

2024

WATER SYSTEM PLAN



Providing our customers with high-quality water services at an affordable price.



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ACRONYMS AND ABBREVIATIONS

AC	asbestos-cement
ADD	Average Day Demand
afy	acre-feet per year
AHJ	Authorities Having Jurisdiction
AMR	Automated Meter Reading
APWA	American Public Works Association
As	arsenic
ASR	Annual Summary Report
AWWA	American Water Works Association
BAT	backflow assembly tester
CaRD	Conservation and Reserve Development
ccf	100s of cubic feet
CCCP	Cross-Connection Control Program
CCL	Contaminant Candidate List
CCP	concrete cylinder pipe
CCR	Consumer Confidence Report
CCS	Cross-Connection Specialist
CEU	continuing education unit
CFE	combined filter effluent
CFO	Chief Financial Officer
CFR	Code of Federal Regulations
cfs	cubic feet per second
cfu	colony forming unit
CI	cast iron
CIP	Capital Improvement Plan
ClO ₂	chlorine dioxide
Commission	Skagit County Public Utility District Board of Commissioners
CMMS	Computerized Maintenance Management System
CT	contact time
CU	color unit
CWSP	Skagit County Coordinated Water System Plan
DBP	disinfection byproduct
D/DBPR	Disinfectants/Disinfection By-Product Rule
DI	ductile iron
DNS	Determination of Non-Significance
DOH	Washington State Department of Health
DOSH/WISHA	Department of Occupational Safety and Health/Washington Industrial Safety and Health Administration

DSL	distribution system leakage
DWSRF	Drinking Water State Revolving Fund
Ecology	Washington State Department of Ecology
EOL	end of life
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ERU	equivalent residential unit
FBRR	Filter Backwash Recycling Rule
FEMA	Federal Emergency Management Agency
FSWM	follow-up source water monitoring
GIS	Geographic Information System
G.O.	General Obligation
gpd	gallons per day
gpm	gallons per minute
GPS	Global Positioning System
GWUDI	groundwater under direct influence
HAA5	haloacetic acid
HDPE	high density polyethylene
HGL	Hydraulic Grade Line
Hp	horsepower
HPC	heterotrophic plate count
HVAC	heating, ventilation, and air conditioning
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
ICS	Incident Command System
IDSE	Initial Distribution System Evaluation
IESWTR	Interim Enhanced Surface Water Treatment Rule
IFE	individual filter effluent
IOC	inorganic chemical
IR	inactivation ratio
ISWM	initial source water monitoring
JOA	Joint Operating Agreement
Judy System	Judy Reservoir System
Judy WTP	Judy Reservoir Water Treatment Plant
L&I	Washington State Department of Labor & Industries
Lab Rule	Drinking Water Laboratory Certification and Data Reporting Rule
LCR	Lead and Copper Rule
LFC	local facilities charge
LID	Local Improvement District
LT2ESWTR	Long Term 2 Enhanced Surface Water Treatment Rule

LUD	Local Utility District
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MDD	Maximum Day Demand
MDL	Minimum Detection Limit
MFL	million fibers per liter
MG	million gallons
MGD	million gallons per day
mg/L	milligrams per liter
MOA	Memorandum of Agreement Regarding Utilization of Skagit River Basin Water Resources for Instream and Out of Stream Purposes
MRDL	maximum residual disinfectant level
MRDLG	maximum residual disinfectant level goal
mrem/year	millirem per year
MSDS	Material Safety Data Sheet
MWL	Municipal Water Law
NaOH	caustic soda
NH ₃	ammonia
NIMS	National Incident Management System
NO ₂	nitrite
NO ₃	nitrate
NOM	naturally occurring materials
NRF	National Response Framework
NTU	Nephelometric Turbidity Unit
O&M	operations and maintenance
OFM	Washington State Office of Financial Management
OSRSI	Open Space of Regional/Statewide Importance
pCi/L	picoCuries per liter
PHD	Peak Hour Demand
PNR	Public Notification Rule
ppb	parts per billion
ppm	parts per million
PRV	pressure-reducing valve
PSE	Puget Sound Energy
psi	pounds per square inch
PSV	pressure sustaining valve
PUD	Public Utility District No. 1 of Skagit County
PWS	public water system
PWSID	Public Water System Identification
PWTF	Public Works Trust Fund
PZ	Pressure Zone

Qa	annual quantity
Qi	instantaneous quantity
RCW	Revised Code of Washington
RTCR	Revised Total Coliform Rule
SCADA	supervisory control and data acquisition
SCFM	standard cubic feet per minute
SDF	System Development Fee
SDWA	Safe Drinking Water Act
SEPA	State Environmental Policy Act
Skagit PUD	Public Utility District No. 1 of Skagit County
SMA	Satellite Management Agency
SOC	synthetic organic chemical
sq ft	square foot
SR	State Route
SRD	Skagit River Diversion
SRL	State Reporting Level
SWTR	Surface Water Treatment Rule
TCR	Total Coliform Rule
TOC	total organic carbon
TTHM	total trihalomethane
UCMR2	Unregulated Contaminant Monitoring Rule 2
UCMR3	Unregulated Contaminant Monitoring Rule 3
UGA	Urban Growth Area
ULID	Utility Local Improvement District
VFD	variable frequency drive
VOC	volatile organic chemical
WAC	Washington Administrative Code
WETRC	Washington Environmental Training Center
WISHA	Washington Industrial Safety and Health Act of 1973
WLCAP	Water Loss Control Action Plan
WMP	Watershed Management Plan
WQMR	Water Quality Monitoring Report
WS	Water System
WSDM	Water System Design Manual
WSP	Water System Plan
WTP	water treatment plant
WTPO	Water Treatment Plant Operator
WUE	Water Use Efficiency
WUER	Water Use Efficiency Rule

EXECUTIVE SUMMARY

Public Utility District No. 1 of Skagit County [Skagit PUD] owns and operates seven water systems. Its largest system is Judy Reservoir, followed by six satellite water systems - Alger, Cedargrove, Judy Reservoir, Marblemount, Potlatch Beach, Rockport, and Skagit View Village. The Judy Reservoir water system serves the central region of Skagit County. The service area includes the cities of Mount Vernon, Burlington, and Sedro-Woolley, as well as nearby communities such as Bay View, Allen, Avon, Clear Lake, Big Lake, and Conway, in addition to agricultural and rural areas.

Skagit PUD also owns and manages six satellite water systems that serve the communities of Allen, Cedargrove, Marblemount, Potlatch Beach, Rockport, and Skagit View Village. All six of these water systems are designated as Group A Community Systems.

The 2024 Water System Plan (WSP) outlines Skagit PUD's strategies for meeting current and projected water demands by delivering high-quality water services. This strategy is achieved through the cost-effective operation of the Judy water system, preventative maintenance, and reasonable facility upgrades and replacements.

While the primary focus of the 2024 WSP is the upcoming decade, it also offers a long-term perspective extending to 2046. The plan was developed following regulatory guidelines from the Washington Administrative Code and the planning framework established by the Washington State Department of Health. It also aligns with the Water Use Efficiency Rule of the Growth Management Act and local land use plans.

The plan highlights critical data, analysis, and implementation actions. Subsequent chapters provide a detailed analysis, identify deficiencies, and propose corrective actions.

The plan also includes adjustments to the Judy water system's retail water service area. These adjustments reflect the transfer of a satellite water system to the City of Anacortes and facilitate water service in two areas adjacent to the existing retail service area.

Utility Mission Execution

Skagit PUD provides its customers with high-quality water services through interconnected programs. Various departments are responsible for specific programs that provide institutional knowledge and deliverables to meet our customers' needs and correct observed deficiencies. Some of these programs are briefly discussed below. All programs are discussed in detail throughout the WSP.

Asset Management Program

The Asset Management Program is implemented through the Asset Management Supervisor and overseen by the Engineering Manager. This program addresses the physical condition, life expectancy, and system criticality of existing facilities and infrastructure. The Operation and Maintenance Program

and the Capital Improvement Program use information developed and provided by the Asset Management Program.

Water Quality Program

The Water Quality Program is implemented through the Water Quality Coordinator and overseen by the Operations Manager. This program is responsible for all water quality sampling and testing, and required results and analyses are reported to the Department of Health and customers. Information from the Water Quality Program is used by the Operation and Maintenance Program to optimize the water treatment plant and manage water quality in Judy Reservoir and the distribution system.

Water Use Efficiency Program

The Community Relations Manager develops and oversees the Water Use Efficiency Program. This program is responsible for creating a strategy that contributes to the long-term water supply reliability and promotes good stewardship of our water resources. Water use efficiency is reported annually to the Department of Health and customers.

Source Water Protection Program

The Engineering Supervisor and the Environmental Compliance Coordinator implement the Source Water Protection Program and are overseen by the Engineering Manager. This program is responsible for protecting and improving the source water used by the PUD.

Operation and Maintenance Program

The Operation Manager implements the Operation and Maintenance Program with the assistance of the Distribution Superintendent, Maintenance Superintendent, and WTP Superintendent. This program is responsible for ensuring satisfactory management of the water system operations. Implementation of a sound program enables the water system to deliver high-quality water services by maintaining consistent and reliable operations, extending asset life, and maximizing public health protection.

Cross-Connection Control Program

The Cross-Connection Control Program is implemented by the Cross-Connection Control Coordinator and overseen by the Engineering Manager. This program aims to reduce the risk of contamination of the water system. This program actively identifies potential cross-connections, ensures proper measures are implemented, and requires customers to install and routinely test cross-connection control devices.

Capital Improvement Program

The Capital Improvement Program [CIP] is developed and updated each year. This program is implemented by the Engineering Manager and the Capital Program Manager with input from all

departments, managers, and superintendents. The CIP summarizes and prioritizes the water system needs to help ensure safety, reliability, and compliance with applicable regulations. Each year's CIP is used to develop the PUD's annual operating budget.

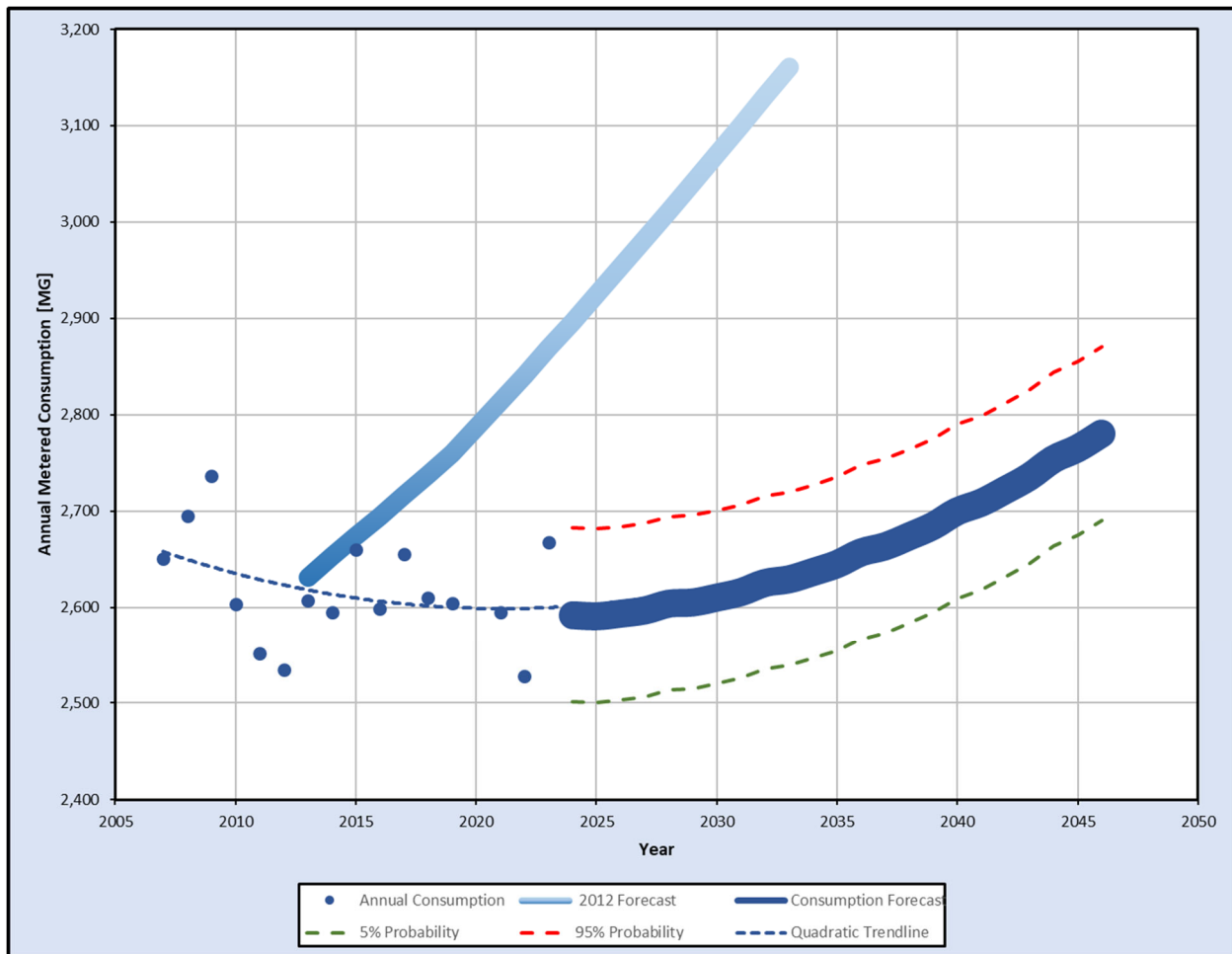
Financial Program

The Financial Manager/Treasurer and the Finance Department oversee the Financial Program. An annual operating budget is prepared each year for review and approval by the Board of Commissioners. The operating budget identifies the total cost of providing water service, implementing the CIP, establishing adequate rates, and demonstrating financial prudence.

Planning and Analysis

Several planning resources are used to evaluate water consumption and forecasted water demands. These include the Office of Financial Management [OFM] population estimates and projections and the PUD's water production, consumption, and water loss estimates.

- According to the OFM, the population in Skagit County is estimated to grow between 0.6 and 1.6 percent per year for the next 10 years, from 2025 to 2035, with the average expected annual growth rate of 0.9 percent. The population growth rate over the following 10 years, from 2036 to 2046, is anticipated to be between 0.5 and 1.3 percent, with an average expected annual growth rate of 0.7 percent. By 2046, the total population in Skagit County is forecasted to increase 23 percent from 2022 estimates.
- Meter growth is highly correlated with population estimates over the past 15 years. New meter sales are anticipated to increase between 0.6 and 1.6 percent annually. By 2046, the total meter count is projected to grow 21 percent from 2023 levels.
- Judy Reservoir Water Treatment Plant [Judy WTP] is the primary supply source for the Judy System, accounting for 97 to 99 percent of the total supply. The remaining supply source is from the Anacortes WTP, which is typically only used as a backup or emergency supply source.
- Overall, water consumption has been declining over the past 15 years. Three factors contribute to this decline: water efficiency fixtures in new construction, reduced landscaping irrigation, and water use elasticity, which results from annual rate increases.
- The average day demand [ADD] for an equivalent residential unit [ERU] has also been declining from 152 gpd/ERU in 2012 to 146 gpd/ERU in 2022, mirroring the decreasing trend in overall consumption.
- The water consumption is forecasted to remain relatively consistent through 2030, then rise gradually to between 2,660 and 2,850 million gallons [MG] in 2046. See the figure below.



Water Quality and Treatment

Judy WTP is a direct filtration facility that filters and disinfects 97 to 99 percent of the water delivered to the Judy System. The Judy WTP is staffed full-time to monitor the treatment processes and make necessary adjustments. The Judy WTP has a state-certified laboratory for analyzing coliform samples. Skagit PUD also manages a cross-connection control program to protect drinking water quality.

- The Gilligan and Mundt Creek watersheds are protected through PUD ownership, restricted access, and limited operation by forestry landowners.
- Operations staff routinely monitor and characterize the limnology conditions of Judy Reservoir. The reservoir level is actively managed during the late summer to avoid algae blooms. Also, vegetation controls are employed to prevent aquatic nuisances and invasive species.
- The Judy WTP constantly meets drinking water quality standards and regulations.
- Corrosion control measures ensure that water meets lead and copper requirements. An initial assessment indicates that the Judy System has no lead service lines or components.

- A condition assessment is conducted periodically to assess the viability of components of the water treatment plant. Ongoing routine maintenance also provides periodic evaluation of critical components.
- All pumping systems are in the process of being replaced. The Raw Water Pump Station was completed in 2022. The W1 Pump System is scheduled to be replaced in 2025, and the Backwash Pump System is expected to be replaced in 2026.
- The Disinfection Study will be completed in 2024, and a new hypochlorination system will be designed in 2025.

