA) Hardware and Software Upgrades.** The computer systems used to monitor and operate valves, pump stations, reservoirs, supply connections, and treatment facilities should be upgraded on a regular basis as the hardware and software becomes outdated and can no longer be cost-effectively maintained.
- **Meter Replacement.** A key element of ongoing maintenance is regular replacement of older meters to minimize lost water through malfunctioning or erroneous readings. As meters age, they tend to under-register, resulting in lower than actual consumption being measured.
- **Vehicles and Equipment.** Vehicles and major equipment must be replaced on a regular basis to maintain a reliable fleet.

11.3.2 Reservoirs

In addition to maintaining existing storage tanks, the District will construct new storage to meet the needs of planned growth. A second storage tank was constructed at the Hillcrest tank site in 2010. Two more tanks will be constructed at new sites along Getchell Road and Burn Road.

11.3.3 Pump Stations

The District's pump stations are operated daily. Normal wear on mechanical and electrical equipment result in the need for periodic rehabilitation and replacement of facilities. In addition to keeping up with existing demands, future growth will require that station capacities be increased through upgrades or replacements.

Because major pump station upgrades were completed after the 2002 WSP, improvements in the next six-year period will be relatively minor, consisting of adding pumps where provisions have been made in existing pump stations. The District's financial reserves are also sufficient to repair or replace any pump that breaks down. The existing pump stations have redundant capacity to supply the system when a pump is down for repair or maintenance.

11.3.4 Distribution

There are approximately 382 miles of pipeline in the District's water systems ranging from ¾- to 30-inches in diameter and including steel, cast iron, asbestos cement, PVC, HDPE, and ductile iron.

Deficiencies with the piping will be addressed by either replacement through a specific CIP-funded project, through routine developer-funded replacements, or through the District's miscellaneous pipeline replacement program.

The planned water mains in Figure 11-1 are grouped into the following three types of projects:

CIP Funded Projects – The new pipelines shown in green will be constructed by the District. The Capital Improvement Plan in Table 11-1 identifies these as projects 1 through 37.

Developer Funded Projects – The new pipelines shown in red have been sized to handle the anticipated water demands; however, funding for these projects will come solely from developers requiring water service from the District in these designated areas. Developers desiring to extend water to projects in these areas will be required to extend pipelines large enough to handle the anticipated needs of the future Integrated Service Area with no financial assistance from the District.

Miscellaneous Improvements, Relocations, and Pipeline Replacements – The District will replace existing pipes highlighted in orange. The District's systems contain approximately 174,000 feet of galvanized iron/steel and asbestos cement pipe that is substandard and reaching its useful life. The District's goal is to replace all of these pipes within 20 years. Project number 99 in Table 11-1 is the annual funding dedicated to achieve this goal.

Each year, the District reviews the status of its aging pipes to identify the next pipes to replace. Priority pipes for replacement typically experience the greatest number of breaks or leaks. The frequency of breaks is judged from a combination of input from District crews and records maintained in GIS. The District also prioritizes replacements that resolve issues such as fire flow or pressure deficiencies as an additional benefit. The District finds it is better to go through this prioritization each year than to identify specific pipes for replacement in the Capital Improvement Plan, because priorities often shift over the course of the planning period.

The District also has unplanned projects that come up each year, such as relocations for transportation or drainage projects and opportunities to include water mains in bridge projects. Project number 98 in Table 11-1 is an amount of money set aside every year to address the unplanned projects.

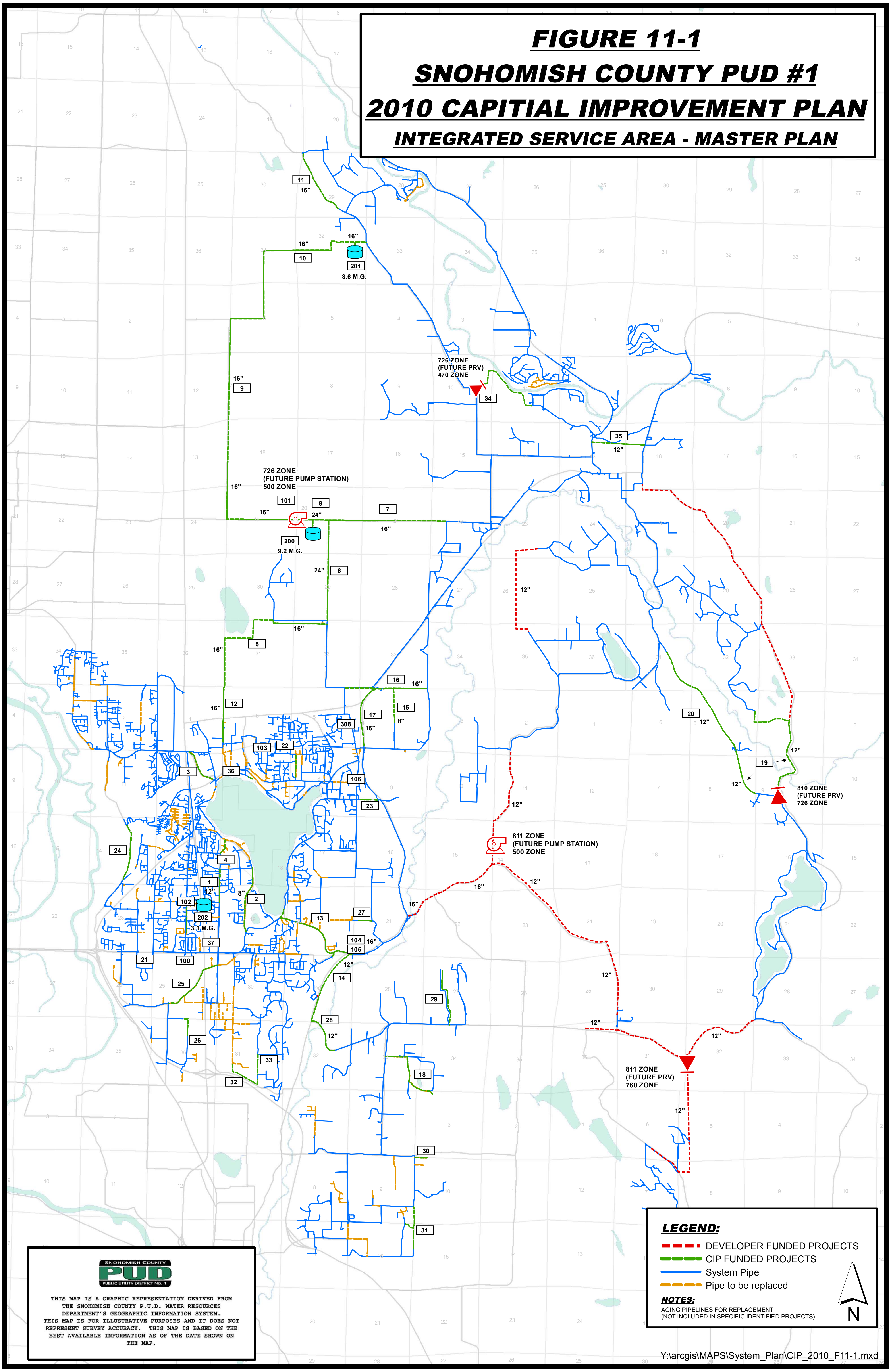
FIGURE 11-1
SNOHOMISH COUNTY PUD #1
2010 CAPITIAL IMPROVEMENT PLAN
INTEGRATED SERVICE AREA - MASTER PLAN
726 ZONE (FUTURE PRV) 470 ZONE
726 ZONE (FUTURE PUMP STATION) 500 ZONE
3.6 M.G.
9.2 M.G.
3.1 M.G.
811 ZONE (FUTURE PUMP STATION) 500 ZONE
810 ZONE (FUTURE PRV) 726 ZONE
811 ZONE (FUTURE PRV) 760 ZONE
11
10
201
9
101
8
7
200
6
5
12
16
15
17
308
103
22
3
36
106
23
24
4
1
102
2
202
13
27
37
104
105
21
100
14
25
29
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33
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34
35
20
19
LEGEND:
DEVELOPER FUNDED PROJECTS
CIP FUNDED PROJECTS
System Pipe
Pipe to be replaced
NOTES:
AGING PIPELINES FOR REPLACEMENT
(NOT INCLUDED IN SPECIFIC IDENTIFIED PROJECTS)
N
SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT NO. 1
THIS MAP IS A GRAPHIC REPRESENTATION DERIVED FROM THE SNOHOMISH COUNTY P.U.D. WATER RESOURCES DEPARTMENT'S GEOGRAPHIC INFORMATION SYSTEM. THIS MAP IS FOR ILLUSTRATIVE PURPOSES AND IT DOES NOT REPRESENT SURVEY ACCURACY. THIS MAP IS BASED ON THE BEST AVAILABLE INFORMATION AS OF THE DATE SHOWN ON THE MAP.
Y:\arcgis\MAPS\System_Plan\CIP_2010_F11-1.mxd

Table 11-1 - Snohomish County PUD - Capital Improvement Plan

No.	Description	Est Project Cost ($1,000's)	%GFC	%RF	%Other	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Water Mains:																											
1	99th Ave SE	$550	40%	60%	0%				$11	$539																	$550
2	Davies Rd.	$964	0%	100%	0%			$19	$944																		$964
3	Soperhill Road	$689	40%	60%	0%			$14	$675																		$689
4	Lakemont Avenue	$269	0%	100%	0%				$5	$263																	$269
5	Lake Cassidy Transmission Main	$3,634	100%	0%	0%													$73	$3,562								$3,634
6	123rd Avenue NE	$2,515	100%	0%	0%							$50	$2,465														$2,515
7	Getchell Road (84th Street NE)	$2,494	100%	0%	0%							$50	$2,444														$2,494
8	Getchell Rd. (84th St. NE)	$943	100%	0%	0%							$19	$924														$943
9	Sisco Heights Transmission Main	$8,409	100%	0%	0%														$168	$8,241							$8,409
10	St Andrews Transmission Main	$2,785	100%	0%	0%														$56	$2,730							$2,785
11	Burn Road	$1,005	100%	0%	0%																$20	$985					$1,005
12	99th Ave NE	$1,177	100%	0%	0%													$24	$1,153								$1,177
13	Machias Cutoff / Williams Road Connection	$1,621	100%	0%	0%																		$32	$1,588			$1,621
14	South Machias Road	$1,053	100%	0%	0%									$21	$1,032												$1,053
15	139th Ave NE	$535	100%	0%	0%					$11	$524																$535
16	44th St NE	$1,093	100%	0%	0%					$22	$1,071																$1,093
17	N Machias Road	$1,382	100%	0%	0%						$28	$1,354															$1,382
18	44th St SE	$1,084	0%	100%	0%																			$22	$1,062		$1,084
19	Menzel Lake Road Extension	$3,482	100%	0%	0%	$28	$3,454																				$3,482
20	Robe Menzel Road	$2,601	100%	0%	0%		$57	$2,543																			$2,601
21	20th St SE - Relocation Project, Phase 2	$515	0%	100%	0%			$515																			$515
22	Walker Hill Booster Zone Intertie	$129	100%	0%	0%			$129																			$129
23	16th St NE	$296	100%	0%	0%											$6	$291										$296
24	Sunnyside Blvd	$852	100%	0%	0%																	$19	$834				$852
25	South Lake Stevens Road	$1,547	40%	60%	0%		$1,268	$278																			$1,547
26	Tom Marks Road	$278	100%	0%	0%			$278																			$278
27	12th St SE	$222	100%	0%	0%											$4	$218										$222
28	South Machias Road - LS/Dubuque Intertie. Includes zone realignment and Dubuque Road bridge crossing.	$1,408	100%	0%	0%	$24	$28	$1,356																			$1,408
29	153rd Ave SE	$982	40%	60%	0%																	$20	$963				$982
30	Dutch Hill #1 Tap	$213	100%	0%	0%					$213																	$213
31	147th Ave SE	$825	100%	0%	0%				$16	$808																	$825
32	Bunk Foss Road	$663	100%	0%	0%										$13	$650											$663
33	109th Ave SE	$463	100%	0%	0%										$9	$454											$463
34	West Engebretson Road (Includes Mainline PRV)	$1,547	100%	0%	0%																				$31	$1,516	$1,547
35	GF Alternate Route	$520	100%	0%	0%	$520																					$520
36	Lundeen Parkway Roundabout	$342	0%	100%	0%	$342																					$342
37	20th St SE - Relocation Project, Phase 1	$192	0%	100%	0%	$192																					$192
98	Misc. Improvements / Relocations	$950	0%	100%	0%	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$45	$950
99	Main Replacement Program	$20,300	0%	100%	0%	$1,300	$0	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$20,300
	Subtotal - Water Mains:					***$2,451***	***$4,853***	***$6,178***	***$2,697***	***$2,901***	***$2,668***	***$2,519***	***$6,878***	***$1,066***	***$2,100***	***$2,160***	***$1,554***	***$1,141***	***$5,984***	***$12,016***	***$1,065***	***$2,069***	***$2,874***	***$2,655***	***$2,139***	***$2,561***	***$70,529***
Pump Stations																											
100	East Hewitt Improvements (3500 gpm total capacity req)	$669	100%	0%	0%									$13	$655												$669
101	Getchell Pump Station (2000 gpm capacity req)	$1,203	100%	0%	0%												$24	$1,179									$1,203
102	Hillcrest PS Improvements	$267	20%	80%	0%																				$5	$262	$267
103	Walker Hill PS Improvements (add 1000 gpm capacity)	$267	20%	80%	0%												$5	$262									$267
104	Machias Pump Station Pump #4	$134	100%	0%	0%										$134												$134
105	Machias Pump Station Pump #5	$134	100%	0%	0%														$134								$134
106	Lake Stevens - New Treatment Plant	$802	100%	0%	0%	$74	$728																				$802
	Subtotal - Pump Stations:					***$74***	***$728***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$13***	***$789***	***$0***	***$29***	***$1,441***	***$134***	***$0***	***$0***	***$0***	***$0***	***$0***	***$5***	***$262***	***$3,476***
Reservoirs:																											
200	Getchell (500 Zone - 9.2 MG)	$12,300	100%	0%	0%								$246	$12,054													$12,300
201	Burn Road 726 Reservoir (3.6 MG)	$4,813	100%	0%	0%															$96	$4,717						$4,813
202	Hillcrest Reservoir - Phase 2 (3 MG)	$189	100%	0%	0%	$189																					$189
	Subtotal - Reservoirs:					***$189***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$246***	***$12,054***	***$0***	***$0***	***$0***	***$0***	***$0***	***$96***	***$4,717***	***$0***	***$0***	***$0***	***$0***	***$0***	***$17,303***
General:																											
300	Meter Replacement (2010-2030)	$1,585	0%	100%	0%	$0	$124	$77	$74	$91	$75	$86	$68	$82	$77	$71	$129	$79	$51	$61	$69	$71	$73	$74	$76	$78	$1,585
301	Vehicles & Equipment (WTR92)	$5,550	0%	100%	0%	$0	$989	$123	$0	$254	$584	$158	$180	$179	$60	$160	$989	$123	$60	$254	$584	$218	$180	$179	$120	$160	$5,550
302	Power Operated Equipment (WTR96)	$286	0%	100%	0%	$0	$0	$0	$60	$0	$0	$0	$48	$18	$17	$0	$0	$0	$60	$0	$0	$0	$48	$18	$17	$0	$286

Table 11-1 - Snohomish County PUD - Capital Improvement Plan

No.	Description	Est Project Cost ($1,000's)	%GFC	%RF	%Other	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
303	New Capitalized Office Furniture and Equipment (WTR 91)	$100	0%	100%	0%	$8	$7	$7	$0	$7	$10	$0	$14	$0	$0	$17	$0	$7	$7	$0	$0	$7	$0	$0	$7	$0	$100
304	Misc. Tools and Equipment (WTR 98)	$41	0%	100%	0%	$0	$0	$0	$0	$0	$0	$0	$8	$12	$0	$0	$0	$0	$0	$0	$0	$0	$8	$0	$12	$0	$41
305	New Services - (2010-2030)	$11,568	0%	100%	0%	$155	$425	$437	$451	$464	$478	$492	$507	$522	$538	$554	$571	$588	$606	$624	$642	$662	$682	$702	$723	$745	$11,568
306	Pre-Capitilized Meters - (2010-2030)	$2,174	0%	100%	0%	$67	$121	$91	$91	$103	$94	$102	$92	$102	$101	$98	$138	$107	$90	$98	$105	$108	$111	$115	$118	$121	$2,174
307	SCADA Retrofit	$644	0%	100%	0%										$32	$611											$644
308	Water Operations Facility	$2,296	0%	100%	0%	$2,296																					$2,296
	Subtotal - General:					***$2,527***	***$1,666***	***$735***	***$675***	***$919***	***$1,241***	***$838***	***$918***	***$915***	***$825***	***$1,512***	***$1,827***	***$903***	***$874***	***$1,036***	***$1,400***	***$1,065***	***$1,102***	***$1,088***	***$1,073***	***$1,104***	***$24,243***
	GFC Total:					***$835***	***$4,775***	***$4,423***	***$291***	***$1,269***	***$1,623***	***$1,473***	***$6,079***	***$12,089***	***$1,844***	***$1,115***	***$534***	***$1,328***	***$5,072***	***$11,067***	***$4,737***	***$1,012***	***$1,251***	***$1,588***	***$32***	***$1,568***	***$64,004***
	RF Total:					***$4,406***	***$2,472***	***$2,490***	***$3,082***	***$2,551***	***$2,286***	***$1,883***	***$1,963***	***$1,961***	***$1,870***	***$2,557***	***$2,877***	***$2,158***	***$1,919***	***$2,081***	***$2,446***	***$2,122***	***$2,725***	***$2,155***	***$3,185***	***$2,359***	***$51,547***
	Other Total:					***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***
	Total:	***$115,551***				***$5,240***	***$7,247***	***$6,913***	***$3,373***	***$3,820***	***$3,909***	***$3,357***	***$8,042***	***$14,049***	***$3,713***	***$3,671***	***$3,410***	***$3,486***	***$6,991***	***$13,148***	***$7,183***	***$3,134***	***$3,976***	***$3,743***	***$3,217***	***$3,927***	***$115,551***

12 Financial Plan

The effective implementation of a WSP depends on accurately developing a document that can be financially supported, meet state and local regulatory requirements, and provide flexibility to deal with unforeseen events. This chapter presents a financial plan based on a Water Utility Financial Model designed by R. W. Beck, Inc. The financial plan outlines the annual operating and capital needs of the water utility and determines if water revenues are sufficient to cover expenses.

The 2010-2030 Water Utility Financial Model is provided in Appendix 12-1. The model uses various financial scenarios to determine the District's ability to meet its capital improvement and operating needs while maintaining sufficient revenue to support those needs. Capital costs in the model are from the CIP developed and presented in Chapter 11. The model can be run on a cash basis or a utility basis. Since the cash basis was used in projecting the 2009 revenue bond requirements, the cash basis model is included in this document. While the District believes that assumptions made in this model are reasonable, they are dependent upon future events and actual conditions may differ from those assumed.

The water utility serves approximately 20,000 customers in central Snohomish County and purchases the majority of its water from the city of Everett. The District's water utility is financed and accounted for as a system separate from the electric and generation systems. The water utility is charged for administrative and operations and maintenance functions provided by the electric system. Water utility assets include transmission mains, pump stations, distribution mains and services, supply wells, reservoirs, meters, maintenance facilities, and equipment.

12.1 FINANCIAL HISTORY

Table 12-1 shows operating statistics for the District's water utility for the period 2005 through 2009, including the number of water connections and the amount of water purchased or pumped. Table 12-2 shows the financial history for the District's water utility for the period 2005 through 2009.

Table 12-1: Water Utility Operating Statistics

	2005	2006	2007	2008	2009
No. of Connections	16,553	17,338	18,392	18,981	19,607
Water Sales (1000cf)					
Retail	175,063	191,478	189,672	192,033	207,296
Wholesale[1]	32,990	38,996	36,595	38,477	40,665
Total Water Sales	208,053	230,444	226,267	230,510	247,961
Non-Revenue Water Use	21,717	22,416	16,303	15,691	11,521
Water Purchased and Pumped	**229,770**	**252,860**	**242,570**	**246,201**	**259,483**

[1]Wholesale sales represent sales to the cities of Granite Falls and Arlington.

Table 12-2: Water Financial History ($1000's)

	2005	2006	2007	2008	2009
Operating Revenues:					
Water Sales	$5,387	$5,807	$6,161	$6,469	$7,762
Facilities/Connection Charges (1)	2,936	3,800	3,794	2,118	2,054
Plant Contributions & Other (2)	2,642	3,091	3,688	3,357	1,778
Total Operating Revenues	$10,965	$12,698	$13,643	$12,174	$11,594
Operating Expenses:					
Purchased Water	$1,357	$1,588	$1,525	$1,592	$1,961
Operations & Maintenance	2,739	3,276	3,212	3,542	2,749
Depreciation	1,569	1,704	1,880	2,027	2,193
Taxes	283	331	357	338	398
Total Operating Expenses	$5,948	$6,899	$6,974	$7,499	$7,301
Net Operating Income	$5,017	$5,799	$6,669	$4,675	$4,293
Interest and Other Income:					
Interest and Other	(351)	(274)	(355)	(551)	(657)
Net Income	$4,666	5,525	$6,314	$4,124	$3,636
Balance Available for Debt Coverage	4,522	5,228	5,752	3,684	5,197
Debt Service Paid from Revenues	$1,158	$1,282	$1,708	$1,836	$2,123
Senior Lien Debt Service Coverage	3.9x	4.1x	3.4x	2.0x	2.72x

(1) Includes general facilities charges, service connection fees and distribution system charges.
(2) Represents facilities donated to the District by developers and property owners.

12.2 OUTSTANDING DEBT

The 2009 Water Revenue Bonds were issued in the principal amount of $13,085,000 to finance a portion of the District's capital improvement program, to fund a Reserve Account, and to pay costs of issuing the bonds. Debt service requirements for previous outstanding bonds plus the 2009 bond issuance are summarized in Table 12-3. The District expects to use approximately $2.1 million of the Series 2009 Water Revenue Bonds to fund capital improvement projects in 2010.

The District has also been successful in acquiring low-interest loans from state programs and will continue to monitor these funds as a source of borrowing for future capital improvements. Table 12-4 presents the outstanding water debt from five loans that the water utility is repaying as of December 31, 2009. All five obligations are junior lien loans from the state Public Works Trust Fund (PWTF) and the federal Drinking Water State Revolving Fund (DWSRF). Both programs are administered through the Public Works Board within the Department of Commerce. The District also received a Water System Acquisition and Rehabilitation Program (WSARP) grant of $500,000 for improvements to the Kayak Water System.

Revenues of the District's electric and generation systems are not pledged to the payment of operation expenses or debt of the water utility.