Transmission and Distribution

The PUD's retail service area is supplied with water through a network of more than 600 miles of transmission and distribution pipelines. The transmission pipelines form a backbone for water conveyance throughout the service area. Transmission pipelines range from 16-inch to 36-inch diameter. The distribution pipelines are 12 inches in diameter and smaller and are used to deliver water to customers.

The Judy System has 18 pump stations to convey water to higher pressure zones and 22 storage tanks for equalizing and standby storage.

- The Mount Vernon transmission pipeline was completed in 2023. Over the next decade, the PUD will focus on the Sedro-Woolley transmission pipeline infrastructure. Portions of this pipeline are 55 years old and possibly near the end of their useful life. Also, hydraulic restrictions prevent efficient water conveyance to the Sedro-Woolley and Burlington service areas.
- The average pipeline age is 34 years. The pipeline leaks or breaks rate averages 4.6 per 100 miles per year.
- The Judy System distribution system leakage was 9.9 percent for 2021 through 2023, below the state standard of 10 percent.
- The PUD is focused on replacing old and undersized distribution pipelines. Most pipeline replacement projects include 4-inch AC pipes and smaller plastic pipes. However, the PUD is moving toward a Business Risk Model using GIS-based data to select pipeline replacement projects.
- Additional storage will be designed and constructed in the Hoogdal and Panorama pressure zones over the next decade. Additional Clearwell storage may also be added to facilitate CT compliance.
- Pump stations will be upgraded to improve resiliency.
- Based on recommendations presented in the latest risk and resiliency study, various seismic improvements will be implemented throughout the Judy System.
- Preventative maintenance on valves and hydrants is performed at scheduled intervals and recorded in the Asset Management System.

Financial Sustainability

The Capital Improvement Program [CIP] is reviewed and updated yearly during the annual budgeting process. All cost estimates are updated using current pricing. Cost estimates presented in the CIP are subject to change as project scopes are refined. All updated CIPs are presented to the Commission for review and approval.

- The CIP for the 2024 through 2046 totals \$101.8 million (in 2023 dollars).
- The annual operating budget consistently meets or exceeds established financial metrics, helping to ensure a sound and sustainable financial foundation that will keep our rates as low as possible while making necessary capital investments and strategic business decisions.
- A new rate study will begin in 2024 to help ensure the financial stability of the water utility.

Conclusion

Skagit PUD continues to invest in planning, forecasting, and infrastructure improvements to provide our customers with high-quality water services at an affordable price. Most of the capital investment is directed toward rehabilitating, replacing, and renewing water system infrastructure to improve resiliency, reliability, and operational efficiency.

1 WATER SYSTEM DESCRIPTION

Skagit County is in the northwestern part of Washington State, stretching from Puget Sound to the crest of the Cascade Mountains. Also included are the San Juan Archipelago leeward islands, along with the Skagit River delta and floodplain. The northern Cascade Mountains and portions of North Cascade National Park and Mount Baker National Forest dominate the eastern two-thirds of Skagit County. Mount Vernon is the largest city in Skagit County and the county seat. Significant municipalities include Anacortes, Burlington, Concrete, Hamilton, La Conner, Lyman, and Sedro-Woolley. **Figure 1-1** is a general vicinity map of Skagit County.

As described in this chapter, Public Utility District No. 1 of Skagit County (Skagit PUD) operates the Judy Reservoir Water System and six small satellite water systems, which are all covered in this Water System Plan. **Figures 1-2** and **1-3** show PUD-owned and managed water systems and adjacent water purveyors in Skagit County. A description of each water system is provided below.

Judy Reservoir (PWS ID#79500E)

The Judy Reservoir Water System, herein called the Judy System, is the County's most expansive water system with over 26,000 connections. Most services are within the Judy System, which serves Mount Vernon, Burlington, Sedro-Woolley, and surrounding rural and suburban areas. Characteristics include:

- The source water is diverted from the Skagit River and four tributaries (Gilligan, Salmon, Turner, and Mundt creeks) on Cultus Mountain. Source water is stored in Judy Reservoir, a 1.5 billion gallon surface water impoundment.
- Treatment of the raw water from Judy Reservoir consists of direct filtration and chlorination provided by the Judy Water Treatment Plant (Judy WTP). Safe Drinking Water Act (SDWA) requirements are met for disinfected and filtered water. The disinfection process includes chlorine dioxide, chlorine, and chloramines. Finished water from the WTP flows by gravity to three clearwells adjacent to the plant. In turn, water in the clearwells flows by gravity to the PUD's customers.
- There are 24 storage tanks within the distribution system with a combined capacity of 35.6 million gallons.
- The distribution system has 25 pressure zones. Pressures are maintained by 130 pressure-reducing stations and 18 pump stations.
- There are seven interties with the City of Anacortes where additional water can be obtained for the Judy System. These interties are connected to the Anacortes transmission pipeline system. Four of the interties are used on a secondary basis.

Alger (PWS ID#01400K)

The Alger water system is in and around the community of Alger near the northern Skagit County border. This water system has 144 connections (130 residential and 14 non-residential) and is authorized by DOH to serve 219 connections. Characteristics include:

- A single well source with a current pumping capacity of 60 gpm.
- Ion-exchange filtration is provided to remove iron and manganese; sodium hypochlorite is injected for disinfection.
- A single concrete storage tank with a capacity of 132,000 gallons provides operating, equalizing, standby, and fire suppression storage.
- The distribution system has three (3) pressure zones. Two pump stations maintain pressures in the higher zones.

Cedargrove (PWS ID#119174)

The Cedargrove water system is located along the South Skagit Highway near the community of Concrete. This water system has 168 residential connections and is authorized by DOH to serve 466 connections. Characteristics include:

- A single well source with a current pumping capacity of 105 gpm.
- Ion-exchange filtration is provided to remove iron and manganese; sodium hypochlorite is injected for disinfection.
- A single bolted-steel storage tank with a capacity of 270,000 gallons provides operating, equalizing, standby, and fire suppression storage.
- The distribution system has one (1) pressure zone and no pump stations or control valves.

Marblemount (PWS ID#AA642)

The Marblemount water system is located along State Route 20 in the community of Marblemount. This water system has 60 connections (46 residential and 14 non-residential) and is authorized by DOH to serve 106 connections. Characteristics include:

- A single well source with a current pumping capacity of 143 gpm.
- There is no treatment provided.
- A single concrete storage tank with a capacity of 63,500 gallons provides operating, equalizing, standby, and fire suppression storage.
- The distribution system has one (1) pressure zone and no pump stations or control valves.

Potlatch Beach (PWS ID#69034 L)

The Potlatch Beach water system is located on the west shore of Guemes Island. This water system has 34 residential connections (20 full-time residential and 14 part-time vacation homes) and is authorized by DOH to serve 182 connections. Characteristics include:

- A saltwater intake with a capacity of 80 gpm and a backup well source with a capacity of 8 gpm.
- A reverse osmosis treatment system removes salt; sodium hypochlorite is injected for disinfection.
- A single concrete storage tank with a capacity of 30,000 gallons provides operating, equalizing, and standby storage.
- The distribution system has two (2) pressure zones. Pressures are maintained by one (1) pump station.

Rockport (PWS ID#736006)

The Rockport water system is located along State Route 20 in the community of Rockport. This water system has 72 connections (66 residential and six non-residential) and is authorized by DOH to serve 106 connections. Characteristics include:

- A single well source with a current pumping capacity of 40 gpm.
- Ion-exchange filtration is provided to remove iron and manganese; sodium hypochlorite is injected for disinfection.
- Two storage tanks with a combined capacity of 73,600 gallons provide operating, equalizing, standby, and fire suppression storage. The first storage tank, with a capacity of 20,000 gallons, is owned by the Washington State Park & Recreation Department and is primarily used for operating and equalizing storage. The second storage tank, with a capacity of 53,600 gallons, is owned by the PUD and provides equalizing, standby, and fire suppression storage for the Rockport System.
- The distribution system has one (1) pressure zone, one (1) control valve, and no pump stations.

Skagit View Village (PWS ID#968795)

The Skagit View Village water system is located along the South Skagit Highway near the community of Concrete. This water system has 87 residential connections and one community clubhouse connection. DOH has authorized this water system to serve 131 connections. Characteristics include:

- A single well source with a current pumping capacity of 62 gpm.
- Ion-exchange filtration is provided to remove iron and manganese; sodium hypochlorite is injected for disinfection.
- A single bolted-steel storage tank with a capacity of 157,000 gallons provides operating, equalizing, standby, and fire suppression storage.
- The distribution system has one (1) pressure zone and no pump stations or control valves.

Appendix B contains the PUD’s Water Facilities Inventory for the Judy Reservoir and satellite water systems.

1.1 Ownership and Management

The responsibilities and powers of Skagit PUD are exercised through a Commission of three members, elected by the voters, having 6-year terms expiring in rotation so that one Commissioner is elected every two years. The Board of Commissioners, as authorized by law, employs a General Manager, a Treasurer, an Auditor, counsel, and such other officials and special services as may be required to conduct the affairs of the PUD. The General Manager, Auditor, and counsel are all independent entities employed by the Commission and work for the unified good of Skagit PUD. There is no legal linkage between Skagit PUD and the Skagit County government, though there is a cooperative working relationship.

The General Manager is the chief administrative officer of Skagit PUD and, assisted by the Treasurer, Auditor, Engineering Manager, counsel, and administrative and operations staff, carries out the policies set by the Board of Commissioners and all other duties as outlined in Revised Code of Washington (RCW) 54.16.100.

Various staff members handle the daily operations of water systems and are overseen by the Operations Manager.

1.2 System History and Background

Skagit PUD is a municipal corporation of the State of Washington, established at the general election of November 3, 1936. The organizational meeting of the Commissioners was held on January 16, 1937. Since the PUD’s organization, the Commissioners have observed regular meeting dates and, in addition, have held special meetings as circumstances dictated. Proceedings of each meeting of the Commission are recorded in an official minute book.

The water sources for the PUD have evolved. The current primary water sources for the Judy System are the Skagit River and four creeks in the Cultus Mountains (Gilligan, Salmon, Turner, and Mundt creeks), with interties to the City of Anacortes water system available on a secondary basis. Below is a summary of key milestones in the history of PUD’s water systems.

- 1939 November 4. Purchased, by friendly condemnation, the water systems in the cities of Mount Vernon, Burlington, and Sedro-Woolley from the Peoples Water and Gas Company for \$300,070. The water systems totaled 3,134 water services; 51.5 miles of pipeline; 3,940,000 gallons of distribution storage; 1.75 million gallons per day (MGD) in treatment facilities; and diversions on the Skagit River, local springs, and five creeks in the Cultus Mountains (East Fork Nookachamps, Rock Springs, Pigeon, Mundt, and Turner creeks).
- 1940 March 7. The Clear Lake Water Corporation was purchased for \$8,330.29, with 180 water services, 11.5 miles of pipeline, 500,000 gallons of distribution storage, and diversions on three Cultus Mountain streams (Gilligan, Salmon, and Turner creeks).

- 1940 July 1. Purchased 1.8 miles of water line from the Avon Mutual Water System for \$2,650.00.
- 1940 Integrated the entire system by laying a wood stave transmission line from Sedro-Woolley to Burlington and Mount Vernon; this line was completed that same year through the support of the Works Progress Administration.
- 1947 Completed construction of impoundment dams in Janicki Basin, forming Judy Reservoir, capacity 450 million gallons, spillway at 435 feet above mean sea level (AMSL).
- 1954 Completed construction of a new Ranney well next to the Skagit River in northwest Mount Vernon.
- 1958 Completed new overhead Skagit River pipe bridge southeast of Sedro-Woolley, replacing failed 1951 submerged crossing.
- 1958 Replaced Gilligan and Salmon Creek diversions/pipeline to increase supply to Judy Reservoir.
- 1960 Extended Judy Reservoir System to Bayview through LUD No. 4.
- 1961 Installed concrete cylinder pipe transmission line connecting Judy Reservoir to Mount Vernon.
- 1962 Acquired the Conway Water Company and connected it to the Judy Reservoir System.
- 1965 Raised Judy Reservoir from elevation 435 feet AMSL to 451 feet AMSL, increasing its impoundment capacity from 450 million to over 1.0 billion gallons.
- 1967 Completed the transmission line loop with the installation of concrete cylinder pipe between Burlington and Mount Vernon.
- 1970 Replaced the wood stave transmission line between Judy Reservoir and the Skagit River pipe bridge with concrete cylinder pipe.
- 1977 Installed a concrete cylinder pipeline from Sedro-Woolley to Burlington. Services were transferred from a wood stave pipe to the concrete cylinder transmission line in 1984.
- 1990 Completed and commissioned the multi-media direct filtration water treatment plant at Judy Reservoir to serve the Judy Reservoir Water System.
- 1991 Acquired and reconstructed Rockport's satellite water system through LUD No. 11.
- 1991 Extended the Judy System toward Big Lake along Gunderson Road through LUD No. 12.
- 1992 Acquired and reconstructed the satellite public water system at Cedargrove through LUD No. 10.
- 1993 Extended the Judy System around Big Lake through LUD No. 16 and to Lake Sixteen through LUD No. 18.
- 1994 Extended the Judy System south of Mount Vernon around Britt Slough through LUD No. 17.
- 1995 Extended the Judy System to the Hoogdal area north of Sedro-Woolley through LUD No. 19.
- 1996 Signed the Memorandum of Agreement Regarding Utilization of Skagit River Basin Water Resources for Instream and Out of Stream Purposes (MOA).
- 1996 Extended the Judy System north of Judy Reservoir to the Panorama area through LUD No. 20.
- 1997 Extended the Judy System to Big Rock through LUD No. 21.

- 1998 Acquired and provided a reverse osmosis water treatment system for the Potlatch Beach water system on Guemes Island through LUD No. 23.
- 1999 Acquired and reconstructed a satellite public water system in the Alger area through LUD Nos. 22 and 24.
- 2000 Extended the Judy System south of Mount Vernon to the Stackpole Road area through LUD No. 25.
- 2000 Completed enlargement of Judy Reservoir, increasing its impoundment capacity from 1.01 billion to 1.45 billion gallons and raising the spill elevation from 451 feet AMSL to 465 feet AMSL.
- 2001 Sewer Authority granted to the PUD through a ballot measure.
- 2004 Acquired and reconstructed a satellite public water system named Skagit View Village through LUD No. 27.
- 2006 Constructed a satellite public water system serving Marblemount through LUD No. 28.
- 2006 Extended the Judy System north of the community of Bayview through North Bayview LUD No. 29.
- 2007 Started construction on the Skagit River Diversion Pump Station and pipeline to Judy Reservoir to provide a redundant water supply to the Judy WTP by having the ability to transfer existing water rights from the Cultus Mountain watershed to the Skagit River.
- 2007 Completed construction of the new 18-inch ductile iron transmission pipeline on Cook Road from Sedro-Woolley to Burlington, increasing the geographical distribution, capacity, and reliability.
- 2008 Completed construction of Clearwell #3 at the WTP to add 3.25 million gallons of finished water storage.
- 2008 Completed installation of new radio-read water meters at each metered service.
- 2009 Added Samish River Park, LUD No. 30, to the Judy System.
- 2009 Finished upgrades to the Judy WTP by adding four new filter beds and expanded the treatment capacity from 12 MGD to 24 MGD.
- 2009 Installed Phase I of the new 36-inch ductile iron Judy Reservoir to Mount Vernon transmission pipeline, from LaVenture Road to College Way. This new pipeline increased the capacity to the service area and provided a redundant supply source.
- 2010 Commissioned and began using the new Skagit River Diversion Pump Station.
- 2012 Completed construction of the new 18-inch ductile iron Josh Wilson Road transmission pipeline from Burlington to Bayview. This new pipeline allows gravity feed from Judy Reservoir to serve PUD customers in Bayview without purchasing water from an intertie with the City of Anacortes.
- 2016 Constructed 8-inch HDPE pipeline along Mann Road on Fir Island through LUD No. 31.

- 2018 Installed a pipeline from Division Street to consolidate the Mountain View water system into the Judy System.
- 2023 Phase II of the new 36-inch welded steel Judy Reservoir to Mount Vernon transmission pipeline was installed from College Way to the Judy WTP. This pipeline increased the supply capacity to Mount Vernon and the south Skagit County service area.
- 2023 Transfer ownership of the Fidalgo water system to the City of Anacortes.

1.3 Related Plans

Skagit PUD’s water delivery to its customers has been developed over many years through various plans and policies that address water management in Skagit County. This section describes plans that influence the PUD’s water service policies and provides information about the authority and responsibility of Skagit PUD to provide water.