Table 12-3: Debt Service Requirements

Year	Debt Service on Outstanding Bonds	2009 Bonds Principal	Interest	Total	Total Debt Service
2009	$ 2,066,090	$ -----------	$ ----------	$ -----------	$ 2,066,090
2010	2,057,170	-----------	528,421	528,421	2,585,591
2011	2,045,100	430,000	510,004	940,004	2,985,104
2012	2,035,528	440,000	499,254	939,254	2,974,781
2013	2,063,203	455,000	488,254	943,254	3,006,456
2014	1,856,563	465,000	476,879	941,879	2,798,441
2015	1,802,563	480,000	462,929	942,929	2,745,491
2016	1,747,575	495,000	446,129	941,129	2,688,704
2017	1,692,163	515,000	426,329	941,329	2,633,491
2018	1,636,325	535,000	405,729	940,729	2,577,054
2019	1,518,813	555,000	384,329	939,329	2,458,141
2020	1,428,038	580,000	362,129	942,129	2,370,166
2021	1,413,988	600,000	338,929	938,929	2,352,916
2022	1,442,675	625,000	314,929	939,929	2,382,604
2023	389,288	650,000	289,929	939,929	1,329,216
2024	385,263	675,000	263,929	938,929	1,324,191
2025	385,813	705,000	236,929	941,929	1,327,741
2026	385,725	730,000	208,729	938,729	1,324,454
2027	--	760,000	178,616	938,616	938,616
2028	--	795,000	146,696	941,696	941,696
2029	--	830,000	112,909	942,909	942,909
2030	--	865,000	77,219	942,219	942,219
2031	--	900,000	39,375	939,375	939,375
Total	**$26,351,878**	**$13,085,000**	**$7,198,571**	**$20,283,571**	**$46,635,448**

Table 12-4: PWTF and DWSRF Debt ($1000's)

Loan/Grant Program	Project	Total Borrowed	Interest Rate	Debt Retires	Remaining Principal
PWTF	Granite Falls Area Regional Water Supply	$3,500	1%	2012	$391
DWSRF	Interties to Five Systems	$1,164	2.5%	2022	$574
DWSRF	Hillcrest Tank 2	$2,290	1.5%	2029	$1,180
DWSRF	Kayak Water System	$1,217	1.5%	2027	$1,089
PWTF	Water System Plan	$100	0%	2017	$100

12.2.1 Future Bonds

The District does not expect to issue additional water utility bonds in the next three years.

12.2.2 Ratings

Moody's Investors Services (Moody's) and Standard & Poor's Rating Services (S&P) assigned their ratings of "A1" and "AA," respectively to the District's 2009 bond issuance.

12.3 CAPITAL IMPROVEMENT COSTS 2010-2015

Capital projects planned in 2010 and 2011 include a new water operations facility, a reservoir project, water main replacement projects, two projects to construct new water mains, and a water treatment project. Projects planned in 2012 through 2015 are primarily construction of new water main and water main replacement.

Table 12-5 summarizes the costs of capital improvements from 2010 through 2015, obtained from Table 11-1 in Chapter 11. Projected improvements beyond 2015 can also be found in Table 11-1. Because all costs are provided in 2010 dollars, future costs must be adjusted at the time of construction to account for inflation and changing market conditions.

Table 12-5: Six Year Capital Improvement Costs ($1000's)

	2010	2011	2012	2013	2014	2015
General	$2,526	$1,666	$735	$675	$919	$1,241
Water Mains	2,451	4,853	6,178	2,697	2,901	2,668
Pumping Station	74	728	--	--	--	--
Reservoir	189	--	--	--	--	--
Total Capital Expenditures	$5,240	$7,247	$6,913	$3,372	$3,820	$3,909

12.4 OPERATION & MAINTENANCE COSTS 2010 - 2015

Table 12-6 summarizes the estimated annual operation and maintenance expenses for 2010 through 2015, including routine fleet and equipment replacement, maintenance of buildings and structures, and replacing broken or end-of-useful life meters and services.

Table 12-6: Six-Year Operation & Maintenance Costs ($1000's)

	2010	2011	2012	2013	2014	2015
Source of Supply	$2,210	$1,687	$1,795	$1,937	$2,090	$2,255
Pumping	359	375	392	409	428	447
Treatment	114	120	125	130	136	143
Transmission & Distribution	1,156	1,207	1,261	1,429	1,493	1,559
Customer Services	573	599	625	654	683	714
A&G	1,242	793	1,381	1,539	1,620	676
Taxes	431	542	616	627	638	650
Total O&M	$6,085	$5,323	$6,195	$6,725	$7,088	$6,444

12.5 FUNDING SOURCES

District revenues come from a variety of sources including rates, connection charges, fees for services, assessments from local utility districts, grants, and revenue derived from debt. The District has covenanted to establish, maintain, and collect rates and charges that will be adequate to provide revenues sufficient for proper operation and maintenance of the systems, including all resource obligations required to be paid as operating expenses. Proceeds in the amount of $999,800 from the 2009 Bonds were deposited in the Rate Stabilization Fund (Reserve Account).

For the year-ended December 31, 2010, the water utility had actual water sales of 247 million cubic feet and gross operating revenues of $11,514,737, as compared to the 2010 projections found in Table 12-7. As of December 31, 2010, the total assets of the water systems were $118,258,150 and total long-term debt was $31,061,714.

Cash for capital improvement projects can be obtained from loans or by issuing debt through warrants or bonds. The District expects that a portion of its long-term future financings will be assessment bond financings. In the event assessment income is insufficient in future years to pay debt service on the 2009 Bonds or other Assessment Bonds, the District has covenanted to raise water rates to cure such deficiency.

Table 12-7: Projected Revenues ($1000's)

	2010	2011	2012	2013	2014	2015
Operating Revenues						
Water Sales[1]	$8,892	$10,212	$11,660	$11,851	$12,047	$12,258
Facilities/Connection Fees	1,712	1,785	1,861	1,939	2,022	2,109
Non-Cash Contributions & Other	246	167	171	92	182	186
Total Operating Revenues	**$10,850**	**$12,164**	**$13,692**	**$13,968**	**$14,251**	**$14,553**
Operating Expenses[2]						
Purchased Water	$2,157	$1,631	$1,737	$1,876	$2,026	$2,188
Operations & Maintenance	3,497	3,150	3,842	4,222	4,425	3,606
Taxes	431	542	616	627	638	650
Total Operating Expenses	**$6,085**	**$5,323**	**$6,195**	**$6,725**	**$7,089**	**$6,444**
Interest and Other	328	328	328	328	328	328
Net Income	**$4,765**	**$6,841**	**$7,497**	**$7,242**	**$7,162**	**$8,109**
Balance Available for Debt Coverage	5,093	7,169	7,825	7,570	7,490	8,436
Debt Service Paid from Revenues	2,184	2,749	2,744	2,781	2,582	2,532
Debt Service Coverage	2.83x	3.38x	3.56x	3.39x	3.58x	3.99x

[1]Projected retail sales revenues include rate increases of 13% effective January 1, 2010 through 2012 as approved by the Board of Commissioners on December 6, 2008.

[2]Excludes depreciation.

12.5.1 Retail Rates

The District's water utility has a favorable mix of customers, with 91 percent of retail water revenue coming from residential customers and about 7 percent coming from commercial customers. Residential customers account for approximately 75 percent of water consumed and commercial customers accounting for about 9 percent of consumed water.

Effective January 1, 2009, the District raised its general water rates an average of 13 percent. The District's Board of Commissioners also adopted additional annual rate increases of 13 percent per year in 2010 through 2012. The District has regularly raised its general water rates an average of 4.2 percent per year from 2002 through 2008.

12.5.2 Major Customers

The District's water utility serves primarily suburban and rural residential areas. The District's ten largest retail customers used 11,617,937 cubic feet of water in 2009 with retail sales totaling $253,275. These ten customers account for approximately 4 percent of consumption and about 3 percent of retail water sales.

The following table compares the District's water bills with those of other nearby water utilities, normalized to 1,000 cubic feet per month. The representative monthly water bills shown are based on specific rate schedules for each utility. Use of different schedules applicable to particular customers would yield different results.

Table 12-8: Monthly Residential Water Bill Comparisons

(Retail Rates Effective September 1, 2009)

Utility	1,000 cubic feet per month
The District	**$33.50**
City of Seattle (Shoreline)	$46.95
Skagit County PUD	$42.99
Woodinville Water District	$39.68
City of Arlington	$37.88
City of Marysville	$36.31
Mukilteo Water District	$33.80
Silverlake Water District	$29.10
Mukilteo Water District	$28.32
Kitsap County PUD	$26.96
City of Everett (metered)	$26.40
Alderwood Water District	$25.29

12.5.3 Wholesale rates

The District's two wholesale customers, the cities of Granite Falls and Arlington, account for approximately 16 percent of water consumption and about 6 percent of revenues. The contract with Granite Falls continues through 2016 and thereafter unless terminated by mutual agreement upon five years' written notice by either party. The contract with Arlington continues through 2018 and thereafter unless terminated by mutual agreement or upon five year written notice by either party. The District's agreements with Granite Falls and Arlington are summarized in section 3.3.4 can be found in Appendix 3-2.

12.5.4 Connection fees

Table 12-9 lists the District's water connection fees, which include its general facilities charge (GFC), distribution system charge (DSC), and service connection fees. The District adjusts these fees annually, effective January 1 of each year, based on the change in the Engineering News Record Construction Cost Index for the Seattle area.

The GFC recovers the cost of source, treatment, transmission, and storage facilities needed to serve new customer's anticipated demand.

The DSC is used to recover the average cost of existing distribution mains when a new customer connects to an existing water main, rather than extending a water main to obtain service. When a new customer connects to a water main within 10 years of construction by a developer, 95 percent of the DSC is passed through to the developer as a means to help recover their investment.

The service connection fee recovers the actual cost of installing a new water service.

Table 12-9: 2010 Connection Fees

General Facilities Charge	$3,035
Distribution System Charge - Subdivision	$31/front foot
Distribution System Charge – Individual Parcel	$3,500
¾" Service Connection	$1,125
1" Service Connection	$1,265

12.5.5 Other Funding Sources

Although there are limited opportunities at the present time, the District has obtained low-interest loans and grants for water projects in the past. If and when applicable funding sources are available, the District will make application for them.

By state law, the District is authorized to issue nonvoter-approved general obligation bonds for any corporate purpose of the District in an amount up to ¾ of 1 percent of the total assessed value of the taxable property within the District. In addition, the District is authorized to levy an annual tax on all taxable property within the District up to 45 cents per $1,000 of assessed value in any one year, exclusive of interest and redemption for general obligation bonds. The District has no outstanding general obligation bonds and does not levy a tax. The proceeds of any such tax would not be available to pay or secure bonds.

12.5.6 Local Utility Districts

Under Washington law, the District may establish local utility districts (LUDs) to finance capital improvements that specifically benefit property within the LUD. In a LUD, assessments may be levied on each property benefitting from the project to pay for the cost of the improvements. At the option of the property owner, special assessments are paid within a 30-day prepayment period or in annual installments extending over a period not exceeding 20 years. LUD assessments become a lien on the property assessed, which is paramount to all other liens previously created except the lien for general property taxes.

The Snohomish County Treasurer's Office acts as the District's collection agent for routine billing and receiving of LUD payments. The District receives a delinquency list from the county on an annual basis and sends reminder letters to the affected property owners, in addition to the delinquency notices mailed by the county. Under District policy, the entire assessment becomes due and payable upon the failure to pay any installment of a local improvement assessment. Those assessment liens may be referred to General Counsel for foreclosure if the unpaid balance of the assessment exceeds $500. However, due to the cost of legal services and expenses associated with foreclosure proceedings, the District makes a concerted effort to work with the property owner to pay assessments off or to bring them current before assigning to a collection agency or initiating legal action.