Table 1-1 lists the related plans reviewed for consistency with this Water System Plan. These plans and other policies are discussed in the sections below.

Table 1-1. Related Plans

Category	Document Title	Year
Local and Regional Planning Documents	Skagit County Coordinated Water System Plan – Regional Supplement	2000
	Skagit PUD Water Policy Manual	2023
	Skagit County Comprehensive Plan	2016
	City of Burlington Comprehensive Plan	2005
	City of Mount Vernon Comprehensive Plan	2016
	City of Sedro-Woolley Comprehensive Plan	2016
Water Supply Planning Documents	1996 Memorandum of Agreement Regarding Skagit River etc.	1996
	Cultus Mountain Water Shed Management Plan	2021
	Skagit River Watershed Control Plan	2010
	Anacortes and Skagit PUD Joint Operating Agreement	1993
	Skagit County Franchise Agreement	1993

1.3.1 Skagit County Coordinated Water System Plan – Regional Supplement

The Public Water System Coordination Act of 1977 (Chapter 70.116 RCW) requires coordinated planning among public water supply systems within critical service areas. In 1982, the area known as Fidalgo Island was designated a critical water supply service area, and in 1984, the Skagit Board of County Commissioners adopted the first coordinated water system plan titled “Anacortes–Fidalgo Island Coordinated Water System Plan.”

After several years, it became apparent to resource managers that many water system issues being dealt with locally had implications outside the Fidalgo Island area. Subsequently, in July 1993, the Skagit Board of County Commissioners approved an updated CWSP that included all of Skagit County. The plan was adopted in 2000.

The CWSP aimed to provide maximum integration and coordination of public water system facilities consistent with protecting and enhancing public health and well-being. The 2000 CWSP describes strategies to manage the County's potable water according to applicable statutes and ordinances. Topic areas covered in the plan include minimum design standards, water utility service areas, utility service review procedures, satellite system management, water demand forecasts, water supply system assessments, regional water supply strategies, and a joint-use facilities plan. This Water System Plan is consistent with the policies, goals, and requirements outlined in the CWSP.

1.3.2 Local Government Comprehensive Plans

A comprehensive plan is a local government's codified strategy for managing future growth, land use, and development within its jurisdictional boundaries. These plans are long-range in nature, typically with 20-year planning horizons, and contain a broad set of goals, policies, and objectives that address land use, urban design, transportation, housing, economic development, parks and open space, community facilities (e.g., hospitals, schools), and utility services. Comprehensive plans are implemented through zoning, land division regulations, and other codes.

The Judy Reservoir Water System lies within and serves unincorporated Skagit County and the cities of Burlington, Mount Vernon, and Sedro-Woolley. All these local governments have comprehensive plans and zoning ordinances that affect the development and future placement of water utility infrastructure.

All six satellite water systems lie within and serve small communities in unincorporated Skagit County. Skagit County comprehensive plans and zoning ordinances affect future development adjacent to these rural service areas.

This Water System Plan and its policies are consistent with these locally adopted comprehensive plans and implementing regulations.

1.4 Service Area, Maps, and Land Use

1.4.1 Service Area

The PUD is authorized by RCW 54.04.030 to operate water systems within and outside Skagit County, Washington. This statute gives the PUD countywide service authority and sets its legal boundaries at, but not limited to, the boundaries of the County. Consistent with this authority, the place of use of its water rights, and the PUD's status as a municipal water supply system under RCW 90.03.115, the PUD's existing service area (i.e., retail service areas and future service area) covers Skagit County except for those areas claimed and served by other public water systems.

The PUD and the other water utilities participated in the Skagit County Coordinated Water System Plan (CWSP) process and agreed upon the designated service area boundaries for each water system. As evidenced by the 2000 CWSP, the PUD is generally recognized as the most capable regional water purveyor in Skagit County.

The CWSP service area boundaries were established before the Municipal Water Law (MWL) passage in 2003. The MWL required the PUD, as a municipal water supply system, to designate its

retail service area(s). Within such retail service areas, the PUD has a statutory duty to serve new and existing connections, subject to specified exceptions.

A duty to serve does not exist within all areas of the PUD's CWSP service area, specifically those designated as the future service area. DOH defines a future service area to be a specific area where a water system anticipates providing water service as determined by a written agreement (i.e., CWSP) between purveyors under chapter 70.116 RCW and chapter 246-293 (WAC 246-290-010). Therefore, the PUD's future service area represents the physical area that falls between its mapped and designated retail service areas and the PUD's external and mapped CWSP boundary.

Per the MWL and related DOH regulations, this WSP designates and maps the PUD's respective retail service areas for its Judy System and individual satellite systems, wholesale service area, and CWSP/future service area.

The PUD's Judy System has a retail service area that includes Mount Vernon, Burlington, Sedro-Woolley, and surrounding communities such as Bow Hill, Bay View, Fir Island, Conway, Big Lake, and Clear Lake. The updated retail service area for the Judy System is shown in **Figures 1-2 and 1-3**.

The retail service areas for each PUD's satellite systems were established during LUD formation or acquisition and were consistent with each system's respective water rights. The current satellite system retail service areas are shown in **Figures 1-2, 1-2a, 1-2b, 1-3, and 1-3a through 1-3d**.

As previously discussed, the PUD provides wholesale water service from the Judy System to the North Fir Island Water Association and Samish Farms Water Association; these entities purchase water to serve their primarily residential customer base. The location of each wholesale customer is shown in **Figure 1-2**.

The PUD provides irrigation water to Skagit County Drainage and Irrigation District (DID) #15 and Skagit County Consolidated Diking Improvement District (CDID) #22 when feasible under temporary emergency change drought authorizations. The PUD is authorized to provide irrigation water under Chapter 54 RCW and Department of Ecology Pol-2030.

1.4.2 Service Area Modifications

The PUD's retail service area will expand into the future service area as necessary to accommodate growth and development. Most expansion occurs in the Judy system and less frequently from the satellite systems. All expansions shall happen in a manner consistent with the PUD's retail service area policies, the capacity of the water system facilities, and water rights.

Per the Skagit County CWSP, the PUD will receive applications from Skagit County for water service within its designated future service area. The provision of retail water service to potential customers falling within this future service area shall occur subject to the PUD determining whether such service can be provided in a "timely and reasonable manner" consistent with applicable PUD policy and criteria cited in this WSP. The subject of "timely and reasonable manner" is further discussed in Section 1.6.

If the PUD determines a requested service can be provided in a manner consistent with its policies on timely and reasonable service, the future service area shall be incorporated into the retail service area. If the PUD determines that retail water service cannot be provided promptly and reasonably, the applicant will be advised and referred to an adjacent purveyor if available.

The PUD proposes adjusting its Judy System retail water service area to include the following areas:

- Fidalgo Island Water System Transfer
- Best Road to Swinomish Slough Vicinity
- Helmick Road Vicinity

The PUD's website will be updated to reflect these changes following DOH approval of this WSP. Therefore, water service applicants are encouraged to consult the PUD's retail service area map provided on its website to determine whether their property falls within the PUD's retail or future service areas.

Figures 1-2c illustrates the PUD's service area adjustments. No adjustments are proposed for the satellite systems.

1.4.2.1 Service Area Adjustment: Fidalgo Island Water System Transfer

Skagit PUD transferred ownership of the Fidalgo Island water system (PWSID 00932 Y) to the City of Anacortes on October 25, 2023. The Fidalgo Island water system has been withdrawn from the PUD's service. The City of Anacortes' service area has been expanded to encompass the Fidalgo Island water system, which has now been consolidated into the Anacortes water system.

1.4.2.2 Service Area Adjustment: Best Road to Swinomish Slough Vicinity

Portions of the PUD future service area have been converted to retail service area along State Route 20 from the Fredonia area west to the Swinomish Slough. Approximately 14 water services are connected to the Anacortes transmission pipeline within this portion of the PUD future service area, and the PUD is in discussions with Anacortes about transferring these services to the PUD. It is anticipated that water supply for these services will continue to be obtained through interties with the City of Anacortes, similar to several existing interties in this area. The PUD may also provide irrigation water in this area through these interties; such supply would be through permanent service connections or the PUD's existing temporary water service procedures.

1.4.2.3 Service Area Adjustment: Helmick Road Vicinity

The Upper Skagit Tribal Community is exploring the potential for the PUD to provide an emergency water supply to their water system east of the City of Sedro Woolley. This project would include extending the PUD water system to reach the Upper Skagit water system and transferring approximately five services outside the reservation boundary currently served by the tribe. As a result of this potential for growth of the PUD water system, the Judy System retail service area has been expanded in the vicinity of Helmick Road. The potential wholesale service area to provide water supply to the Upper Skagit Tribal Community is also included.

1.5 System Policies

Skagit PUD's Water Policy Manual outlines the policies and procedures to be applied by staff while providing utility services to individual properties. The policies guide how the PUD will manage water system extensions and improvements and provide service to satellite utility systems owned or operated by Skagit PUD. Specifically, the manual includes information on the following:

- Terms, conditions, and policies for furnishing and receiving water
- Metering and billing procedures
- Schedules for water rates
- Fees and deposits
- Management strategies for satellite systems
- System extensions policies
- Water system design criteria

The Water Policy Manual was initially drafted in January 2005 but is a living document. The manual's content is continually updated as policies and procedures evolve and change so that the document can serve as a daily reference guide for staff and management. This Water System Plan is consistent with the policies and requirements outlined in the PUD's Water Policy Manual. A link to this document can be found in **Appendix F**.

1.5.1 Satellite Management Agency

Skagit PUD is the Satellite Management Agency for Skagit County (SMA #103) and, as identified in the CWSP, will work with any water system that is unable to provide service within or adjacent to its own designated service area and will evaluate service to any new system in undesignated areas. Skagit PUD will consider service whenever financially feasible and meet the requirements of the PUD's Water Policy Manual by line extension from an existing system or establishment of a new satellite system.

1.6 Duty to Serve

The following discussion describes the authority and responsibility of Skagit PUD to provide water within the service areas established as part of the Skagit County Coordinated Water System Plan (CWSP).

1.6.1 Existing Service Area Characteristics

The PUD is authorized by RCW 54.04.030 to operate water systems within and outside the boundaries of Skagit County, Washington. This statute gives the PUD countywide water supply planning and service authority and sets its legal boundaries to provide water service, subject to the 2000 CWSP. The future, retail, and wholesale service areas described in the PUD's approved water system plans and the place of use of its municipal purpose water rights have been established to be consistent with the CWSP and the MWL.

The PUD and other water utilities participating in the CWSP have agreed on each water system's designated service area boundaries. The CWSP describes how existing systems that are "adjacent" to a proposed development are given the first option to provide service.

The PUD's current service areas encompass much of the County, except those areas already claimed and served by another public water system per the 2000 CWSP. These other systems prioritize providing water service to adjacent new development proposals within one-half mile of their service areas designated by the CWSP.

If an adjacent water system declines service, or Skagit County determines under RCW 70A.100.060 that the water system cannot provide water service in a timely and reasonable manner, the PUD is responsible for providing new water service under the CWSP. The provision of such service by the PUD, however, is contingent on its ability to do so in a timely and reasonable manner, as well as the MWL retail service area criteria discussed below.

In 2003, the MWL was passed by the Washington State Legislature. The MWL and related DOH rules (WAC 246-290-100) changed how municipal water suppliers describe their water system service area within their Water System Plan. To this end, the DOH rules were adopted in 2008 and later amended in 2016 to provide definitions of how an "existing service area," "retail service area," and "future service area" are to be described within a Water System Plan and to set out the legal obligations associated with such service areas.

Under the MWL, municipal water supply systems were prescribed a statutory duty to serve new connections falling within a retail service area if the following criteria can be met:

- Sufficient capacity exists to serve water reliably,
- Service can be provided in a manner consistent with provisions of adopted land use plans and development regulations that reasonably relate to water service,
- Sufficient water rights exist to provide the service, and
- Service can be provided in a timely and reasonable manner.

The MWL did not define "timely and reasonable" for designated retail service areas. However, DOH has determined per rule guidance that municipal water suppliers are responsible for identifying the "timely and reasonable" criteria for their retail service areas within their Water System Plan.

1.6.2 Retail Service Area

According to the MWL, retail service area is defined by the DOH rule to mean "the specific area defined by the municipal water supplier where, as noted above, the municipal water supplier has a duty to provide service to all new service connections as outlined in RCW 43.20.260."

The Judy System has a designated retail service area that includes Mount Vernon, Burlington, Sedro-Woolley, and surrounding communities such as Bow Hill, Bay View, Fir Island, Conway, Big Lake, and Clear Lake. **Figures 1-2** and **1-3** show the Judy System retail service area and CWSP future service area. Retail service areas and the water rights for each of the PUD's remote satellite systems have been established, as shown in **Figures 1-2, 1-2a, through 1-2c, 1-3, and 1-3a through 1-3d.**

The PUD may extend a retail service area to any area of Skagit County not identified as the service area of another public water system if said area falls within the PUD's future service area as designated by the CWSP and can be served in a manner consistent with applicable PUD policies and MWL provisions.

1.6.3 Future Service Area

Under the MWL and implementation rules, a future service area is generally defined as a specific area where a public water system is authorized to provide service by agreement among purveyors but where retail water service is not currently provided. A purveyor has no duty to serve within areas designated as future service areas that are unserved and fall outside a designated retail service area.

The PUD's future service area encompasses much of the County except those areas already claimed and served by another public water system. As outlined in the CWSP Service Area Agreement, the PUD may serve any area within the County not already a designated service area of another approved water utility within the CWSP, subject to the capacity of the PUD to provide such service in a timely and reasonable manner.

Due to factors including physical topography, remote locations, low population density, and distance from existing sources and facilities, there may be circumstances where water service to all areas within the County is simply not feasible. The PUD has previously discussed extending water service to the Samish Water District around Lake Samish in Whatcom County. It has also been approached by utilities in Island County and San Juan County regarding satellite service. Any potential customer(s) outside Skagit County can have its area annexed into the service territory of the PUD, provided its area is contiguous with the PUD's existing service boundary.

1.6.4 Wholesale Service Area

A municipal water supplier may designate a wholesale water service area within a Water System Plan or update. In this regard, a wholesale water system is "a public water system that treats source water as necessary to produce finished water and then delivers some or all of that to another public water system. Delivery may be through a direct connection, a distribution system, or one or more consecutive systems" (WAC 246-290-010).

As discussed previously, the PUD provides wholesale water from the Judy System to the North Fir Island Water Association and Samish Farms Water Association. These entities purchase water to serve their primarily residential customer base, and their water service areas fall within the Judy System retail service area shown in **Figure 1-2**.

1.6.5 Timely and Reasonable

An individual or developer seeking public water system service within a municipal water supplier's future service area based on the CWSP is required to receive water service from a designated utility but is entitled to appeal this requirement if such service cannot be provided within a timely and reasonable manner. For purposes of the Skagit CWSP, an existing purveyor is not able to provide water service in a timely manner if such service cannot be provided to an applicant within one hundred twenty days (RCW 70.116.060(3b)).

For purposes of its retail and future service areas, the PUD considers water service to be "timely and reasonable" if it can be provided within 120 calendar days of all fees being paid, subject to the

policies stated within the PUD’s Water Policy Manual (Section 2: General Terms, Conditions, and Policies) and the service area policies stated below:

1. If the extent of water service requested requires the construction of major facilities, such as the replacement or installation of new storage tanks, wells, booster pumps, or transmission or distribution mains, the time associated with construction and permitting will be added to the 120 days. The time will commence after the fees are paid.
2. Construction of water facilities is subject to design review and approval at the state and local levels. The “construction time” includes state and local permitting, construction season considerations, and coordination with other planned infrastructure projects such as roads, sewers, lights, etc. “Construction time” activities are in addition to the 120 days.
3. Upon request, a letter of water availability indicating the conditions for service provision will be drafted and sent to the new customer before the start of the 120 days. The PUD’s water service policies are defined in the Water Policy Manual. A customer is responsible for paying for appropriate connection charges and costs of extending or upgrading facilities.
4. If an appeal is requested, it will be evaluated per the terms of the 2000 CWSP appeal procedure.

1.6.6 Priority Services Areas

The PUD will provide retail water service to those customers desiring water service so long as the improvements meet the provisions of the water policy manual and water can be provided in a timely and reasonable manner.

In coordination with Skagit County, the PUD has identified high-priority areas for water service provision. These priorities include the following:

1. Service to Urban and Urban Growth Areas; and
2. Service to areas with pre-existing higher rural density land use designations AND either of the following two types of flow constraints:
 - a. Instream flow constraints due to limited access to on-site water supplies under Skagit and Stillaguamish instream flow rules (Chapters 173-503 and 173-505 WAC, respectively) or
 - b. Low-flow basins identified in Skagit County’s Critical Areas Ordinance (Skagit County Code 14.24).