The District finances some LUD improvements from revenues of the water utility. Assessments collected from those LUDs are deposited in the Water General Fund. If revenue bonds are issued to finance LUD improvements, state law requires the assessments from that LUD to be deposited into the bond fund for those bonds. Proceeds of the sale of any property foreclosed upon up to the amount of the unpaid LUD assessment, interest, and penalties are also deposited into the bond fund. The District currently has 29 LUDs with outstanding assessments pledged to bonds as summarized in Table 12-10.

Assuming no early payments of the outstanding assessments pledged to the bond fund, Table 12-11 shows estimated principal and interest payments on the above-referenced LUDs, which payments will be deposited into the bond fund.

Table 12-12 forecasts the District's operating statistics for the calendar years 2010 through 2015 based on projections from the water utility Financial Model as of December 31, 2009.

12.6 CONCLUSION

The District continues to maintain the water utility in a healthy financial position and is taking steps with this plan to ensure future stability of the water utility financial status. The District has a long-range financial plan which enables it to meet projected capital and operational requirements outlined in this plan and to do so through upfront rate increases established through 2012 and the adjustment of connection fees based on the ENR construction cost index.

Table 12-10: Local Utility Districts

LUD No.	Name	Date Assessment Confirmed	Original Assessment	Principal Assessment Balance 12/31/2010	Pledged to:
12	Lake Roesiger	July 12, 1994	$1,995,113	30,346	Bonds
13	Rainbow Springs	July 8, 1997	762,837	23,177	Bonds
14	River Terrace	December 3, 1996	258,490	8,766	Bonds
15	Lake Bosworth	May 28, 997	1,317,160	437	Bonds
16	Sunday Lake	September 3, 1996	607,320	26,442	Bonds
17	Canyon Falls Park	December 14, 1999	1,452,690	183,746	Bonds
18	Getchell Park	December 14, 1999	324,254	21,212	Bonds
19	Jordan River Trails	September 24, 1996	421,668	8,128	Bonds
20	Jordan Area	July 8, 1997	111,628	11,700	Bonds
21	Riverscene	April 14, 1998	195,669	1,283	Bonds
22	134th Street NE	January 28, 1997	143,230	15,122	Bonds
23	130th Street NE	March 11, 1997	134,634	3,747	Bonds
26	Ray Gray Road	December 12, 2000	324,591	27,735	Bonds
29	Green Acres	February 2, 1999	500,617	22,029	Bonds
31	Noncontiguous	December 1996	373,469	551	General Fund
32	Noncontiguous	December 1997	41,020	12,306	General Fund
35	Storm Lake Ridge	December 14, 1999	68,970	1,254	Bonds
38	Noncontiguous	December 1998	435,000	5,250	General Fund
40	Noncontiguous	November 1999	30,105	7,919	General Fund
41	Sunset Ridge	January 9, 2001	341,002	41,962	Bonds
42	Noncontiguous	December 2000	328,230	49,684	General Fund
44	Noncontiguous	December 2001	105,585	16,047	General Fund
46	Noncontiguous	December 2003	139,875	50,889	General Fund
47	Noncontiguous	December 2004	71,430	25,295	General Fund
48	Noncontiguous	December 2005	77,795	51,999	General Fund
49	Noncontiguous	December 2006	74,150	41,604	General Fund
50	Noncontiguous	December 2007	23,190	20,482	General Fund
51	Noncontiguous	December 2008	67,010	53,169	General Fund
52	Noncontiguous	December 2009	71,925	68,329	General Fund
	Total		**$ 10,798,657**	**$ 830,610**	

Table 12-11: Estimated LUD Assessment Payments Pledged to Bonds

Year	Principal & Interest
2009	$ 171,972
2010	120,914
2011	120,914
2012	120,914
2013	120,914
2014	120,914
2015	120,914
2016	120,914
2017	104,594
2018	68,569
2019	66,772
2020	17,611
2021	9,802
Total	**$1,285,718**

Table 12-12: Water Utility Operating Projections (1000cf)

	2010	2011	2012	2013	2014	2015
No. of Customers	19,926	20,207	20,492	20,783	21,077	21,375
Water Sales						
Retail	210,095	213,058	216,067	219,122	222,223	225,372
Wholesale[1]	39,775	40,441	41,118	41,807	42,508	43,221
Total Water Sales	249,870	253,499	257,185	260,929	264,731	268,593
Non-Revenue Water Use	12,493	12,675	12,859	13,046	13,236	13,429
Water Purchased & Pumped	**262,363**	**266,174**	**270,044**	**273,975**	**277,967**	**282,022**

[1]Wholesale sales represent sales to the cities of Granite Falls and Arlington.

RESOLUTION NO. 5550

FIFTH SUPPLEMENTAL WATER SYSTEM
REVENUE BOND RESOLUTION

A RESOLUTION authorizing the issuance of $9,650,000 principal amount of Water System Revenue Refunding Bonds, Series 2011, of Public Utility District No. 1 of Snohomish County, Washington, to refund certain outstanding water system revenue bonds of the District, and approving a bond purchase agreement for the sale of the bonds to J.P. Morgan Securities LLC.

WHEREAS, Public Utility District No. 1 of Snohomish County, Washington (the "District") owns and operates a water supply and distribution system (the "Water System"); and

WHEREAS, the Commission by Resolution No. 3825 adopted on August 25, 1992, authorized the issuance from time to time of bonds of the District payable from revenue of the Water System (the "Bonds"); and

WHEREAS, the Commission by Resolution No. 5031 adopted on January 8, 2002 (the "2002 Bond Resolution"), issued a series of Bonds designated as Public Utility District No. 1 of Snohomish County, Washington, Water System Revenue and Refunding Bonds, Series 2002, which remain outstanding as follows:

Maturity Years (December 1)	Principal Amounts	Interest Rates
2011	$ 765,000	4.65%
2012	790,000	4.75
2013	855,000	4.80
2014	1,000,000	5.50
2015	1,000,000	5.50
2016	1,000,000	5.50
2017	1,000,000	5.50
2018	1,000,000	5.125
2021	2,750,000	5.25
2022	1,000,000	5.50

(the "2002 Bonds"); and

WHEREAS, the 2002 Bond Resolution provides that the District may call the 2002 Bonds maturing on and after December 1, 2012 (the "Refunded Bonds"), in whole or in part, for redemption on June 1, 2012 or any date thereafter, at the price of par plus accrued interest, if any, to the date of redemption; and

WHEREAS, it appears to the Commission that the Refunded Bonds may be defeased and refunded by the proceeds of the series of Bonds authorized herein (the "2011 Bonds") at a substantial savings to the District; and

WHEREAS, to effect this refunding in the most economical manner it is deemed necessary and advisable that proceeds of the sale of the 2011 Bonds and, if necessary, other money available and required for refunding purposes be invested in obligations maturing in such amounts and at such times as are required to pay the interest on the Refunded Bonds as the same become due, and to redeem and retire the Refunded Bonds on the first date on which the Refunded Bonds may be called for redemption prior to their scheduled maturities; and

WHEREAS, the District has received the offer of J.P. Morgan Securities LLC (the "Underwriter") to purchase the 2011 Bonds on terms and conditions set forth in that offer and in this Fifth Supplemental Resolution, and the Commission has determined that it is in the best interest of the District to accept that offer and to approve a bond purchase agreement to be entered into by the District and the Underwriter, as provided in this Fifth Supplemental Resolution;

NOW, THEREFORE, BE IT RESOLVED BY THE COMMISSION OF PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY, WASHINGTON AS FOLLOWS:

ARTICLE I

DEFINITIONS AND FINDINGS

Section 1.01. Supplemental Resolution. This Fifth Supplemental Resolution is supplemental to Resolution No. 3825 (the "Resolution") and is adopted in accordance with Article II of the Resolution.

Section 1.02. Definitions. All terms defined in Section 1.1 of the Resolution have the same meanings when used in this Fifth Supplemental Resolution. In addition, in this Fifth Supplemental Resolution:

"DTC" means The Depository Trust Company of New York, New York.

"Escrow Agent" means U.S. Bank National Association.

"MSRB" means the Municipal Securities Rulemaking Board or any successor to its functions.

"Refunded Bonds" means the 2002 Bonds maturing on and after December 1, 2012.

"Rule" means the SEC's Rule 15c2-12 under the Securities and Exchange Act of 1934, as the same may be amended from time to time.

"SEC" means the Securities and Exchange Commission.

"Tax Certificate" means the certificate executed by the Treasurer or Deputy Treasurer of the District pertaining to tax matters with respect to the 2011 Bonds.

"Underwriter" means J.P. Morgan Securities LLC.

"2002 Bond Resolution" means Resolution No. 5031 of the Commission, adopted on January 8, 2002, and also identified as the Second Supplemental Resolution.

"2002 Bonds" means the Water System Revenue and Refunding Bonds, Series 2002, issued pursuant to the Resolution and the 2002 Bond Resolution.

"2011 Bonds" means the Water System Revenue Refunding Bonds, Series 2011, authorized to be issued pursuant to the Resolution and this Fifth Supplemental Resolution.

Section 1.03. Findings.

A. *Parity Conditions.* The Commission hereby finds as required by Section 2.4 of the Resolution as follows:

(1) The 2011 Bonds will be issued for the purpose of refunding outstanding Water System revenue bonds.

(2) At the time of the issuance of the 2011 Bonds there will be on file a certificate of the Treasurer as required by Section 2.4(a) of the Resolution.

B. *Due Regard.* The Commission hereby finds that due regard has been given to the costs of operation and maintenance of the Water System and that it has not obligated the District to set aside into the Bond Fund for the account of the 2011 Bonds a greater amount of the revenues and proceeds of the Water System than, in its judgment, will be available over and above the costs of maintenance and operation.

ARTICLE II

AUTHORIZATION OF 2011 BONDS; TAX COVENANTS

Section 2.01. Terms of the 2011 Bonds.

A. *Description.* The District will issue and sell the 2011 Bonds in the aggregate principal amount of $9,650,000 to refund the Refunded Bonds and to pay costs of issuing the 2011 Bonds. The 2011 Bonds will be designated "Public Utility District No. 1 of Snohomish County, Washington, Water System Revenue Refunding Bonds, Series 2011"; will be dated the date of their initial delivery to the Underwriter; will be in the denomination of $5,000 each or any integral multiple thereof, provided that no 2011 Bond will represent more than one maturity; will be fully registered as to both principal and interest; and will be numbered separately in the manner and with any additional designation as the Registrar deems necessary for purposes of identification. The 2011 Bonds shall bear interest from their date until such interest has been paid or its payment duly provided for, payable June 1, 2012, and semiannually thereafter on the first days of each succeeding December and June and shall mature on December 1 in the years and amounts as are set forth below:

Maturity Years (December 1)	Principal Amounts	Interest Rates
2012	$ 745,000	2.00%
2013	870,000	3.00
2014	1,005,000	4.00
2015	990,000	3.00
2016	960,000	3.00
2017	935,000	3.00
2018	910,000	4.00
2019	830,000	4.00
2020	770,000	4.00
2021	790,000	4.00
2022	845,000	5.00

B. *Optional Redemption.* The District hereby reserves the right to redeem the outstanding 2011 Bonds maturing on December 1, 2022 in whole or in part (by lot within a maturity in such manner as DTC or the Registrar, as appropriate, shall determine) on December 1, 2021, and any date thereafter, at the price of par, plus accrued interest to the date of redemption.

C. *Notice of Redemption.* Notice of redemption of any 2011 Bonds shall be given as provided in the Resolution, except that (i) any such notice will be mailed not less than 20 nor more than 60 days prior to the redemption date and (ii) no published notice is required, as otherwise provided in Section 4.3(c)(iii) of the Resolution.

Notice of any optional redemption may be cancelled by the District prior to the designated redemption date by giving written notice of such cancellation to all parties who were given notice of redemption in the same manner as such notice was given.

D. *Purchase of 2011 Bonds.* The District also reserves the right to purchase any of the 2011 Bonds in the open market at any time at prices deemed reasonable by the District.

Section 2.02. Book Entry System of Registration and Transfer.

A. *DTC Acceptance; Letter of Representations.* The 2011 Bonds will initially be held in fully immobilized form by DTC acting as depository. To induce DTC to accept the 2011 Bonds as eligible for deposit at DTC, the District has heretofore executed and delivered to DTC a Blanket Issuer Letter of Representations (the "Letter of Representations"). The 2011 Bonds will be issued in denominations equal to the aggregate principal amount of each maturity and initially will be registered in the name of CEDE & Co., as the nominee of DTC.

Neither the District nor the Registrar will have any responsibility or obligation to DTC participants or the persons for whom they act as nominees with respect to the accuracy of any records maintained by DTC or any DTC participant as to the 2011 Bonds, the payment by DTC or any DTC participant of any amount in respect of the principal or redemption price of or interest on the 2011 Bonds, any notice that is permitted or required to be given to registered owners under this Fifth Supplemental Resolution (except any such notices as are required to be given by the District to the Registrar or to DTC), the selection by DTC or any DTC participant of any person to receive payment in the event of a partial redemption of the 2011 Bonds or any consent given or other action taken by DTC as the registered owner of the 2011 Bonds. For so long as any 2011 Bonds are held in fully immobilized form hereunder, DTC or its successor depository will be deemed to be the registered owner for all purposes hereunder, and (except as provided in Article IV of the Resolution) all references in this Fifth Supplemental Resolution to registered owners, bondowners or the like will mean DTC or its nominee and not the owners of any beneficial interests in the 2011 Bonds.

B. *Use of Depository.*

(1) The 2011 Bonds will be registered initially in the name of "CEDE & Co.," as nominee of DTC, with one Bond for each maturity. Purchases of the 2011 Bonds may be made through brokers and dealers, who must be or act through participants in DTC, in principal amounts of $5,000 and integral multiples thereof. Registered ownership of such immobilized 2011 Bonds, or any portions thereof, may not thereafter be transferred except (a) to any successor of DTC or its nominee, provided that any such successor must be qualified under any applicable laws to provide the service proposed to be provided by it; (b) to any substitute depository appointed by the District pursuant to subsection (ii) below or such substitute depository's successor; or (c) to any person as provided in subsection (iv) below.

(2) Upon the resignation of DTC or its successor (or any substitute depository or its successor) from its functions as depository, or a determination by the District that it is no longer in the best interests of owners of beneficial interests in the 2011 Bonds to continue the system of book-entry transfers through DTC or its successor (or any substitute depository or its successor), the District may appoint a substitute depository or terminate the use of a depository. Any such substitute depository shall be qualified under any applicable laws to provide the services proposed to be provided by it.

(3) In the case of any transfer pursuant to clause (a) or (b) of subsection (i) above, the Registrar will, upon receipt of all outstanding 2011 Bonds, together with a written request on behalf of the District, issue a single new 2011 Bond for each maturity of such 2011 Bonds then outstanding, registered in the name of such successor or such substitute depository, or its nominee, as the case may be, all as specified in such written request of the District.

(4) If (a) DTC or its successor (or substitute depository or its successor) resigns from its functions as depository or (b) the District determines that it is in the best interests of the District or the beneficial owners of the 2011 Bonds that they be able to obtain bond certificates, the ownership of 2011 Bonds may then be transferred to any person or entity as herein provided, and the 2011 Bonds will no longer be held in fully immobilized form. The

District will deliver a written request to the Registrar, together with a supply of definitive 2011 Bonds, to issue 2011 Bonds as herein provided in any authorized denomination. Upon receipt of all then outstanding 2011 Bonds by the Registrar together with a written request on behalf of the District to the Registrar, new 2011 Bonds will be issued in such denominations and registered in the names of such persons as are specified in such written request.

(5) As long as DTC or its successor (or substitute depository or its successor) is not the registered owner of the 2011 Bonds, any 2011 Bond may be transferred pursuant to its provisions at the principal office for such purpose of the Registrar by surrender of such 2011 Bond for cancellation, accompanied by a written instrument of transfer, in form satisfactory to the Registrar, duly executed by the registered owner in person or by his or her duly authorized attorney, and thereupon the District will issue and the Registrar will authenticate and deliver at the principal office of the Registrar (or send by registered or first class insured mail to the owner thereof at his expense), in the name of the transferee or transferees, a new 2011 Bond of the same interest rate, principal amount and maturity, and on which interest accrues from the last interest payment date to which interest has been paid so that there will result no gain or loss of interest as a result of such transfer, upon payment of any applicable tax or governmental charge. To the extent of denominations authorized in respect of any such 2011 Bond by the terms of this Fifth Supplemental Resolution, one such 2011 Bond may be transferred for several such 2011 Bonds of the same interest rate and maturity, and for a like aggregate principal amount, and several such 2011 Bonds of the same interest rate and maturity may be transferred for one or several such 2011 Bonds, respectively, of the same interest rate and maturity and for a like aggregate principal amount.

Section 2.03. <u>Tax Covenants</u>.

A. *General*. The District intends for interest on the 2011 Bonds to be excludable from gross income for federal income tax purposes under sections 103 and 141 through 150 of the Code, and the applicable regulations. The District covenants not to take any action, or knowingly omit to take any action within its control, that if taken or omitted would cause the interest on the 2011 Bonds to be includable in gross income, as defined in section 61 of the Code, for federal income tax purposes.

B. *Tax Certificate*. Upon the issuance of the 2011 Bonds, the Treasurer or Deputy Treasurer is authorized to execute a federal tax certificate (the "Tax Certificate"), which will certify to various facts and representations concerning the 2011 Bonds, based on the facts and estimates known or reasonably expected on the date of issuance of the 2011 Bonds, and make certain covenants with respect to the 2011 Bonds, including but not limited to the following:

(1) *No Private Activity Bonds*. The proceeds of the 2011 Bonds will not be used in a manner that would cause the 2011 Bonds to be "private activity bonds" within the meaning of the Code, as further described in the Tax Certificate. Moreover, the District covenants that it will use the proceeds of the 2011 Bonds (including interest or other investment income derived from 2011 Bond proceeds), regulate the use of property refinanced, directly or indirectly, with such proceeds, and take such other and further action as may be required so that the 2011 Bonds will not be "private activity bonds."

(2) *No Federal Guarantee*. The District has not and will not take any action, and has not knowingly omitted and will not knowingly omit to take any action within its control, that, if taken or omitted would cause the 2011 Bonds to be "federally guaranteed" within the meaning of the Code, as further described in the Tax Certificate.

(3) *No Arbitrage Bonds*. The District reasonably expects that the proceeds of the 2011 Bonds will not be used in a manner that would cause the 2011 Bonds to be "arbitrage bonds" within the meaning of the Code, as further described in the Tax Certificate.

(4) *No Hedge Bonds*. The District reasonably expects that at least 85% of the proceeds of the 2011 Bonds will be spent within three years of the date the 2011 Bonds are issued to carry out the governmental purposes of the 2011 Bonds.

The District covenants that it will comply with the Tax Certificate unless it receives advice from nationally recognized bond counsel or the Internal Revenue Service that certain provisions have been amended or no longer apply to the 2011 Bonds.

C. *Arbitrage Rebate*. If the District does not qualify for an exception to the requirements of Section 148(f) of the Code relating to the payment of arbitrage rebate to the United States, the District will take all necessary steps to comply with the requirement that certain amounts earned by the District on the investment of the "gross proceeds" of the 2011 Bonds (within the meaning of the Code) be rebated.

D. *Not Bank Qualified*. The 2011 Bonds are not "qualified tax-exempt obligations" within the meaning of Section 265(b) of the Code.

ARTICLE III

SALE OF 2011 BONDS; PLAN OF REFUNDING

Section 3.01 Sale of 2011 Bonds. The Commission hereby finds that the Underwriter's offer to purchase the 2011 Bonds, as set forth in the bond purchase agreement presented to the Commission at this meeting (the "Bond Purchase Agreement"), is reasonable and that it is in the best interest of the District that the 2011 Bonds be sold to the Underwriter on the conditions set forth in the Bond Purchase Agreement and in this Fifth Supplemental Resolution. The Commission hereby authorizes the President of the Commission, General Manager, or Treasurer to execute the Bond Purchase Agreement and deliver it to the Underwriter.

Section 3.02. Official Statement; Use of Documents. The President of the Commission, General Manager, or Treasurer are authorized and directed to execute and deliver to the Underwriter copies of an Official Statement in substantially the form of the Preliminary Official Statement; provided, however, that the General Manager is authorized to supplement or amend the Preliminary Official Statement as the General Manager, with the approval of Bond Counsel to the District, deems necessary or appropriate.

The Commission approves and authorizes the use of the Official Statement (including any such supplements and amendments thereto) in connection with the public offering and sale of the 2011 Bonds by the Underwriter.

Section 3.03. Execution and Delivery of the 2011 Bonds. The proper officers of the Commission and the General Manager and Treasurer of the District are hereby authorized and directed to do all things necessary or proper for the printing, execution and delivery of the 2011 Bonds to the Underwriter, upon payment of the purchase price specified in the Bond Purchase Agreement, in accordance with the terms of the Bond Purchase Agreement, the Resolution, and this Fifth Supplemental Resolution.

Section 3.04. Disposition of 2011 Bond Proceeds; Refunding Plan and Account. The proceeds from the sale of the 2011 Bonds will be applied as follows:

A. *Refunding Plan.* For the purpose of realizing a debt service savings and benefiting the ratepayers of the District, the 2011 Bonds shall be issued to provide for the payment of the principal of and interest on the Refunded Bonds and to call the Refunded Bonds for redemption on June 1, 2012. To effect the refunding of the Refunded Bonds, there is hereby authorized to be created in the Bond Fund an account to be held by the Escrow Agent and drawn upon for the sole purpose of paying the principal of and interest on the Refunded Bonds until their date of redemption and of paying costs related to the refunding of the Refunded Bonds (the "Refunding Account").

A portion of the proceeds of the sale of the 2011 Bonds (exclusive of accrued interest thereon, if any, which shall be paid into the Interest Account in the Bond Fund and used to pay interest on the 2011 Bonds) shall be credited to the Refunding Account.

Money in the Refunding Account shall be used to defease the Refunded Bonds as authorized by the Resolution and the 2002 Bond Resolution and to pay costs of issuance of the 2011 Bonds. The District shall defease the Refunded Bonds and discharge such obligations by the use of money in the Refunding Account to purchase the Escrow Securities (as hereafter identified) bearing such interest and maturing as to principal and interest in such amounts and at such times that, together with any necessary beginning cash balance, will provide for the payment of the redemption price of the Refunded Bonds (100% of the principal amount thereof) on June 1, 2012.