Responsibilities for public water systems within flow-sensitive basins are described in Skagit County Code 12.48.060(1).

The pre-existing higher rural density land use designations have corresponding Skagit County Comprehensive Plan designations that recognize these areas (i.e., limited areas of more intensive rural development (LAMIRD), as authorized by RCW 36.70A.070(5)(d)(i)).

1.6.7 Low-Priority Areas for Public Water Service

The following two types of Skagit County Comprehensive Plan designated areas are low priority for public water because of their specific long-term purposes as forest resources or open space lands:

1. Industrial Forest Natural Resource Lands

Water service is discouraged in commercial forest resource lands per the following policies:

Countywide Planning Policy 2.10:

Establishment or expansion of local improvement districts and special purpose taxing districts except flood control, diking districts and other districts formed for the purpose of protecting water quality, in designated commercial forest resource lands shall be discouraged.

Skagit County Comprehensive Plan Policy 4B-4.4:

Discourage Tax Districts and LIDs (Local Improvement Districts)

Special purpose taxing districts and local improvement districts that plan to expand into Industrial Forest Lands, allowing as a result new residential or commercial development, shall be required to provide an analysis of impacts and related mitigation of such new, non-resource development on established commercial forestry operations.

2. United States Forest Service and National Park Service lands with county designation of Open Space of Regional/Statewide Importance (OSRSI) and no or limited facilities.

The specific areas include North Cascades National Park, Noisy Diobsud Wilderness, Glacier Peak Wilderness, Ross Lake National Recreation Area, and the Mount Baker–Snoqualmie National Forest.

1.7 Local Government Consistency

Purpose. The local government consistency section satisfies the requirements of WAC 246-290-100(7) and WAC 246-290-108 for municipal water suppliers. Insuring consistency between the Water System Plan and local comprehensive plans, development regulations, and other local codes supports orderly planning and development, minimizes conflicts and legal entanglements, and is necessary to receive the benefits of the Municipal Water Law (see RCW 43.20.260), including expanding a water right place of use. The section will be completed after receiving comments from local government planning entities.

The local land use authorities provide consistency determinations. **Appendix A** contains copies of the consistency determinations for this Water System Plan.

1.8 Watershed Plan Consistency

The retail service areas of the PUD's water systems, including the areas of expansion described in this Water System Plan, are not within the area of a watershed plan approved under Chapter 90.82 RCW or RCW 90.54.040(1). As a result, the proposed alterations of the retail service areas and place of use are not inconsistent with any such watershed plan.

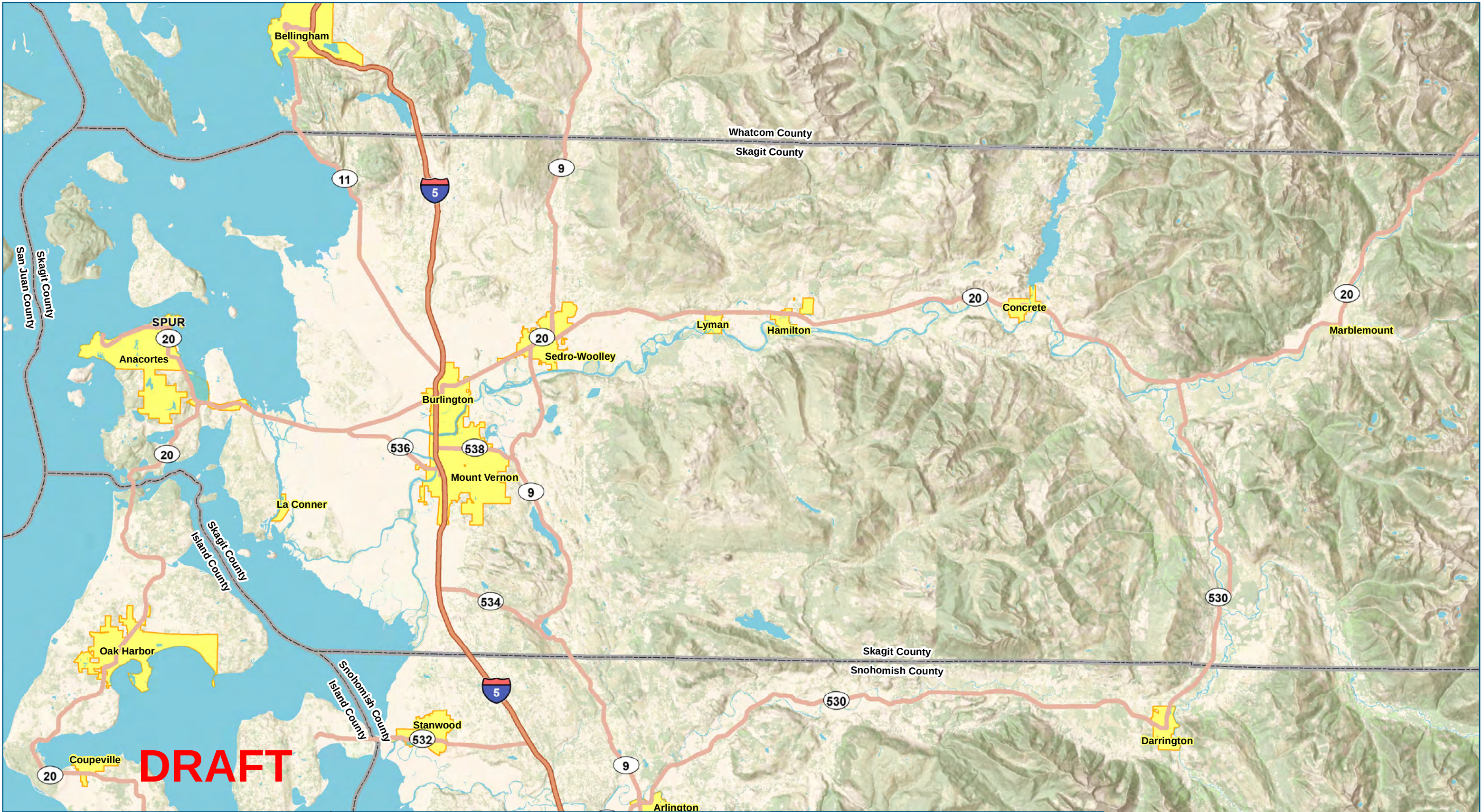


Figure 1-1.

General Vicinity Map
2024 Water System Plan



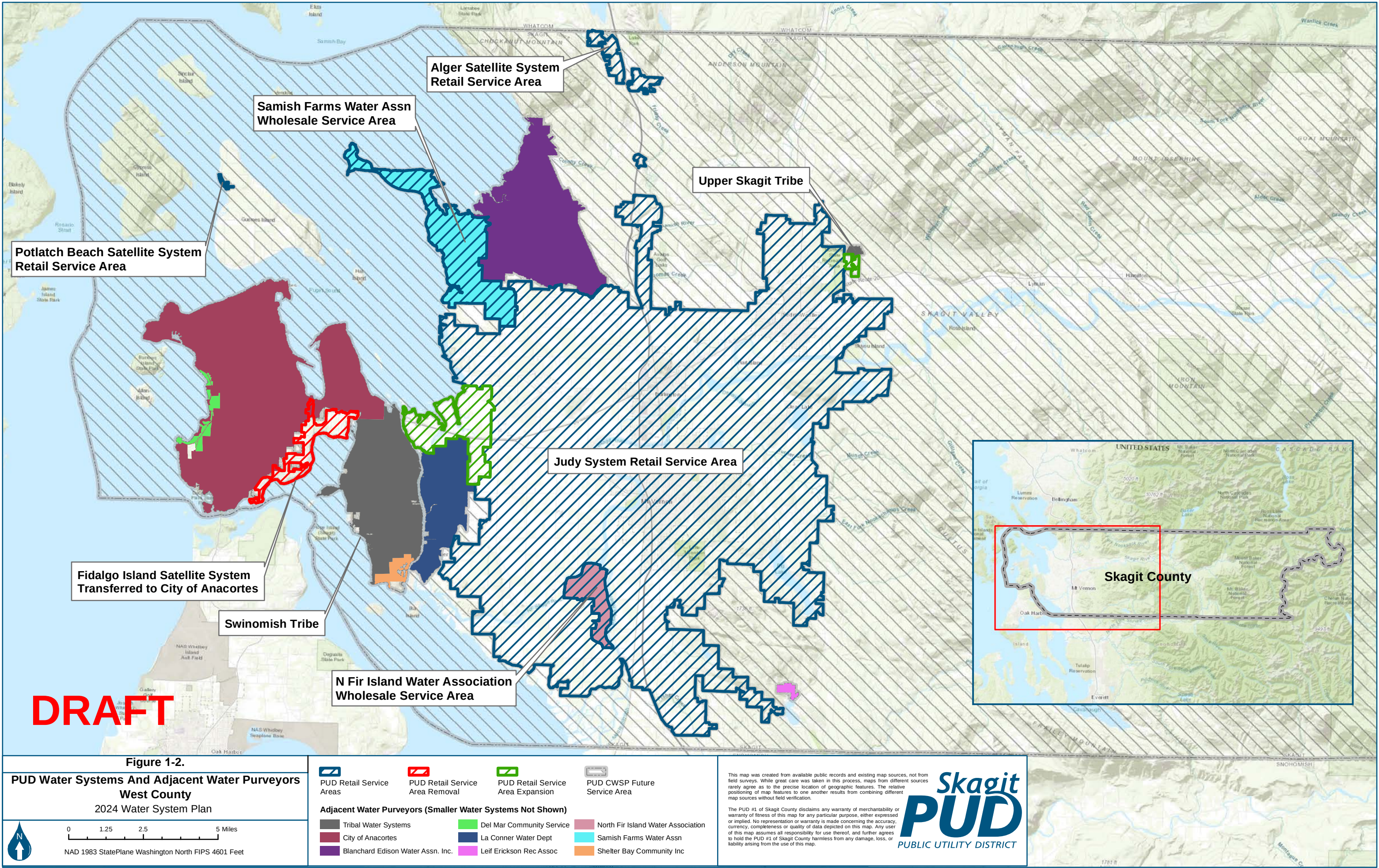
0 2.5 5 10 Miles
NAD 1983 StatePlane Washington North FIPS 4601 Feet

 U.S. Interstate	 County Boundaries
 U.S. Highway	 DNR Hydrography
 State Route	 City Limits

This map was created from available public records and existing map sources, not from field surveys. While great care was taken in this process, maps from different sources rarely agree as to the precise location of geographic features. The relative positioning of map features to one another results from combining different map sources without field verification.

The PUD #1 of Skagit County disclaims any warranty of merchantability or warranty of fitness of this map for any particular purpose, either expressed or implied. No representation or warranty is made concerning the accuracy, currency, completeness or quality of data depicted on this map. Any user of this map assumes all responsibility for use thereof, and further agrees to hold the PUD #1 of Skagit County harmless from any damage, loss, or liability arising from the use of this map.

Skagit
PUD
PUBLIC UTILITY DISTRICT



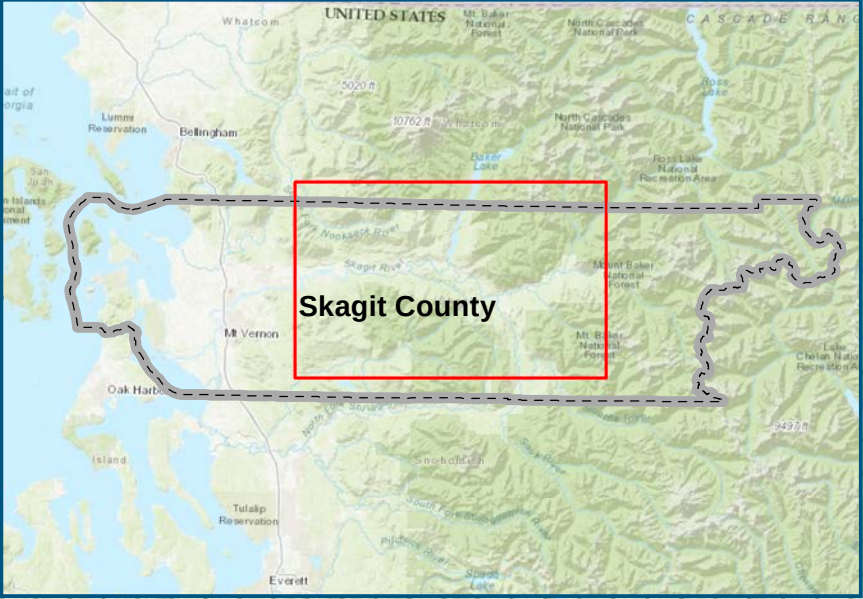
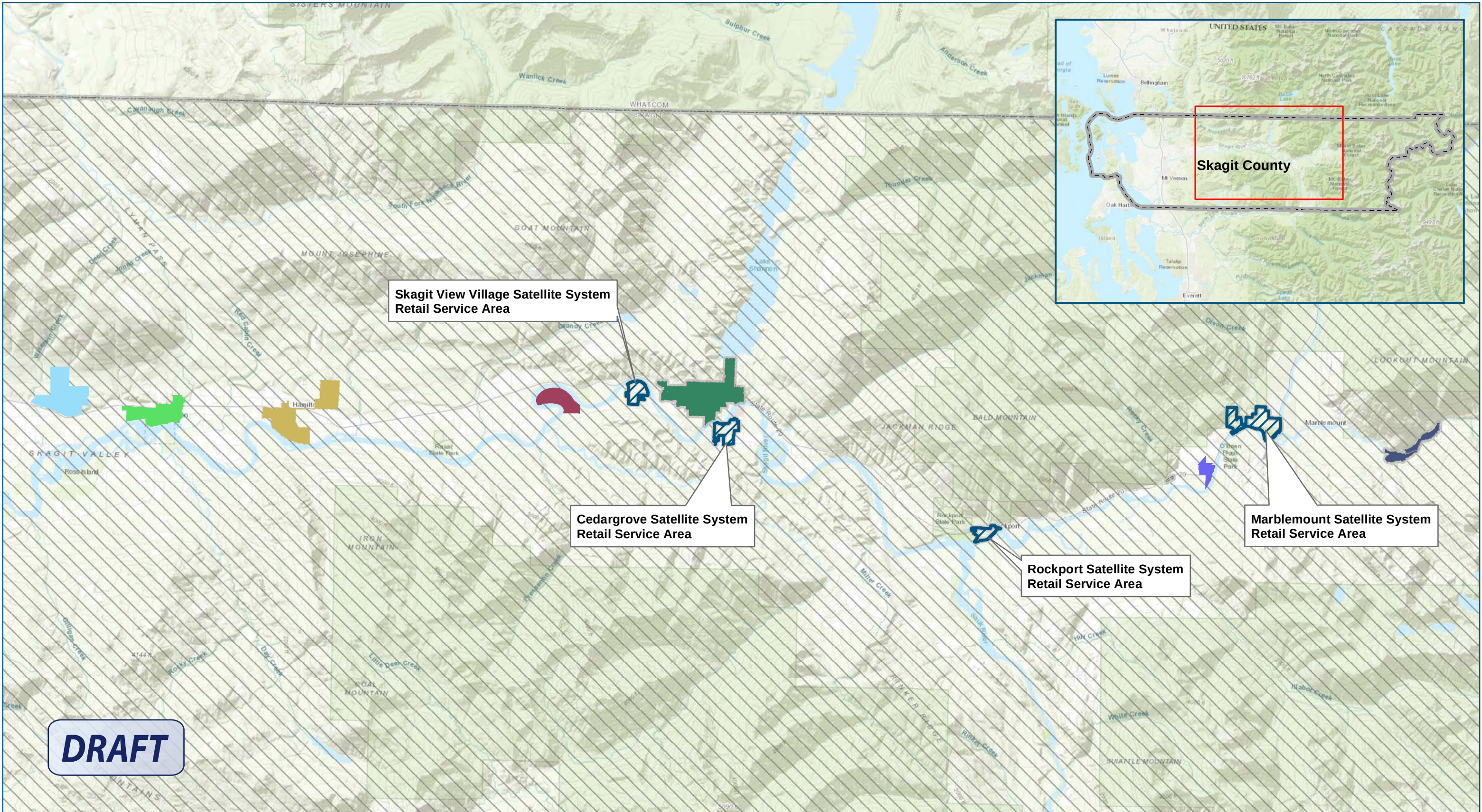


Figure 1-3.
PUD Water Systems And Adjacent Water Purveyors
East County
2024 Water System Plan



0 1 2 4 Miles

NAD 1983 StatePlane Washington North FIPS 4601 Feet

 PUD Retail Service Areas  PUD CWSP Future Service Area

Adjacent Water Purveyors (Smaller Water Systems Not Shown)

 BACUS ROAD #1	 HAMILTON WATER DEPARTMENT
 CAPE HORN MAINTENANCE COMPANY	 LYMAN WATER DEPARTMENT
 CASCADE RIVER COMMUNITY CLUB	 CONCRETE UTILITIES
 GLACIER PEAK RESORT AND WINERY	

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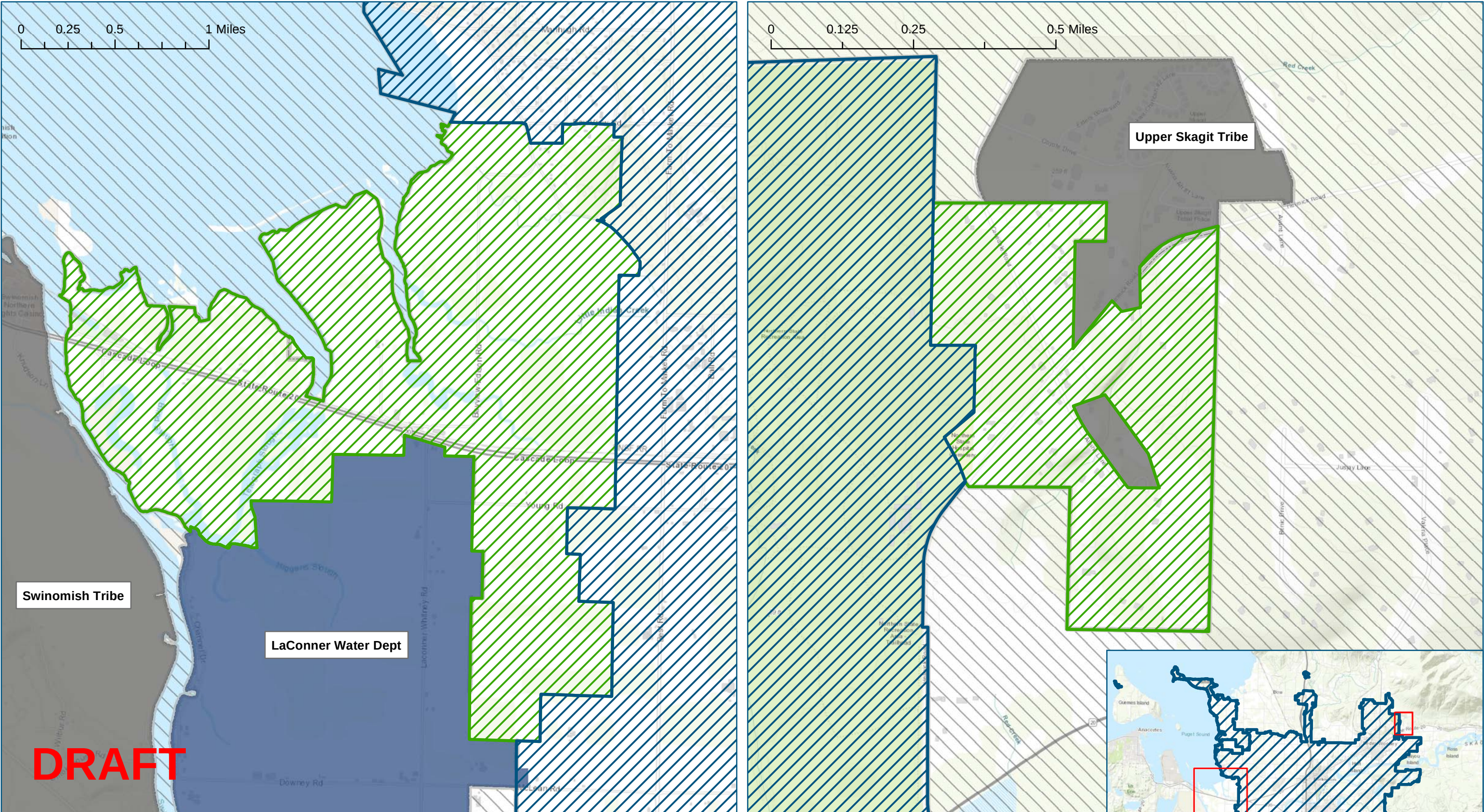


Figure 1-2c.

PUD Water Systems And Adjacent Water Purveyors

West County Retail Service Area Expansion

2024 Water System Plan

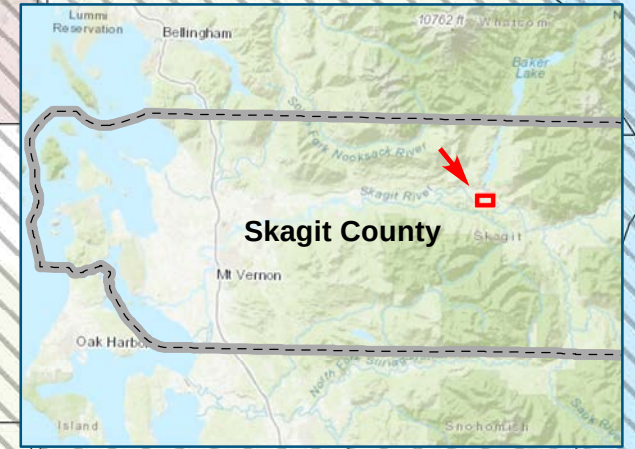
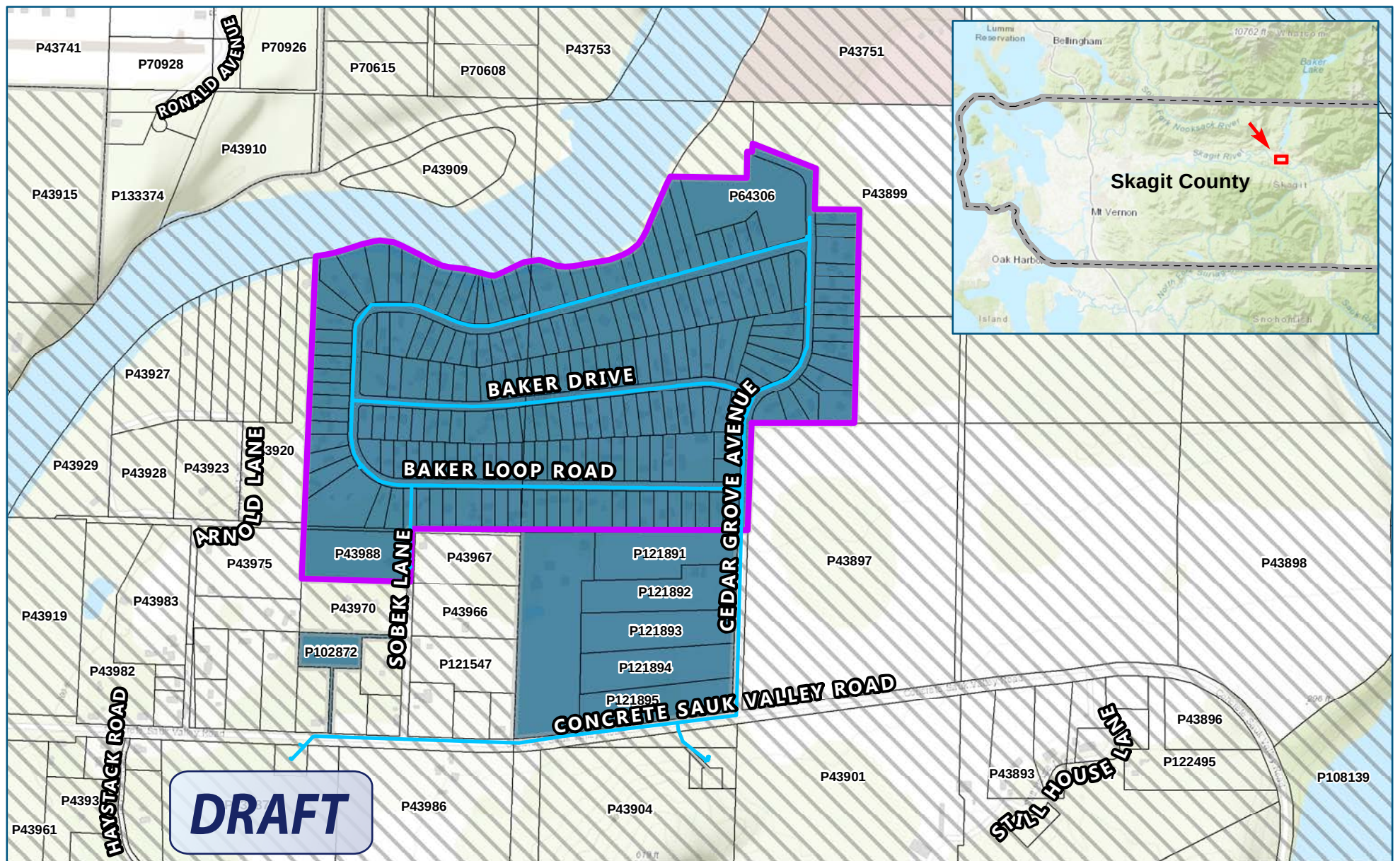
NAD 1983 StatePlane Washington North FIPS 4601 Feet

PUD Retail Service Areas	PUD Retail Service Area Expansion	PUD CWSP Future Service Area
Adjacent Water Purveyors (Smaller Water Systems Not Shown)		
Tribal Water Systems	Del Mar Community Service	North Fir Island Water Association
City of Anacortes	La Conner Water Dept	Samish Farms Water Assn
Blanchard Edison Water Assn. Inc.	Leif Erickson Rec Assoc	Shelter Bay Community Inc

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Figure 1-3b.
Cedargrove Satellite Water System
 2024 Water System Plan



0 250 500 1,000 Feet

NAD 1983 StatePlane Washington North FIPS 4601 Feet

- Existing Main
- LUD Boundary
- PUD Retail Service Areas
- PUD CWSP Future Service Area
- County Parcels

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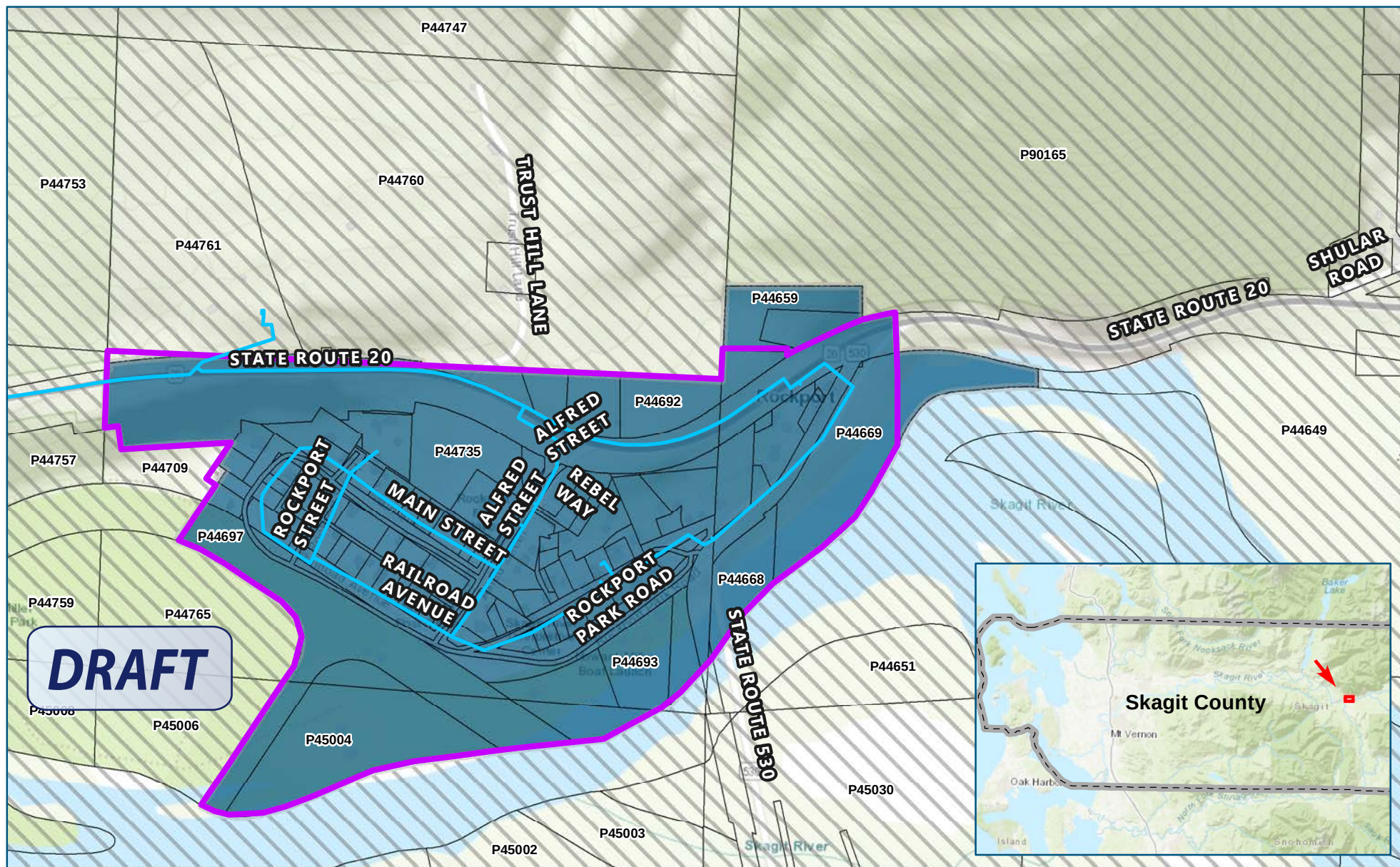


Figure 1-3c. Rockport Satellite Water System 2024 Water System Plan		Existing Main LUD Boundary PUD Retail Service Areas PUD CWSP Future Service Area County Parcels	This map was created from available public records and existing map sources, not from field surveys. While great care was taken in this process, maps from different sources rarely agree as to the precise location of geographic features. The relative positioning of map features to one another results from combining different map sources without field verification. The PUD #1 of Skagit County disclaims any warranty of merchantability or warranty of fitness of this map for any particular purpose, either expressed or implied. No representation or warranty is made concerning the accuracy, currency, completeness or quality of data depicted on this map. Any user of this map assumes all responsibility for use thereof, and further agrees to hold the PUD #1 of Skagit County harmless from any damage, loss, or liability arising from the use of this map.
0 250 500 1,000 Feet NAD 1983 StatePlane Washington North FIPS 4601 Feet			