B. *Refunding Procedures.* The net proceeds of sale of the 2011 Bonds shall be delivered to the Escrow Agent for the purpose of defeasing the Refunded Bonds and paying related costs of issuance of the 2011 Bonds. Immediately upon receipt of such funds, the Escrow Agent shall use the funds to defease the Refunded Bonds as authorized by the 2002 Bond Resolution and to pay costs of issuance of the 2011 Bonds. On behalf of the District, the Escrow Agent will purchase certain Government Obligations (which obligations so purchased, are herein called the "Escrow Securities"), bearing such interest and maturing as to principal and interest in such amounts and at such times that, together with any necessary beginning cash balance, will provide for the payment of:

(1) interest on the Refunded Bonds due and payable on and prior to June 1, 2012; and

(2) the redemption price of the Refunded Bonds (100% of the principal amount thereof) on June 1, 2012.

The Escrow Securities will be purchased at a yield not greater than the yield permitted by the Code and regulations relating to escrowed securities in connection with refunding bond issues.

U.S. Bank National Association is hereby appointed as the escrow agent (the "Escrow Agent") for the Refunded Bonds. A beginning cash balance, if any, and the Escrow Securities shall be deposited irrevocably with the Escrow Agent in an amount sufficient to defease the Refunded Bonds. Proceeds of the 2011 Bonds remaining after acquisition of the Escrow Securities and provision for the necessary beginning cash balance shall be utilized to pay expenses for the acquisition and safekeeping of the Escrow Securities and for the issuance of the 2011 Bonds.

To carry out the purposes of this refunding plan, the General Manager or Treasurer is authorized and directed to execute and deliver to the Escrow Agent a mutually agreeable Escrow Deposit Agreement, subject to approval by counsel to the District.

C. *Call For Redemption of Refunded Bonds*. The District hereby calls the Refunded Bonds for redemption on June 1, 2012, in accordance with the provisions of the 2002 Bond Resolution authorizing the redemption and retirement of the Refunded Bonds prior to their fixed maturities. That defeasance and call for redemption of the Refunded Bonds will be irrevocable after the issuance of the 2011 Bonds and delivery of the Escrow Securities to the Escrow Agent.

The Escrow Agent is hereby authorized and directed to provide for the giving of notices of the defeasance and the redemption of the Refunded Bonds in accordance with the applicable provisions of the 2002 Bond Resolution. The General Manager, Treasurer and other officers and employees of the District are authorized and requested to provide whatever assistance is necessary to accomplish such redemption and the giving of notices therefor. The costs of publication of such notices shall be an expense of the District.

The District will take such actions as are found necessary to see that all necessary and proper fees, compensation and expenses of the Escrow Agent are paid when due.

Section 3.05. Continuing the Debt Service Reserve Forward Delivery Agreement. To provide for a portion of the reserve requirement for the 2011 Bonds and other outstanding Bonds, the District wishes to continue the Debt Service Reserve Forward Delivery Agreement (the "Agreement") in accordance with its terms. The Provider (as defined in the Agreement) has agreed to continue the Agreement, as set forth in a Second Amendment to the Agreement (the "Amendment"), a copy of which is filed with the records of this meeting. The Commission hereby approves the Amendment and authorizes the General Manager or Treasurer to execute the Amendment on behalf of the District, deliver the Amendment to the Provider, and take all such additional actions as may be necessary or desirable to complete the transaction contemplated by the Amendment.

ARTICLE IV

ONGOING DISCLOSURE

Section 4.01. Undertaking to Provide Ongoing Disclosure.

A. *Contract/Undertaking*. This section constitutes the District's written undertaking for the benefit of the holders of the 2011 Bonds as required by Section (b)(5) of the Rule.

B. *Financial Statements/Operating Data*. The District agrees to provide or cause to be provided to the Municipal Securities Rulemaking Board ("MSRB"), the following annual financial information and operating data for the prior fiscal year (commencing in 2012 for the fiscal year ending December 31, 2011):

(1) Annual financial statements showing ending fund balances for the Water System, prepared in accordance with generally accepted accounting principles as promulgated for municipalities (and as modified as may be required by the Washington State Auditor pursuant to RCW 43.09.200 (or any successor statute)) and generally of the type included in the official statement for the 2011 Bonds under the heading "Comparative Income Statements";

(2) Principal amount of outstanding Bonds;

(3) Debt service coverage for outstanding Bonds;

(4) Aggregate cubic feet of water usage per year for, and gross revenue from, the Water System's ten largest customers; and

(5) Water System operating statistics showing average number of customers, water sales, system use and losses and water purchased.

Items 2-5 shall be required only to the extent that such information is not included in the annual financial statements.

Such annual information and operating data described above will be provided on or before nine months after the end of the District's fiscal year. The District's current fiscal year ends December 31. The District may adjust such fiscal year by providing written notice of the change of fiscal year to the MSRB. In lieu of providing such annual financial information and operating data, the District may cross-reference to other documents available to the public on the MSRB's internet website or filed with the SEC.

If not provided as part of the annual financial information discussed above, the District will provide to the MSRB the District's audited annual financial statement prepared in accordance with generally accepted accounting principles (and as modified as may be required by the Washington State Auditor pursuant to RCW 43.09.200 (or any successor statute)), when and if available.

C. *Specified Events*. The District agrees to provide or cause to be provided to the MSRB in a timely manner, not in excess of ten business days after the occurrence of the event, notice of the occurrence of any of the following events with respect to the 2011 Bonds:

(1) Principal and interest payment delinquencies;

(2) Non-payment related defaults, if material;

(3) Unscheduled draws on debt service reserves reflecting financial difficulties;

(4) Unscheduled draws on credit enhancements reflecting financial difficulties;

(5) Substitution of credit or liquidity providers, or their failure to perform;

(6) Adverse tax opinions, the issuance by the Internal Revenue Service of proposed or final determinations of taxability, Notices of Proposed Issue (IRS Form 5701-TEB) or other material notices or determinations with respect to the tax status of the 2011 Bonds, or other material events affecting the tax status of the 2011 Bonds;

(7) Modifications to the rights of 2011 Bond owners, if material;

(8) Bond calls, if material, and tender offers;

(9) Defeasances;

(10) Release, substitution or sale of property securing repayment of the 2011 Bonds, if material;

(11) Rating changes;

(12) Bankruptcy, insolvency, receivership or similar event of the District;

(13) The consummation of a merger, consolidation, or acquisition involving the District or the sale of all or substantially all of the assets of the District, other than in the ordinary course of business, the entry into a definitive agreement to undertake such an action or the termination of a definitive agreement relating to any such actions, other than pursuant to its terms, if material; and

(14) Appointment of a successor or additional trustee or the change of name of a trustee, if material.

Solely for purposes of disclosure, and not intending to modify this undertaking, the District advises that no real property secures repayment of the 2011 Bonds. The only debt service reserve is the Reserve Account.

D. *Notification Upon Failure to Provide Financial Data.* The District agrees to provide or cause to be provided, in a timely manner, to the MSRB, notice of its failure to provide the annual financial information described in subsection B above on or prior to the date set forth in subsection B above.

E. *Format for Filings with the MSRB.* Until otherwise designated by the MSRB or the SEC, any information or notices submitted to the MSRB in compliance with the Rule are to be submitted through the MSRB's Electronic Municipal Market Access system ("EMMA"), currently located at www.emma.msrb.org. All notices, financial information and operating data required by this undertaking to be provided to the MSRB must be in an electronic format as prescribed by the MSRB. All documents provided to the MSRB pursuant to this undertaking must be accompanied by identifying information as prescribed by the MSRB.

F. *Termination/Modification.* The District's obligations to provide annual financial information and notices of specified events will terminate upon the legal defeasance, prior redemption or payment in full of all of the 2011 Bonds. This section, or any provision hereof, will be null and void if the District (1) obtains an opinion of nationally recognized bond counsel to the effect that those portions of the Rule which require this section, or any such provision, are invalid, have been repealed retroactively or otherwise do not apply to the 2011 Bonds; and (2) notifies the MSRB of such opinion and the cancellation of this section.

The District may amend this section with an opinion of nationally recognized bond counsel in accordance with the Rule. In the event of any amendment of this section, the District shall describe such amendment in the next annual report, and shall include a narrative explanation of the reason for the amendment and its impact on the type (or in the case of a change of accounting principles, on the presentation) of financial information or operating data being presented by the District. In addition, if the amendment relates to the accounting principles to be followed in preparing financial statements, (i) notice of such change shall be given in the same manner as for a specified event under subsection (c), and (ii) the annual report for the year in which the change is made shall present a comparison (in narrative form and also, if feasible, in quantitative form) between the financial statements as prepared on the basis of the new accounting principles and those prepared on the basis of the former accounting principles.

G. *Bond Owner's Remedies Under This Section.* The right of any Bond Owner or Beneficial Owner of 2011 Bonds to enforce the provisions of this section is limited to a right to obtain specific enforcement of the District's obligations hereunder, and any failure by the District to comply with the provisions of this undertaking will not be an event of default with respect to the 2011 Bonds hereunder. For purposes of this section, "Beneficial Owner" means any person who has the power, directly or indirectly, to vote or consent with respect to, or to dispose of ownership of, any 2011 Bonds, including persons holding 2011 Bonds through nominees or depositories.

ARTICLE V

MISCELLANEOUS

Section 5.01. Effective Date. This Fifth Supplemental Resolution will become effective upon its adoption.

Section 5.02. Ratification of Past Acts and Authorization of Future Acts. All actions and proceedings heretofore taken by the officers, agents, attorneys and employees of the District in connection with the sale and issuance of the 2011 Bonds are hereby ratified, approved and confirmed.

The Commission further authorizes and directs all proper officers, agents, attorneys and employees of the District to carry out or cause to be carried out all obligations of the District under this Fifth Supplemental Resolution, to execute additional documents and certificates and to perform such other acts as they may consider necessary or advisable in connection with the sale and issuance of the 2011 Bonds.

Resolution No. 5550

Adopted by the Commission of Public Utility District No. 1 of Snohomish County, Washington, this 16th day of August, 2011.

PUBLIC UTILITY DISTRICT NO. 1 OF
SNOHOMISH COUNTY, WASHINGTON

President

Vice President

Secretary

August 16, 2011
Clerk's Note:

AMENDMENT NO. 2 TO DEBT SERVICE RESERVE FORWARD DELIVERY AGREEMENT, is mentioned in Resolution No. 5550 as "filed with the records of this meeting," and attached hereto.

Sandra Wallenfelsz
Senior Deputy Clerk of the Board

AMENDMENT NO. 2 TO DEBT SERVICE RESERVE FORWARD DELIVERY AGREEMENT

This Amendment No. 2 to Debt Service Reserve Forward Delivery Agreement (the "Amendment") is dated [August 31], 2011, and is made by and among BANK OF AMERICA, N.A., a national banking association duly organized and existing under and by virtue of the laws of the United States of America (the "Bank"), PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY, WASHINGTON, a municipal corporation duly organized and existing under the laws of the State of Washington (the "Issuer"), and U.S. BANK NATIONAL ASSOCIATION, a national banking association duly organized and existing under and by virtue of the laws of the United States of America (the "Custodial Agent").