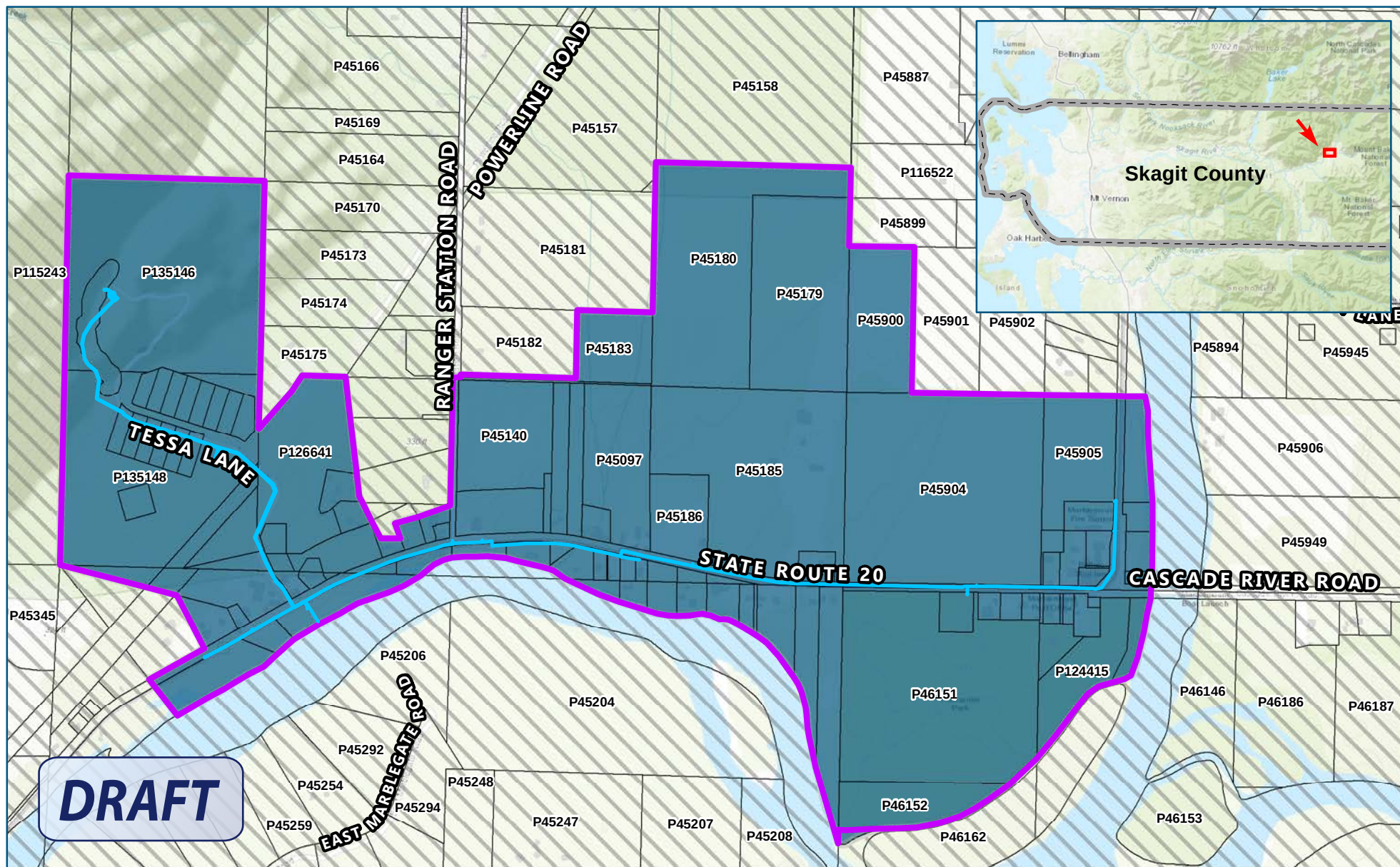


Figure 1-3d. Marblemount Satellite Water System 2024 Water System Plan		— Existing Main □ LUD Boundary ■ PUD Retail Service Areas ▨ PUD CWSP Future Service Area □ County Parcels	This map was created from available public records and existing map sources, not from field surveys. While great care was taken in this process, maps from different sources rarely agree as to the precise location of geographic features. The relative positioning of map features to one another results from combining different map sources without field verification. The PUD #1 of Skagit County disclaims any warranty of merchantability or warranty of fitness of this map for any particular purpose, either expressed or implied. No representation or warranty is made concerning the accuracy, currency, completeness or quality of data depicted on this map. Any user of this map assumes all responsibility for use thereof, and further agrees to hold the PUD #1 of Skagit County harmless from any damage, loss, or liability arising from the use of this map.
0 500 1,000 2,000 Feet NAD 1983 StatePlane Washington North FIPS 4601 Feet			

2 PLANNING DATA

Planning data and forecast information are used to assess the current and future capabilities of the Judy Reservoir Water System over the next 22 years (2025 through 2046). First, current population trends in Skagit County are examined. Second, water meter growth projections are estimated. Finally, water use characteristics, including demand, consumption, and related factors, are used to develop Skagit PUD's production and consumption forecast for the 22-year planning period.

Population Projections. Population growth within Skagit County provides indications of future meter requirements.

Water Production Forecast. Future projections of water production needs are essential to determine the adequacy of the water treatment plant to produce a sufficient, quality water supply. Production forecasts are also necessary to determine if Skagit PUD has sufficient water rights to meet water system demands.

Meter Growth. Meter growth forecasts are used to manage the inventory of meter assemblies. Recent supply chain disruptions have strained the manufacturing and delivery of several components used in meter assemblies. Meter growth forecasts are used to estimate component purchases for long lead times.

Consumption. Our customers finance the PUD through water consumption. Future consumption estimates are used to develop rate structures that finance the PUD operations, maintenance, and capital improvements.

Skagit PUD serves two distinctly different populations in Skagit County: an extensive urban-based water system and six small rural satellite water systems. The Judy System is the largest water system in Skagit County and is characterized by multiple pressure zones, pump stations, storage tanks, and control valves. In contrast, the small satellite systems are considerably less complex and have limited growth potential. Given these differences, planning is tailored to each water system's size. As such, the Judy system's planning involves a more comprehensive discussion, while the satellite systems' planning focuses on capacity analyses.

2.1 Population, Service Connections, and ERUs

Skagit County's population growth and development impacts meter growth and water consumption. The enactment of the Growth Management Act [GMA] in the 1990s requires local governments to manage development and protect critical areas and natural resources. Growth management planning, both regionally and locally, is the primary responsibility of large cities and county governments.

As a regional water purveyor, Skagit PUD does not directly control development but must respond to development pressure. Adequate potable water supply and fire suppression are paramount to safe and sustainable communities. This section examines the population and growth patterns, trends, and forecasts that may impact water system planning.

2.1.1 County Population

Population, households, and employment in Skagit County have grown gradually over the past three decades. Census data and average annual growth rates for Skagit County and the three cities served by the Judy Reservoir Water System are presented in **Table 2-1**.

Table 2-1: Census Data for Population Growth in Skagit County

Jurisdiction	1990	2000	10-Year Growth Rate (1990-2000)	2010	10-Year Growth Rate (2000-2010)	2020	10-Year Growth Rate (2010-2020)
Skagit County	79,545	102,979	29.5%	116,901	13.5%	129,523	10.8%
Rural County ¹	37,841	44,506	17.6%	48,112	8.1%	52,606	9.3%
Mount Vernon	17,647	26,297	49.0%	31,743	20.7%	35,219	11.0%
Burlington	4,349	6,757	55.4%	8,388	24.1%	9,152	9.1%
Sedro-Woolley	6,333	8,658	36.7%	10,540	21.7%	12,421	17.8%
MV-Burl-SW	28,329	41,712	47.2%	50,671	21.5%	56,792	12.1%
Note 1: Total County population minus all city and town estimates.							

GMA intended to concentrate development in urban areas to efficiently deliver public services, such as water supply. The table shows annual growth rates have declined over the past 30 years. Also, in the 1990s, growth rates in the cities were noticeably higher than in rural Skagit County as a whole. However, by the 2010s, growth rates in rural Skagit County were approaching par with urban cities.

2.1.2 Service Connections

At the end of 2023, the Judy System had 25,991 service connections over various customer classes and subcategories. The meters allocation to each customer class and subcategory in 2023 is presented in Section 2.1.3.

2.1.3 Equivalent Residential Units

An equivalent residential unit [ERU] is the water used by a full-time, single-family household. ERUs also represent water use by non-residential customers compared to residential customers. ERUs are used in water system planning to determine the availability of supply, pumping, and reservoir storage adequacy. ERUs for each of the PUD's water systems are calculated from consumption data specific to each system. The Judy System water use factors from 2007–2023 are presented in **Table 2-2**. ERUs for each satellite system are calculated in their respective capacity analysis in **Appendix E**.

Table 2-2: Judy System Water Use from 2007 through 2023

Year	Residential Meters	Water Use per ERU
2007	18,792	168.0 gpd/ERU
2008	19,048	159.6 gpd/ERU
2009	19,232	172.6 gpd/ERU
2010	19,324	161.0 gpd/ERU
2011	19,363	150.3 gpd/ERU
2012	19,469	152.1 gpd/ERU
2013	20,255	146.3 gpd/ERU
2014	20,405	147.0 gpd/ERU
2015	20,383	156.3 gpd/ERU
2016	20,587	147.1 gpd/ERU
2017	20,762	154.0 gpd/ERU
2018	21,035	148.4 gpd/ERU
2019	21,221	143.5 gpd/ERU
2020	21,448	146.4 gpd/ERU
2021	21,641	151.8 gpd/ERU
2022	21,729	145.9 gpd/ERU
2023	21,783	149.6 gpd/ERU
Average Consumption per ERU		151.5 gpd/ERU

The residential water use factor of 149.6 gallons per day per residential account in the Judy System was calculated for 2023, a decrease from 152.1 gpd/ERU in 2012. Water usage per ERU has been trending down for a variety of reasons, including:

- Customer-driven water conservation measures,
- Building code-mandated water conservation fixtures and devices, and
- Reduced irrigation behavior.

The water usage of 149.6 gpd/ERU was used for each of the remaining customer categories to determine the overall number of ERUs represented in the Judy system. **Table 2-3** shows the results of those calculations.

Table 2-3: Judy System Water Use and 2023 ERU Estimates

Category	Number of Meters	Water Consumption	ERUs
Residential	21,783	1,189.6 MG	21,783
Multi-Family	1,283	357.7 MG	6,549
Commercial / Industrial	1,883	726.3 MG	13,300
Government	193	90.5 MG	1,658
Farms	141	156.2 MG	2,860
Irrigation	206	105.0 MG	1,923
Fire Protection	489	1.1 MG	20
Resale	2	39.6 MG	726
Other	11	1.3 MG	25
TOTALS	25,991	2,667.4 MG	48,842

2.2 Water Production and Usage

Skagit PUD strives to provide our customers with high-quality water services at an affordable price. Therefore, the design, construction, and maintenance of water supply, treatment, storage, and delivery infrastructure are necessary to meet customer needs.

2.2.1 Water Production and Usage

The Judy Reservoir Water Treatment Plant [Judy WTP] is the primary production source for the Judy System. Water is supplied to Judy Reservoir through two independent supply sources: the Cultus Mountain watershed and the Skagit River. The Cultus Mountain watershed supply utilizes four streams: Gilligan, Mundt, Salmon, and Turner creeks.

The Anacortes water supply is a secondary source used during abnormal operating conditions, such as treatment plant shutdowns.

2.2.2 Judy WTP Production

The Judy WTP Production is the metered water pumped through the Raw Water Pump Station into the treatment headworks. The Judy WTP has a nameplate treatment capacity of 24 million gallons per day [MGD] and an estimated hydraulic capacity of 30 MGD. Average daily production is between 9 and 11 MGD, and maximum daily production is between 15 and 19 MGD.

The Judy WTP must have sufficient capacity to supply the maximum day demand [MDD] to meet customer consumption and internal plant usages, such as backwash operations and chemical carrier water. Over the past several years, WTP operators have optimized the backwash operations to conserve water. Water production at the Judy WTP is presented in **Table 2-4**.

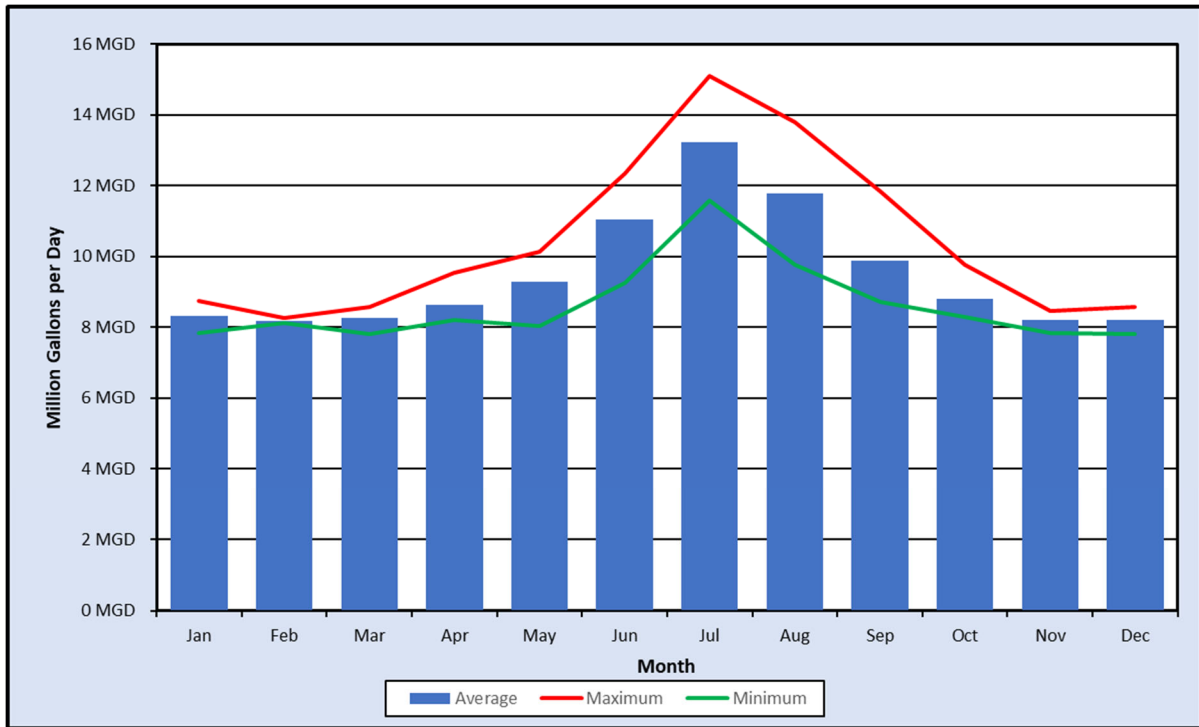
Table 2-4: Judy WTP Production History

Calendar Year	Average Day Demand	Maximum Day Demand	Date of MDD	MDD:ADD Ratio
2007	9.53 MGD	17.56 MGD	July 11, 2007	1.84
2008	9.38 MGD	16.44 MGD	August 15, 2008	1.75
2009	9.36 MGD	17.11 MGD	July 28, 2009	1.83
2010	9.38 MGD	17.28 MGD	July 27, 2010	1.84
2011	9.18 MGD	14.02 MGD	August 10, 2011	1.53
2012	9.38 MGD	16.12 MGD	August 16, 2012	1.72
2013	10.62 MGD	18.56 MGD	July 27, 2013	1.75
2014	10.67 MGD	16.88 MGD	July 10, 2014	1.58
2015	9.96 MGD	17.82 MGD	June 30, 2015	1.79
2016	10.09 MGD	16.03 MGD	August 20, 2016	1.59
2017	10.44 MGD	18.52 MGD	August 2, 2017	1.77
2018	10.00 MGD	18.33 MGD	July 25, 2018	1.83
2019	9.20 MGD	15.66 MGD	June 14, 2019	1.70
2020	8.84 MGD	15.22 MGD	July 31, 2020	1.72
2021	9.83 MGD	19.10 MGD	June 28, 2021	1.94
2022	9.71 MGD	17.00 MGD	June 26, 2022	1.75
2023	9.77 MGD	19.14 MGD	August 24, 2023	1.96
Annual Growth Rate	0.12%		Average	1.76

Over the past 16 years, the WTP annual production has increased an average of 0.12% annually, above the growth rate for metered water consumption, which is negative over the same period.

Water production increases during the summer months due to irrigation use. **Figure 2-1** shows the average monthly water production at the Judy WTP from 2019 through 2023.

Figure 2-1: Judy WTP Monthly Water Production (2019-2023)



2.2.3 Anacortes Supply

Skagit PUD has eleven meters at seven interties along the Anacortes transmission pipelines that can supply water to the Judy service area. These interties have historically been used for various reasons, including service area supply, irrigation augmentation, and emergency operations such as transmission pipeline breaks or Judy WTP shutdowns. Before 2013, the Anacortes supply accounted for 8 to 15 percent of the total supply necessary to meet customer consumption.

In 2013, Skagit PUD completed the Josh Wilson Road transmission pipeline. This pipeline allowed Skagit PUD to adequately supply the Bayview service area with water produced at the Judy WTP. Therefore, the need for the Anacortes supply diminished.

Over the past four years, the Anacortes supply to the Judy service area has been reduced to 0.04 to 2 percent of the total supply. The Judy WTP almost exclusively provides water supply to Judy system customers. The Anacortes supply is only used for emergencies or abnormal operating conditions, such as transmission pipeline breaks and Judy WTP shutdowns.

2.2.4 Water Consumption

Skagit PUD's primary water customer category is residential; however, various other customer types are served. Skagit PUD's customer categories are grouped as follows:

2.2.4.1 Residential Services

Primarily single-family residences, properties with axillary dwelling units [ADUs], and duplexes with individual meters assigned to each unit. The classification is used to calculate the equivalent residential unit [ERU].

2.2.4.2 Non-Residential Services

The non-residential category has several subcategories described below.

Multi-Family: Multi-family customers are defined as apartments, condominiums, and other structures where multiple dwellings are served from a single water meter. Though this subcategory has a residential-type usage, they are considered a commercial operation.

Commercial and Industrial: Commercial retail, churches, manufacturing, and processing consumers.

Government: Buildings or facilities owned by local government agencies and special purpose districts (e.g., schools, hospitals, etc.).

Farms: Customers who own and operate farms that do not have backflow prevention devices.

Irrigation: Customers that provide irrigation water to their property but are not considered agricultural operations. These include parks, golf courses, and sports fields.

Fire Protection: Water is used by fire departments and fire districts throughout Skagit County for training staff.

2.2.4.3 Agricultural Services

Farm operations that have backflow prevention devices. These agricultural services are characterized by high-volume water consumption. To support the agriculture industry in Skagit County, agricultural services are charged a lower rate than other categories but require compliant backflow prevention.