WHEREAS, the Provider, the Issuer, and the Custodial Agent entered into a Debt Service Reserve Forward Delivery Agreement, dated as of November 13, 2002 (the "Original Agreement"), which related to the Issuer's Water System Revenue and Refunding Bonds, Series 2002 (the "2002 Bonds") and the Issuer's Water System Revenue Bonds, Series 1996 (the "1996 Bonds"); and

WHEREAS, the Original Agreement was amended by Amendment No. 1 to Debt Service Reserve Forward Delivery Agreement, dated as of May 15, 2006 (together with the Original Agreement, the "Agreement"), to also relate to the Issuer's Water System Revenue and Refunding Bonds, Series 2006, currently outstanding in the principal amount of $5,285,000 (the "2006 Bonds"), a portion of the proceeds of which was used to refund the 1996 Bonds;

WHEREAS, the Issuer issued its Water System Revenue Bonds, Series 2009 (the "2009 Bonds"), dated November 18, 2009, on a parity with the 2002 Bonds and 2006 Bonds, and the 2009 Bonds are currently outstanding in the aggregate principal amount of $13,085,000; and

WHEREAS, the Issuer has notified the Bank that the Issuer intends to issue its Water System Revenue Refunding Bonds, Series 2011 (the "2011 Bonds") and to use the proceeds thereof to refund the 2002 Bonds maturing on and after December 1, 2012 on the date of this Amendment;

WHEREAS, the Issuer has, by prior written notice, requested that the Bank continue the Agreement and make its terms applicable to the 2011 Bonds and the Issuer's other outstanding water system revenue bonds issued on a parity therewith, which are the remaining 2002 Bonds, the 2006 Bonds and the 2009 Bonds;

WHEREAS, pursuant to Section 9.5 of the Agreement, the Agreement may be modified by a written document duly authorized, executed and delivered by the Issuer, the Custodial Agent, and the Provider;

WHEREAS, the Issuer, the Provider, and the Custodial Agent have agreed to amend the Agreement as provided herein; and

NOW, THEREFORE, the parties hereby agree as follows:

Section 1. Definitions. Except as set forth in this Section 1, capitalized terms used in this Amendment and not otherwise defined herein have the meanings ascribed to them by the Agreement.

Effective as of the date hereof, the definition of "Bonds" set forth in the Agreement is deleted in its entirety and replaced by the following:

"Bonds" means, collectively, the Issuer's Water System Revenue and Refunding Bonds, Series 2002, maturing on December 1, 2011, outstanding as of August 31, 2011 in the principal amount of $765,000 (the "2002 Bonds"), Water System Revenue and Refunding Bonds, Series 2006, outstanding as of August 31, 2011 in the principal amount of $5,285,000 (the "2006 Bonds"), Water System Revenue Bonds, Series 2009, outstanding as of August 31, 2011 in the principal amount of $13,085,000 (the "2009 Bonds"), and Water System Revenue Refunding Bonds, Series 2011, issued on the date of this Amendment in the principal amount of $9,650,000 (the "2011 Bonds").

Section 2. Termination Amount. The parties hereto acknowledge and agree that no Termination Amount or other amount is due and payable by any party with respect to this Amendment.

Section 3. Representations. Each party represents to the other parties that:

(a) it is duly organized and validly existing under the laws of the jurisdiction of its organization or incorporation;

(b) it has the power to execute and deliver this Amendment and to perform its obligations under this Amendment and has taken all necessary action to authorize such execution, delivery and performance;

(c) it is entering into this Amendment as principal;

(d) the person signing this Amendment on its behalf is duly authorized to do so;

(e) it has obtained all governmental and other consents and authorizations that it is required to obtain in connection with its execution and delivery of this Amendment, all such consents and authorizations are in full force and effect, and all conditions of any such consents and authorizations have been complied with;

(f) the execution, delivery and performance of this Amendment will not violate or conflict with any law, ordinance, charter, by-law or rule applicable to it, any order or judgment of any court or other agency of government applicable to it or any of its assets or any contractual restriction binding on or affecting it or any of its assets;

(g) its obligations under this Amendment constitute its legal, valid and binding obligations, enforceable in accordance with their respective terms (subject to applicable bankruptcy, reorganization, insolvency, moratorium or similar laws affecting creditors' rights generally and subject, as to enforceability, to equitable principles of general application, regardless of whether enforcement is sought in a proceeding in equity or at law);

(h) if it is the Issuer, (i) no Issuer Event of Default has occurred, (ii) no event has occurred that would, with the giving of notice or the passage of time, or both, result in such a default, and (iii) no such event or circumstance would occur as a result of its entering into or performing its obligations under this Amendment;

(i) if it is the Custodial Agent, (i) no Custodial Agent Event of Default has occurred, (ii) no event has occurred that would, with the giving of notice or the passage of time, or both, result in such a default, and (iii) no such event or circumstance would occur as a result of its entering into or performing its obligations under this Amendment;

(j) if it is the Provider, (i) no Provider Event of Default has occurred, (ii) no event has occurred that would, with the giving of notice or the passage of time, or both, result in such a default, and (iii) no such event or circumstance would occur as a result of its entering into or performing its obligations under this Amendment;

(k) all other representations contained in the Agreement, as amended, are true and accurate as of the date of this Amendment and such representations are deemed to be given or repeated by each party, as the case may be, on the date of this Amendment;

(l) if it is the Issuer, the 2011 Bonds are being issued on a parity with the 2002 Bonds, the 2006 Bonds, and the 2009 Bonds pursuant to the Resolution and those are all of the bonds issued on a parity with each other pursuant to the Resolution and pursuant to Title 54 and Chapters 39.46 and 39.53 of the Revised Code of Washington, and the 2011 Bonds are secured by the Reserve Account; and

(m) if it is the Issuer, Moody's Investors Service and Standard & Poor's Rating Services, have assigned ratings of "Aa2," and "AA," respectively, to the 2011 Bonds, which ratings are at least equivalent to the ratings that were assigned to the 2002 Bonds immediately prior to the refunding thereof.

Section 4. Documents to be Delivered. Promptly upon execution of this Amendment,

(a) the Issuer shall deliver to the Provider and the Custodial Agent an opinion of counsel to the Issuer with respect to the enforceability of this Amendment against the Issuer;

(b) the Issuer shall deliver to the Custodial Agent and the Provider evidence reasonably satisfactory to the Provider of (i) the authority of the Issuer to enter into this Amendment and (ii) the authority and genuine signature of the individual signing this Amendment on behalf of the Issuer to execute the same; and

(c) the Custodial Agent shall deliver to the Issuer and the Provider evidence reasonably satisfactory to the Provider of (i) the authority of the Custodial Agent to enter into this Amendment and (ii) the authority and genuine signature of the individual signing this Amendment on behalf of the Custodial Agent to execute the same.

Section 5. Ratification and Confirmation. Except as expressly amended by this Amendment, the Agreement is in all respects ratified and confirmed and the terms, provisions, and conditions thereof are and shall remain in full force and effect. From and after the date of this Amendment, all references to the Agreement shall incorporate the terms of this Amendment.

Section 6. Counterparts. This Amendment may be executed in any number of counterparts, each of which shall be deemed an original.

Section 7. No Broker Fee. The Issuer and Custodial Agent each acknowledge and agree that no brokerage or other similar fees will be paid by the Provider in connection with this Amendment.

Section 8. The Provider Has No Fiduciary or Advisory Role. In connection with this Amendment, the Issuer agrees that (i) the Provider is acting and has acted solely as a principal, in the Provider's own best interests, and not as an agent, advisor or fiduciary of the Issuer, (ii) the Provider has not assumed a fiduciary responsibility in favor of the Issuer with respect to this Amendment and (iii) nothing in this Amendment or in any prior relationship between the Provider and the Issuer will be deemed to create an advisory, fiduciary or agency relationship between the Provider and the Issuer in respect of this Amendment (whether or not the Provider or any affiliate of the Provider has provided or is currently providing other services to the Issuer on related or other matters). In addition, the Issuer acknowledges that it has (i) determined, without reliance upon the Provider or any of its affiliates, the financial and economic risks and merits, as well as the legal, tax and accounting characterizations and consequences, of this Amendment and it is capable of assuming such risks, (ii) consulted with its own legal, tax, accounting and financial advisors to determine whether this Amendment is in its best interest and made an independent analysis and decision to enter into this Amendment based on such advice, and (iii) retained Montague DeRose and Associates, LLC as its advisor and has relied on such firm to provide advice to it with respect to this Amendment.

Section 9. Governing Law. This Amendment shall be governed by and construed in accordance with the laws of the State of New York without regard to principles of conflicts of laws.

IN WITNESS WHEREOF, the parties have each caused this Amendment No. 2 to the Debt Service Reserve Forward Delivery Agreement to be duly executed by their respective officers, all as of the day and year first above written.

BANK OF AMERICA, N.A.

By: ______________________________
Name:
Title:

PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY, WASHINGTON

By: ______________________________
Name:
Title:

U.S. BANK NATIONAL ASSOCIATION

By: ______________________________
Name:
Title:

P:\20391_DOT\20391_2GR

CERTIFICATE

I, the undersigned, Clerk of the Commission of Public Utility District No. 1 of Snohomish County, Washington, and keeper of the records of the Commission (the "Commission"), DO HEREBY CERTIFY:

1. That the attached Resolution No. 5550 (the "Resolution") is a true and correct copy of a resolution of the Commission, as finally adopted at a regular meeting of the Commission held on August 16, 2011, and duly recorded in my office.

2. That said meeting was duly convened and held in all respects in accordance with law, and to the extent required by law, due and proper notice of such meeting was given; that a legal quorum was present throughout the meeting and a legally sufficient number of members of the Commission voted in the proper manner for the adoption of said Resolution; that all other requirements and proceedings incident to the proper adoption of said Resolution have been duly fulfilled, carried out and otherwise observed; and that I am authorized to execute this certificate.

DATED this 16th day of August, 2011.

Patricia Busscher

Clerk of the Commission

RESOLUTION NO. 5557

A RESOLUTION Amending District Water Utility Policies, Establishing a Deferred General Facility Charge for Satellite and Remote Water Systems and Granting the Assistant General Manager of Water Resources Authority to Permit or Deny Deferral of General Facility Charges for Such Systems

WHEREAS, the Board of Commissioners of Public Utility District No. 1 of Snohomish County, Washington (the "District"), from time to time has adopted, reviewed and amended its Water Utility Policies and Charges for its water system to accommodate changing circumstances and District needs, and to improve customer service; and

WHEREAS, the District has full and exclusive authority under RCW 54.16.030 to regulate and control the use, distribution and price of its water utility services, and has the power and obligation under RCW 54.24.080 to establish, maintain, and collect rates or charges for water and other services supplied by the District which shall be fair, nondiscriminatory, and adequate to provide revenues sufficient for payment of its lawful obligations to fund its planned improvements, and to provide quality water service to its existing and new water service customers; and

WHEREAS, Resolution No. 4848-J delegates to the District's General Manager broad authority to establish certain policies and regulations relating to water service, but reserves in the District's Commission the authority to establish the general terms, conditions and policies for water service provided by the District as set forth in Section 2, and the rates, charges, and fees set forth in Appendix B, of the District's Policies and Procedures Manual for Administration of Water Services, as it may be amended from time to time; and

WHEREAS, existing policies permit developers that construct main extensions for developments or subdivisions the option to defer payment of the applicable General Facilities

Charge ("GFC") for each lot to the time a service connection is requested for such lot, and the District charges an adjusted GFC amount that enables the District to recover administrative costs and interest costs associated with such delayed payment; and

WHEREAS, while existing policies set forth GFC rates paid at the time of conveyance of the constructed system to the District and rates paid at time of lot sale or service connection for the District's integrated water system, existing policies do not set a GFC rate paid at time of lot sale or service connection for District Satellite and Remote Water Systems; and

WHEREAS, historically developers have not been permitted to defer payment of GFCs for Satellite and Remote Systems for reasons that include a need to ensure the effectiveness of latecomer agreements with developers, or a limitation on the number of available connections; and

WHEREAS, District staff recommend establishing Deferred GFC rates for Satellite and Remote Systems, to be used at the discretion of the Assistant General Manager for Water Resources, to accommodate situations in which such Satellite or Remote Systems have adequate connections available, latecomer agreements with developers do not exist or have expired, and other appropriate situations; and

WHEREAS, having considered the information provided and the recommendation of staff, the Commission finds proposed revisions to the District's Water Utility Policies and Procedures Manual as set forth in the attached Exhibit "A" are reasonable and appropriate, and in the best interests of the District and its customers.