2.2.4.4 Other Services

Other services include a variety of small subcategories and address niche needs.

Resale: Customers with a wholesale meter that provides water to a public water system that serves a specific area. Skagit PUD has two resale customers: North Fir Island Water Association and Samish Farms Water Association.

Hydrant Meters: The PUD has several hydrant meters assigned to entities to draw water from fire hydrants for various uses. Typically, these hydrant meters are issued on a short-term or seasonal basis. The primary user is a contractor who needs water for activities on a construction site before permanent water service is provided.

Fill Stations: The PUD has three fill stations within its service area that Skagit County residents can use for various needs. Water is purchased using a third-party payment system arranged through the PUD's customer service.

Other: This includes two small customer categories: manifold, consisting of the residential meter on a manifold meter set up for irrigation and consumption, and Statement No-Bill, which consists

of the water consumption by the PUD's facilities that are not billed. This consumption includes seal water at pump stations and the water used by the Skagit PUD offices and other PUD facilities.

Table 2-5 shows the number of active service connections by customer category for 2023, along with the total water consumption for that category and the overall percentage of consumption compared to the yearly total.

Table 2-5: 2023 Judy System Service Connections by Category

Category	Number of Meters	Percentage	Water Consumption	Percentage
Residential	21,783	83.8%	1,189.6 MG	44.6%
Multi-Family	1,283	4.9%	357.7 MG	13.4%
Commercial / Industrial	1,883	7.2%	726.3 MG	27.2%
Government	193	0.7%	90.5 MG	3.4%
Farms	141	0.5%	156.2 MG	5.9%
Irrigation	206	0.8%	105.0 MG	3.9%
Fire Protection	489	1.9%	1.1 MG	0.0%
Resale	2	0.0%	39.6 MG	1.5%
Other	11	0.0%	1.3 MG	0.1%
TOTALS	25,991	100%	2,667 MG	100%

The number of water meters in the Judy system has grown while consumption has leveled off and, at times, decreased. **Table 2-6** shows the growth in the number of meters compared to the overall water consumption for the past 15 years.

Meter growth appears to correlate with County population growth, and the Pearson Coefficient confirms a significant correlation (Pearson $r = 0.98$ for the data set). The variables have a linear relationship when the two data sets are correlated. The Pearson Correlation Coefficient measures the strength and direction of the linear relationship. A Pearson Coefficient above 0.5 is considered a positive correlation, and a value near 1.0 indicates a strong correlation.

Table 2-6: Judy System Service Connections and Consumption Growth

Year	Number of Meters	Percent Growth	Water Consumption	Percent Growth
2007	22,402		2,650.8 MG	
2008	22,634	1.0%	2,695.0 MG	1.7%
2009	22,856	1.0%	2,736.5 MG	1.5%
2010	22,895	0.2%	2,603.0 MG	-4.9%
2011	22,938	0.2%	2,551.6 MG	-2.0%
2012	23,063	0.5%	2,534.2 MG	-0.7%
2013	23,816	3.3%	2,607.0 MG	2.9%
2014	23,982	0.7%	2,594.5 MG	-0.5%
2015	24,367	1.6%	2,660.4 MG	2.5%
2016	24,589	0.9%	2,598.3 MG	-2.3%
2017	24,770	0.7%	2,655.0 MG	2.2%
2018	25,079	1.2%	2,609.6 MG	-1.7%
2019	25,293	0.9%	2,604.3 MG	-0.2%
2020	25,544	1.0%	2,340.5 MG	-10.1%
2021	25,775	0.9%	2,595.1 MG	10.9%
2022	25,888	0.4%	2,527.5 MG	-2.6%
2023	25,991	0.4%	2,667.4 MG	5.5%
Average Growth Rate		0.9%		0.0%

2.2.5 Water Balance

A water balance accounts for all supplied, purchased, sold, and lost water. **Table 2-7** shows the water balance for the Judy System for 2023. It is a slightly modified version of the format recommended by the American Water Works Association’s Water Loss Committee.

The water balance allocates the water production to different categories at three different levels:

Level 1: Total water delivered, including water produced at the Judy WTP and water purchased from Anacortes.

Level 2: Both revenue and non-revenue water. As the names imply, revenue water generates income while non-revenue water does not. These values illustrate what percent of water delivered generates income for Skagit PUD. Additionally, non-revenue water needs to be factored into the consumption forecast.

Level 3: The non-revenue water is further divided into three subcategories, which help identify potential additional revenue sources and the magnitude of distribution system leakage that could be fixed.

Unbilled Authorized Consumption: This includes water system flushing, firefighting, and water used for PUD facilities.

Apparent Losses: This includes unauthorized uses and customer meter inaccuracies, both lost revenue opportunities.

Real Losses: This includes various system leaks and inaccuracies in the meters. A certain level of leakage is unavoidable; however, leakage beyond that level should be repaired as soon as possible to avoid loss of water resources and damage to the physical infrastructure. Any amount that cannot be assigned to another category is considered a real loss under the American Water Works Association’s protocol and per the formula for calculating distribution system leakage under Washington State’s Water Use Efficiency Rule.

Level 4: A further split into additional subcategories.

Table 2-7: 2023 Judy System Water Balance

Level 1	Level 2	level 3	Level 4	Million Gallons per Year	Percent of Water Produced
Water Delivery	Revenue Water	Billed Authorized Consumption	Billed Water Exported ¹	39.63	1.3%
			Billed Metered Consumption ²	2,697.61	87.3%
			Billed Unmetered Consumption	0.00	
	Non-Revenue Water	Unbilled Authorized Consumption	Unbilled Metered Consumption ³	1.60	0.1%
			Unbilled Unmetered Consumption ⁴	20.33	0.7%
		Apparent Losses	Unauthorized Consumption	0.00	
			Customer Metering Inaccuracies	0.00	
		Real Losses	Known Leakage	0.00	
			Assumed Leakage ⁵	331.83	10.7%
Total Water Delivered by Judy and Anacortes WTP				3,091.01	100.0%
Notes: 1. Wholesale water to North Fir Island Water Assoc. and Samish Farms Water Assoc. 2. Water sold to retail customers, including hydrant meters and Fire Dept. usage. 3. This represents consumption by PUD facilities that are metered but not billed. 4. Estimated pipeline flushing and fire department usage. 5. This is the overall water delivered minus all other categories. Skagit PUD has replaced two large supply meters on its transmission pipelines, which is expected to increase the reliability and accuracy of the overall system readings.					

2.2.6 Seasonal Variation

Understanding seasonal variation in consumption is helpful, especially with our highest water users.

Table 2-8 analyzes the seasonal variation with our ten highest water users in the Judy water system.

Table 2-8: Judy System Seasonal Variation of the Highest Water Users

Customer	Industry	3-Year Ave Annual	Peak Month		Peaking Ratio
Sierra Pacific Industries	Lumber Mill	181,414 ccf	27,948 ccf	Oct-22	1.28%
Draper Valley Farms	Poultry Processor	149,661 ccf	22,810 ccf	Oct-22	1.27%
Skagit Horticulture, LLC	Irrigator	90,052 ccf	33,567 ccf	Jul-22	3.11%
Samish Farms Water Assoc.	Wholesale	44,447 ccf	12,785 ccf	Jul-22	2.40%
Skagit Valley Farms	Irrigator	58,417 ccf	21,858 ccf	Aug-23	3.12%
Puget Sound Energy	Power Utility	33,256 ccf	9,388 ccf	Aug-23	2.35%
Sakuma Bros Farms. Inc.	Produce Processor	33,239 ccf	13,129 ccf	Jul-21	3.29%
Dick Vanderkooy	Dairy	23,944 ccf	4,069 ccf	Jul-22	1.42%
Skagit Valley Mobile Manor	Trailer Court	21,140 ccf	3,525 ccf	Jul-22	1.39%
Washington Bulb Company	Bulb Processor	18,051 ccf	3,290 ccf	Jun-22	1.52%

The three higher peaking ratios, values greater than 3%, are all irrigators or farm produce processors. These are seasonal uses that occur during the summer season. These peaks are expected and coincide with peaks in the Judy water system. In comparison, the Judy water system experiences an MDD:ADD peaking ratio from 1.53 to 1.94, with the average peaking ratio being 1.75 for the past 17 years. The remaining high-water users have peaking ratios that align with the overall system peaking ratios.

2.3 Distribution System Leakage

Skagit PUD annually estimates its distribution system leakage [DSL] for its water system. **Table 2-9** presents the DSL for the three most recent reporting years in the Judy System.

Table 2-9: Judy Distribution System Leakage from 2021 through 2023

	2021	2022	2023
	(in gallons)		
Total Water Produced and Purchased [TP]	3,038,310,683	2,968,743,593	3,091,008,741
Authorized Consumption [AC]	2,742,924,651	2,687,267,047	2,759,178,691
Distribution Leakage	295,386,032	281,476,546	331,830,050
DSL Percentage	9.72%	9.48%	10.74%
3-Year Annual Average	9.99%		

The PUD's water use efficiency program, including a detailed discussion of distribution system leakage for the Judy System and all six satellite systems, is discussed in **Chapter 4**.

2.4 Water Supply Characteristics

The primary purpose of the PUD is to provide a sufficient and reliable water supply to meet its customers' current and projected potable and non-potable demands. PUD customers include manufacturing, industrial, agricultural (e.g., irrigation), and domestic use within its retail, future, and wholesale service areas. According to its broad statutory authority under RCW 54 and RCW 90.03.015, the PUD is defined as a municipal water supplier. Its water rights qualify for municipal water supply purposes due to their beneficial use in serving 15 or more residential customers and governmental proprietary purposes.

In general terms, the Judy System uses its certificated surface water rights to withdraw and treat water from various sources. The PUD has limited groundwater sources that serve its remote satellite systems. Secondary supply from the City of Anacortes water system can be provided to the PUD's Judy System through multiple interties.

2.4.1 Judy Reservoir Source Characteristics

Judy Reservoir obtains water from four streams in the Cultus Mountain watershed (Gilligan Creek, Salmon Creek, Turner Creek, and Mundt Creek) and the mainstem Skagit River. The Cultus Mountain watershed starts about two miles east of the community of Clear Lake. All the streams in the watershed drain eventually to the Skagit River and are subject to instream flows.

Water is collected from the four Cultus Mountain streams at diversion structures and transported to Judy Reservoir through two collector pipelines. The diversion structures are set up on a bypass system, allowing water to flow past the diversion. Instream Flows set by Rule under WAC 173-503 limit the diversion quantities available from each stream based on the month of the year. When the water measured on Cultus tributary gauges does not meet these minimum flows, the PUD can divert water from its point of diversion on the Skagit River.

Considering the capacity and a combination of stream flows and river pumping to replenish drawdown, the reservoir has the potential to stay full during the year and provide more readily capacity for emergencies.

In 1990, as the Safe Drinking Water Act gained momentum, the PUD constructed a new filtration plant to meet new treatment requirements. This plant features direct filtration and chlorine dioxide treatment followed by chlorination before distribution. Before constructing the filtration plant, the utility needed to treat Judy Reservoir with copper sulfate to kill algae. Unfortunately, that left a slight odor in the water and upset the algae population's natural food chain. After the filtration went online, the PUD discontinued copper sulfate, allowing algae to grow naturally. The filtration process now removes all algae.

The PUD doubled its water filter plant's capacity at Judy Reservoir in 2009 to address our area's growing needs. Along with this expansion, the PUD constructed a new pumping station on the Skagit River to augment flows from the Cultus tributaries, which had been the primary source of water supply. Pulling water from the Skagit River enables the PUD to fill Judy Reservoir when fish protection requirements limit diversions from the streams.

The PUD holds water rights to the Cultus Mountain streams, the Skagit River, two groundwater wells, and the Judy Reservoir storage. Under present and projected operational conditions, the Judy System has sufficient capacity to meet PUD water needs for at least 50 years.

2.4.2 Hydrogeologic and Groundwater Characteristics

The Skagit River occupies a large, relatively flat alluvial valley that is bounded to the south and east by upland and mountainous terrain. The alluvial valley is primarily underlain by fluvial sand and gravel deposits and locally preserved lahar runout deposits. Upland areas contain laterally discontinuous bodies of glacial (till and outwash) and interglacial (fluvial and lacustrine) deposits of varying thickness that reflect terrestrial and shallow marine depositional environments.

Groundwater in unconsolidated aquifers generally flows towards the northwest and west in the direction of the Skagit River and Puget Sound. This generalized flow pattern is likely complicated by low-permeability confining units that separate discontinuous bodies of aquifer material and act as local groundwater-flow barriers.

Groundwater flow directions in the sedimentary aquifer likely reflect local topographic relief (radial flow from bedrock highs) and more regional westward flow from the mountains to the Puget Sound. The highest groundwater level fluctuations observed during the monitoring period (October 2006 through September 2008) occurred in wells completed in the sedimentary aquifer and ranged from about 3 to 27 feet. Water levels in wells completed in unconsolidated hydrogeologic units exhibited seasonal variations ranging from less than 1 to about 10 feet. The groundwater system within the subbasins received an average (September 1, 2006, to August 31, 2008) of about 92,400 acre-feet or about 18 inches of recharge from precipitation a year. Most of this recharge (65 percent) discharges to creeks, and only about 3 percent is withdrawn from wells. The remaining groundwater recharge (32 percent) leaves the subbasin groundwater system as discharge to the Skagit River and Puget Sound. The groundwater system can provide existing and future reliable water supply for the PUD's satellite water systems.

2.5 Water Supply Reliability Evaluation

Ensuring dependable and safe drinking water starts with reliable supply sources. Every public water system is responsible for procuring the best possible quality of drinking water, ensuring it can consistently satisfy both present and future consumer needs. Fulfilling this responsibility is complex due to the scarcity of water resources, limitations outlined in the MOA, the general gridlock in Washington State water rights certification and adjudication, changing climate conditions, and the diverse potential sources of contamination.

2.5.1 Water Supply Characteristics

The Judy System sources its water from the Skagit River and four streams in the Cultus Mountain Watershed: Gilligan Creek, Salmon Creek, Turner Creek, and Mundt Creek. The Skagit River Diversion (SRD) pump station is the primary raw water source for the Judy Reservoir. A watershed control plan for the Skagit River was prepared in collaboration with the City of Anacortes and last updated in 2010. A link to this plan can be found in **Appendix F**.

The Cultus Mountain Watershed, located about 2 miles east of Clear Lake, has a Watershed Management Plan (WMP) discussed in Chapter 5, titled “Source Water Protection”. This WMP was reviewed and approved by the Department of Health (DOH), and its link is provided in **Appendix F**.

Water from the four streams in the Cultus Mountain Watershed is collected at diversion structures and then transported to the Judy Reservoir through two collector pipelines. The amount of water that can be diverted from each stream is limited by the minimum instream flows established by WAC 173-503, and these limits vary depending on the month. *Chapter 3 - System Analysis and Asset Management*, provides a more detailed discussion on water rights and instream flows. If the stream flows, as measured at a downstream stream gauge, do not meet these minimum flows, the PUD will divert additional water from the Skagit River up to the maximum water right.

The water level in the Judy Reservoir fluctuates throughout the year. Inflows from the streams mainly occur from October to June, when stream levels are typically above the minimum instream flows. The PUD manages inflows from the Skagit River all year round, adjusting based on recent and anticipated inflows from the streams and the expected supply needs for the Judy System. As a result, the reservoir typically reaches its highest levels in the spring due to pumping from the SRD and inflows from the streams, while customer consumption is relatively low.

The reservoir level begins to decrease significantly in the summer due to the PUD’s decreasing desire to divert water from the Skagit River due to higher turbidity and increasing customer demand, generally reaching the lowest levels during the late summer. In the fall, inflows from the Skagit River can return the reservoir to a target elevation at year’s end and begin the cycle again. If the reservoir drops below forecasted elevations, inflows from the Skagit River can be increased to maintain an adequate supply to the Water Treatment Plant (WTP).

2.5.2 Source Reliability

The PUD assesses the reliability of the Skagit River and Cultus Mountain water sources from two perspectives: quantity and quality.

The Skagit River system, the second largest drainage basin in Washington State, provides a substantial amount of water. The PUD’s annual withdrawal is tiny compared to the river’s total discharge. This means the Skagit River should remain a sustainable water source despite potential climate changes.

Currently, the Skagit River system is a clean water source. Only one wastewater treatment plant is upstream, located in the Town of Concrete. The land use upstream of the SRD pump station is mainly rural and is expected to stay that way for the foreseeable future. However, unforeseen changes in activities could potentially degrade the water quality. The PUD has conducted a Judy WTP Condition Assessment to address these concerns. The plan is to build additional treatment facilities to handle any changes in water quality, such as increased turbidity if needed.