NOW, THEREFORE, BE IT RESOLVED by the Board of Commissioners of Public Utility District No. 1 of Snohomish County, that effective November 1, 2011, Section 3.3.7

and Table B-2 of the District's Policies and Procedures Manual for the Administration of Water Services shall be amended as set forth in Exhibit "A," incorporated herein by this reference.

PASSED AND APPROVED this 18th day of October, 2011.

President

Vice-President

Secretary

EXHIBIT "A"

Section 2.6.2 of the Water Utility Policies and Procedures Manual is hereby amended as follows:

2.6.2 General Facilities Charge (GFC)

A General Facilities Charge (GFC) is applied on new service connections to compensate for costs the District incurs in construction or acquisition of water system general facilities, (i.e., source, storage, treatment and transmission facilities); required to support the addition of the new customers. The GFC amount is based on the demand a new water service connection is expected to place on the water system (see Appendix B, Tables B-2 and B-3). Equivalent Residential Units (ERU) will be used to represent the demand a given service will place on the District's water system and consequently that service's respective share of the costs of the District's water system general facilities (see Appendix B, Table 3). The following procedures apply to payment of the GFC:

(a) All New Customers connecting to a District water main or expanding their service connection shall pay a GFC, except as follows:

(1) The GFC shall not apply to extensions, new developments, or subdivisions where water facilities are financed under the LUD process (see Section 3.3.2).

(2) If a New Customer provides documentation, acceptable to the District, that the applicable GFC for such customer's requested connection has already been paid through past payment by a Developer, or other means, the GFC shall not be applied.

(b) Where construction of a development or subdivision requires connection of a new Developer-installed main extension to the District's water system, the Developer has the option of paying the total applicable GFC for all lots at the time of conveyance of the main extension to the District, or deferring payment of the GFC applicable to any individual lot until a service connection is requested for such lot (see Appendix B, Table B-2). For Satellite or Remote systems, the option of deferring payment of the GFC is at the discretion of the Assistant General Manager for Water Resources.

(c) Where a development or subdivision is constructed within the boundaries of the District's integrated water system, but connection with the District's integrated water system is deemed by the District in its sole judgment to be impracticable at the time of construction, such development or subdivision may construct and utilize a separate, temporary water supply, storage and distribution system, to be owned and operated by the District. Such system shall be attached to the District's integrated water system at District cost at such time that the District deems attachment practicable and appropriate. The Developer of the development or subdivision has the option of paying the GFC at the time of conveyance of the new distribution system to the District, or deferring payment of the GFC applicable to any individual lot until a service connection is requested for such lot (see Appendix B, Table B-2).

(d) When the Developer chooses to defer the payment of the GFC, an adjusted GFC amount shall be applicable in order to permit the District to recover administrative costs and interest costs associated with delayed payment (see Appendix B, Table B-2).

(e) When the Developer chooses to defer the payment of the GFC with regard to any specific parcel of property to be connected to the District's water system (including, in the case of a condominium, any unit or common area) the Developer shall be obligated to disclose to the initial purchaser of such parcel of property that a GFC is due and must be paid to the District prior to installation of a meter and connection of such parcel to the District's water system. Installation of a meter and connection of a parcel of property, including a condominium unit, to the District's water system shall not occur until all applicable fees have been paid to the District including but not limited to the required GFC.

A Developer who fails to provide the disclosure required in this subsection shall defend, indemnify and hold the District harmless from and against any and all claims, demands, losses, costs and damages of whatsoever nature, including attorney fees and costs, incurred by the District as a result of such failure.

(f) The District shall determine the appropriate number of ERUs to be assigned to any and all New Customer connections. The General Facilities Charge for a subdivision constructed under the circumstances described in subsections (b) and (c) above where the Developer has chosen to pay the GFC at the time of conveyance to the District of the Developer-installed main extension or water distribution system, shall be based upon the total of the estimated number of ERUs assigned by the District for each parcel of property in the development or subdivision. If the use classification or the number of dwelling units for any parcel changes between the date of the estimate and the date of application for service to such parcels, causing a change in the estimated ERUs applicable, the General Facilities Charge shall be recalculated accordingly. The recalculation shall be based upon the new number of ERUs. If the recalculated General Facilities Charge is greater than the original payment, the applicants for service to parcels which have a different use classification or a different number of dwelling units shall pay the difference between the recalculated General Facilities Charge and the estimated General Facilities Charge. No refunds will be made by the District where the recalculated charges are less than the original payment. In recalculating the General Facilities Charge, the rates in effect at the time of the recalculation shall be used; and for purposes of calculating the difference that the applicant shall pay, the estimated General Facilities Charge shall be recomputed based upon the rates then in effect.

(g) The General Facilities Charge shall also apply to an LUD or to the identified and assessed individual properties contained therein at the time of formation. Properties within an LUD are subject to the applicable LUD GFC. However, once an LUD has been established and the final assessment roll confirmed, any additional individual water service customer within an established LUD requesting a new water service connection or adding to the number of ERUs to be served by that customer's existing water service connection shall be deemed a "New Customer," and be subject to the General Facilities Charge imposed at the time of connection (see Section (h) below).

(h) In all cases, the GFC paid shall be based upon the GFC in effect on the date of payment.

Section 3.3.7 of the Water Utility Policies and Procedures Manual is hereby amended as follows:

3.3.7 General Facilities Charge (GFC)

A General Facilities Charge (GFC) is applied on new service connections to compensate for costs the District incurs in construction or acquisition of water system general facilities (i.e., source, storage, treatment and transmission facilities) required to support the addition of the new customers. The GFC amount is based on the demand a new water service connection is expected to place on the water system (see Appendix B, Tables B-2 and B-3). Equivalent Residential Units (ERU) will be used to represent the demand a given service will place on the District's water system and consequently that service's respective share of the costs of the District's water system general facilities. The following procedures apply to payment of the GFC:

(a) All New Customers connecting to a District water main or expanding their service connection shall pay a GFC, except as follows:

(1) The GFC shall not apply to extensions, new developments, or subdivisions where all applicable water system source, storage, treatment, and transmission facilities are financed wholly by the benefited properties under the LUD process (see Section 3.3.2) or through the applicant extension process.

(2) If a New Customer provides documentation, acceptable to the District, that the applicable GFC for such customer's requested connection has already been paid through past payment by an Applicant, or other means, the GFC shall not be applied.

(b) Where construction of a development or subdivision requires connection of a new Applicant-installed main extension to the District's water system, the Applicant has the option of paying the total applicable GFC for all lots at the time of conveyance of the main extension to the District, or deferring payment of the GFC applicable to any individual lot until a service connection is requested for such lot (see Appendix B, Table B-2). <u>For Satellite or Remote systems, the option of deferring payment of the GFC is at the discretion of the Assistant General Manager for Water Resources.</u>

(c) Where a development or subdivision is constructed within the boundaries of the District's integrated water system, but connection with the District's integrated water system is deemed by the District in its sole judgment to be impracticable at the time of construction, such development or subdivision may construct and utilize a separate, temporary water supply, storage and distribution system, to be owned and operated by the District. Such system shall be attached to the District's integrated water system at District cost at such time that the District deems attachment practicable and appropriate. The Applicant of the development or subdivision has the option of paying the GFC at the time of conveyance of the new distribution system to the District, or deferring payment of the GFC applicable to any individual lot until a service connection is requested for such lot (see Appendix B, Table B-2).

(d) When the Applicant chooses to defer the payment of the GFC, an adjusted GFC amount shall be applicable in order to permit the District to recover administrative costs and interest costs associated with delayed payment (see Appendix B, Table B-2).

(e) When the Applicant chooses to defer the payment of the GFC with regard to any specific parcel of property to be connected to the District's water system (including, in the case of a condominium, any unit or common area) the Applicant shall be obligated to disclose to the initial purchaser of such parcel of property that a GFC is due and must be paid to the District prior to installation of a meter and connection of such parcel to the District's water system. Installation of a meter and connection of a parcel of property, including a condominium unit or any parcel held in common for the development, to the District's water system shall not occur until all applicable fees have been paid to the District including but not limited to the required GFC.

An Applicant who fails to provide the disclosure required in this subsection shall defend, indemnify and hold the District harmless from and against any and all claims, demands, losses, costs and damages of whatsoever nature, including attorney fees and costs, incurred by the District as a result of such failure.

(f) The District shall determine the appropriate number of ERUs to be assigned to any and all New Customer connections. The General Facilities Charge for a subdivision constructed under the circumstances described in subsections (b) and (c) above, where the Applicant has chosen to pay the GFC at the time of conveyance to the District of the Applicant-installed main extension or water distribution system, shall be based upon the estimated total number of ERUs as determined by the District to be necessary to provide service for all of the parcels of property within the development or subdivision to be served by the District. If the use classification or the number of dwelling units for any parcel changes between the date of the estimate and the date of application for service to such parcels, causing a change in the estimated ERUs applicable, the General Facilities Charge shall be recalculated accordingly. The recalculation shall be based upon the new number of ERUs. If the recalculated General Facilities Charge is greater than the original payment, the applicants for service to parcels which have a different use classification or a different number of dwelling units shall pay the difference between the recalculated General Facilities Charge and the estimated General Facilities Charge. No refunds will be made by the District where the recalculated charges are less than the original payment.

In recalculating the General Facilities Charge, the rates in effect at the time of the recalculation shall be used; and for purposes of calculating the difference that the applicant shall pay, the estimated General Facilities Charge shall be recomputed based upon the rates then in effect.

(g) The General Facilities Charge shall also apply to an LUD or to the identified and assessed individual properties contained therein at the time of formation. Properties within an LUD are subject to the applicable LUD GFC. However, once an LUD has been established and the final assessment roll confirmed, any additional individual water service customers within such established LUD requesting a new water service connection or adding to the number of ERUs to be served by that customer's existing water service connection shall be deemed a "New Customer," and be subject to the applicable General Facilities Charge imposed at the time of connection (see Section (h) below).

(h) In all cases, the GFC paid shall be based upon the GFC in effect on the date of payment.

Table B-2 of the Water Utility Policies and Procedures Manual is hereby amended as follows:

Table B-2

Table B-2 **General Facilities Charge (GFC)** [1, 4]	
System	**GFC**[2]
Integrated System	
Paid at Time of Conveyance	$ 3,060/ERU
Paid at Time of Lot Sale/Service Connection [3]	$ 3,455/ERU
Satellite and Remote Systems	
Storm Lake Ridge	
Paid at Time of Conveyance	$ 4,965/ERU
Paid at Time of Lot Sale/Service Connection[3]	$ 5,610/ERU
Sunday Lake	
Paid at Time of Conveyance	$ 4, 965/ERU
Paid at Time of Lot Sale/Service Connection[3]	$ 5,610/ERU

Footnotes:

(1) For applicability, see Section 3.3.

(2) See Table B-4 for ERU determination.

(3) Applies only to lots in developments whose bill of sale was accepted by the District after August 31, 1998, where the Developer chose to defer payment responsibility to the property owner at the time of service connection.

(4) Subject to automatic annual adjustment based upon the change ratio of the engineering News Record Construction Cost Index for the Seattle Area as reported for on a November to November calendar basis.

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