On the other hand, the Cultus Mountain sources are already constrained due to established instream flows. Water withdrawals from these streams are only possible during winter and spring when runoff exceeds the minimum instream flows. For most of the year, the instream flows in these streams fall below the established minimums, preventing any withdrawals.

The Cultus Mountain watersheds are pristine, with limited forestry activities strictly regulated by established watershed protection programs. Apart from high turbidity during storm events, these sources maintain excellent water quality, which is expected to continue for the foreseeable future.

2.5.3 Interties

The PUD may also obtain water for the Judy System from the City of Anacortes through interties as needed. These interties are connected to the City’s transmission pipeline, which starts from its water treatment plant adjacent to the Skagit River in Mount Vernon and extends westward to Anacortes on Fidalgo Island. The City obtains water from the Skagit River through its certificated water rights.

2.5.4 Reclaimed Water

The PUD reclaims water at the Judy WTP. Filter backwash water is pumped to lagoons to allow solids to settle out. Supernatant overflows from the lagoons and flows back to Judy Reservoir, where it can be used again as a raw water source.

2.6 Future Population Projections and Service Connections

Population projections and water service connection estimates become increasingly important when considering sustainability. The demand for safe and accessible water is expected to rise. Increased population will increase water service connections, impacting existing infrastructure and resources. Accurate estimates of these connections are crucial for planning and implementing sustainable water management strategies, ensuring that existing and future customers can access water. The challenge lies not only in meeting the increased demand but also in doing so sustainably, balancing the needs of the present with those of future generations.

2.6.1 Population Forecast

As directed by state statute RCW 43.62.035, the Office of Financial Management (OFM) prepares a reasonable range of population growth forecasts for Washington counties required to comply with the Growth Management Act (GMA) every five years. The population forecasts are projected for 20 years and include low, medium, and high estimates. The medium-level projection represents OFM’s estimate of the most likely population projection for the county. Skagit County is required to plan under the GMA. The updated OFM low, medium, and high forecasts for Skagit County for 2030, 2040, and 2050 are presented in **Table 2-10**.

Table 2-10: OFM Population Projections for Skagit County Based on the 2020 Census

Census 2020	OFM Projection	2030	10-year Growth Rate (2020–2030)	2040	10-year Growth Rate (2030–2040)	2050	10-year Growth Rate (2040–2050)
129,523	Low	132,152	2.0%	139,578	5.6%	145,879	4.5%
	Medium	142,805	10.3%	155,142	8.6%	166,281	7.2%
	High	159,634	23.2%	183,768	15.1%	206,608	12.4%

As a comparison, the PUD’s 2013 Water System Plan provided population forecasts from OFM using the 2010 census data and the 2000 Coordinated Water System Plan (CWSP). **Table 2-11** shows the projections from the OFM and the CWSP for 2020.

Table 2-11: Previous OFM and CWSP Population Projections for Skagit County

Projection Rate	OFM 2020 Projection	2020 CWSP Projection	2020 Census
Low	118,117	118,153	129,523
Medium	130,705	125,540	
High	146,280	136,644	

As evidenced by **Table 2-10**, the estimated census population in 2020 was below the medium growth rates for the OFM projections and above the medium growth rate for the CWSP (a very outdated forecast).

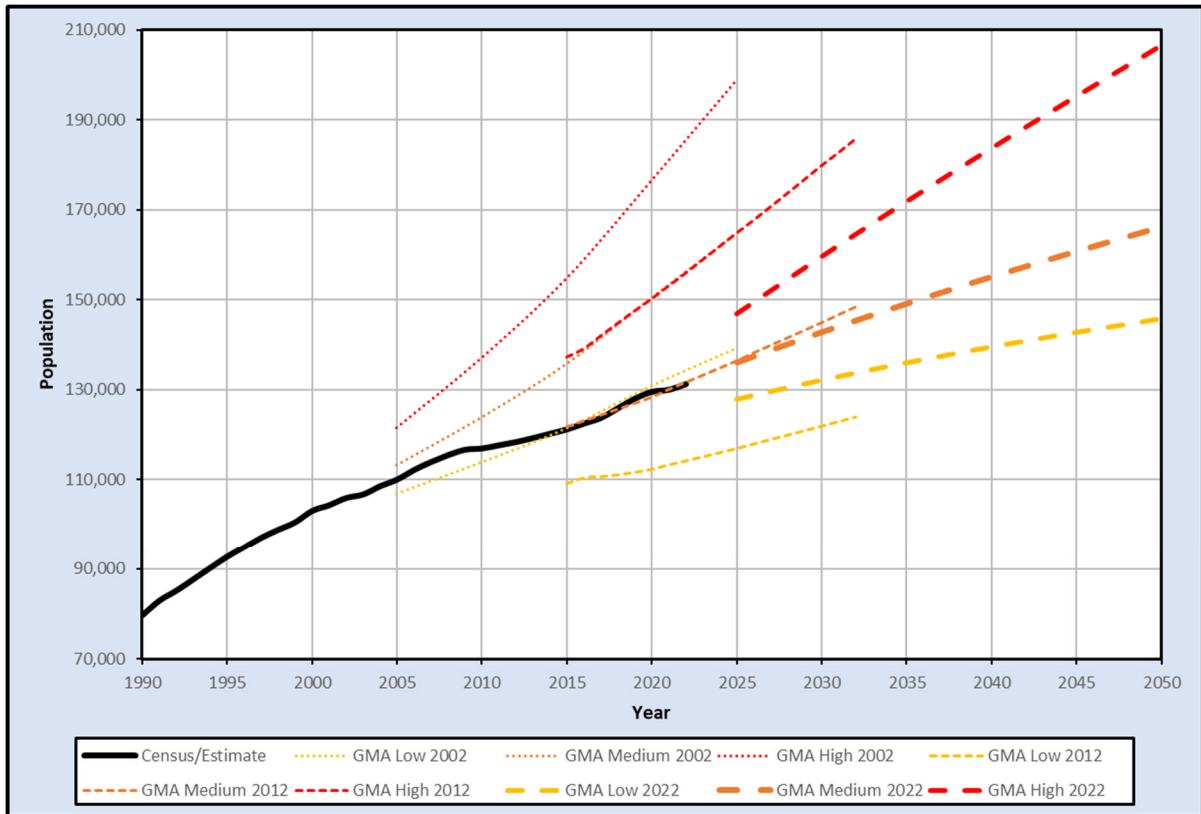
The Skagit County population growth tends to wane with downturns in the business cycle or other external events. A glance at annual population estimates shows that population growth was muted in the 2009-2010 timeframe, which corresponded with the Great Recession. Also, population growth was muted in the 2020-2021 timeframe, which corresponded with the COVID-19 pandemic.

Figure 2-2 shows the population growth from 1990 to the present, along with the 2022 OFM low, medium, and high growth forecasts through 2050. For comparison, the 2002 and 2012 OFM growth forecasts are also provided for reference to historical projection estimates.

Some conclusions regarding population growth in Skagit County can be derived from census data and population forecasts.

- The rate of population growth in Skagit County is decreasing over time.
- Historical population growth in recent years tends to follow the OFM medium forecast in the short term.
- The span between the OFM low and high forecast estimates has significantly converged compared to previous growth forecasts, possibly resulting from a more refined forecasting methodology.

Figure 2-2: Skagit County Population Growth and 2022 GMA Projections

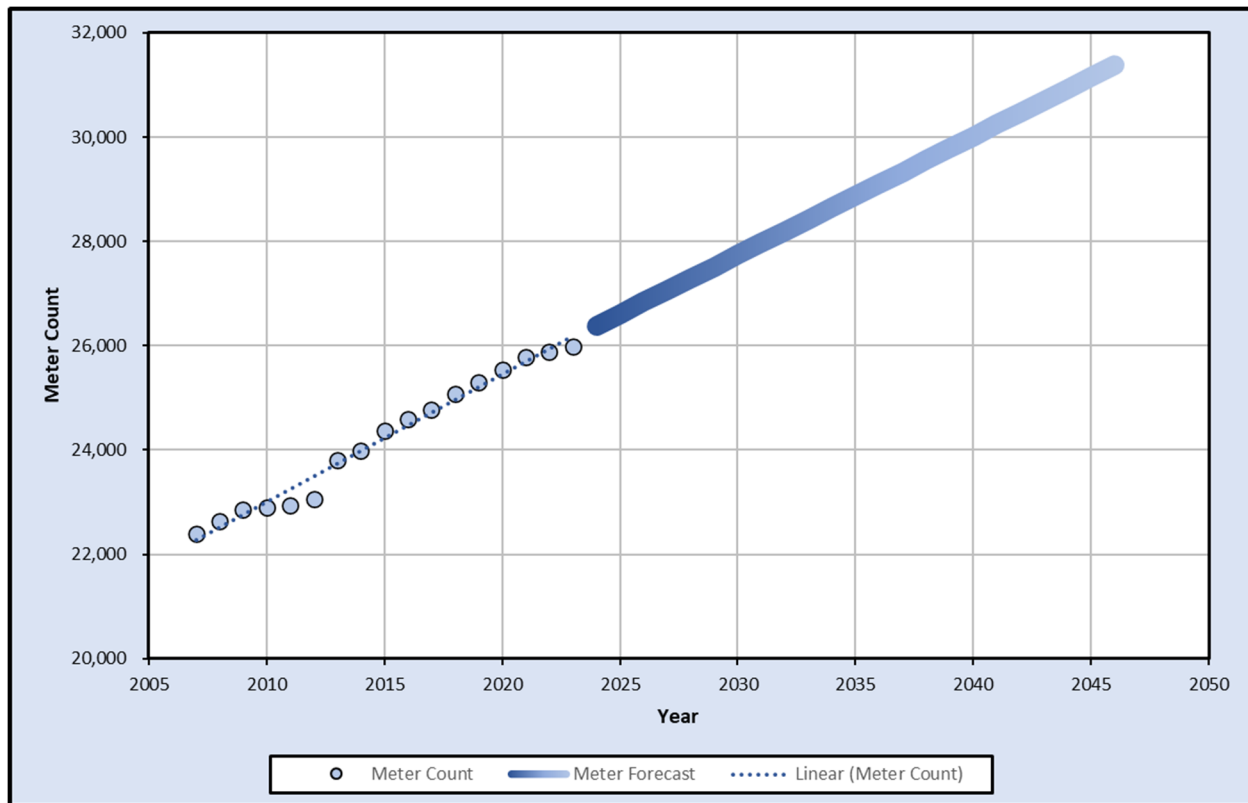


2.6.2 Meter Growth Forecast

The meter growth rate was estimated for each customer category using linear regression. **Table 2-12** (on page 2-23) shows the estimated meter growth for each customer category and the total anticipated growth for the Judy System. Growth rates for various customer categories ranged from a low of 0.0% to a high of 2.0%, with an average growth rate of 0.8% from 2023 to 2046.

The annual meter growth forecast of 0.8% coincides with the OFM medium population growth rate of 0.84% through 2050. **Figure 2-3** visually represents the linear correlation of the historical and forecasted meter growth.

Figure 2-3: Historical and Forecasted Meter Growth



2.7 Future Water Demand

Forecasting methodology is an essential tool for predicting future trends and patterns. This evaluation used linear and quadratic regression to determine the best fit for forecasting growth.

Linear regression is a statistical method that establishes a relationship between two or more variables. The established linear relationship predicts future water production and consumption based on historical trends. The method involves fitting a straight line through the data points and using the slope of the line to predict future values.

Quadratic regression is another statistical method that can be used to establish a relationship between two variables. It is similar to linear regression but involves fitting a parabolic curve through the data points instead of a straight line. Quadratic regression can be used when the two variables have a non-linear (parabolic) relationship.

The “Goodness of Fit” test was used to select the best forecasting methodology for each data set. It is used to determine how well the model fits the data. The closer the value of R-squared (coefficient of determination) is to 1, the better the model fits the data. A value of 1 indicates that all the data points lie on the line or parabolic curve. A value of 0 means there is no relationship between the two variables.

2.7.1 WTP Production Versus Population

Historically, water demand has increased with population growth. However, since the 1990s, water demand has leveled despite population growth and increased economic development. This decline in water demand has been attributed to reduced irrigation, customer-driven conservation, and household fixtures efficiencies.

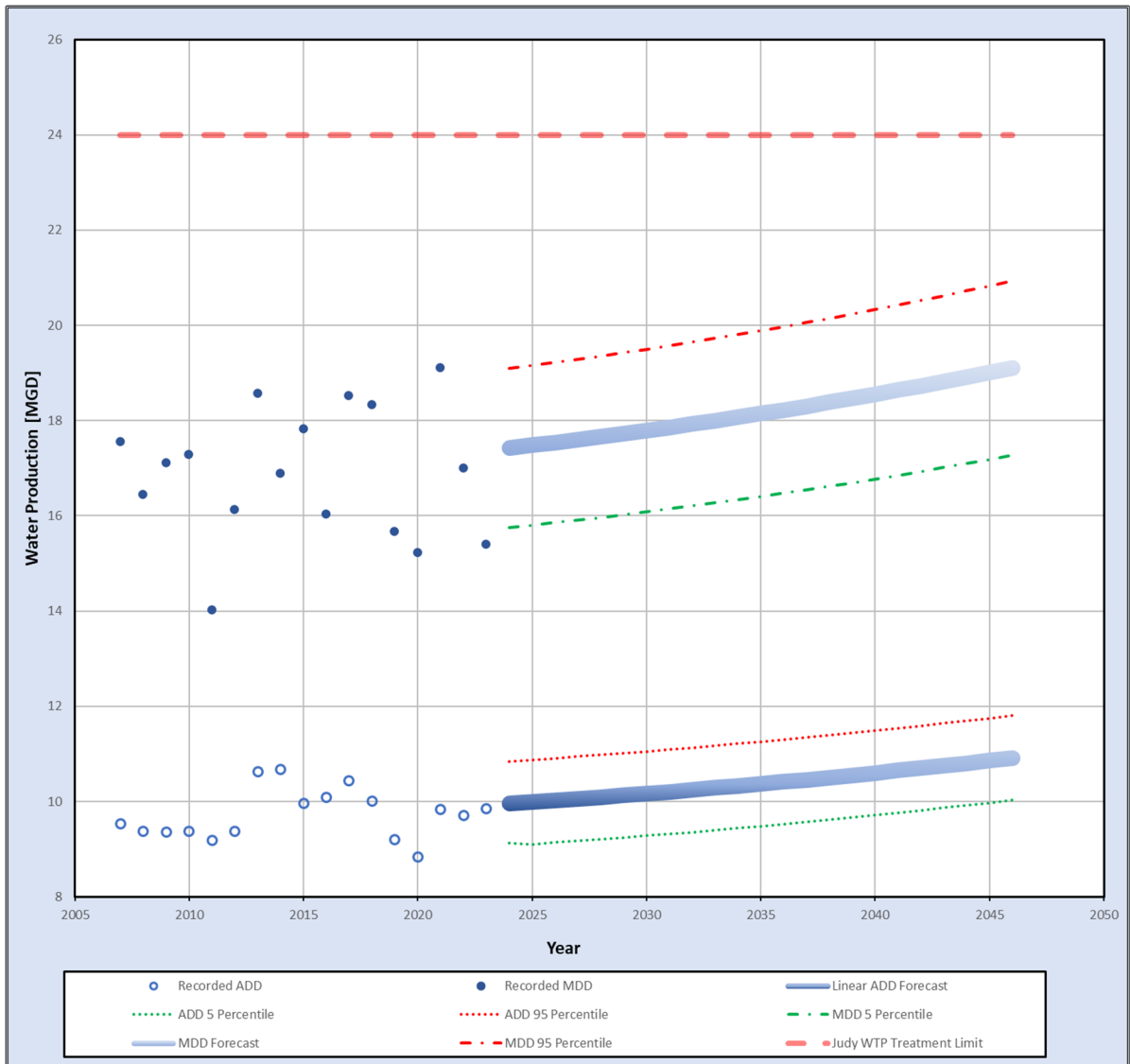
Historically, there was a correlation between population growth and water needs. However, examining water production over the past 16 years indicates that this historical correlation is subsiding. To test this theory, the Pearson Correlation Coefficient was determined for the relationship between population growth and water production at Judy WTP. The Pearson Correlation Coefficient [r] is 0.0 for the data set, which shows no correlation. When two data sets do not correlate, there is no linear relationship between the two variables. A Pearson Coefficient between -0.5 and 0.5 is considered uncorrelated.

2.7.2 Judy WTP Production Forecast

Since water production requirements are not correlated with population projections, a second-order linear regression (quadratic) and extrapolation were used to forecast the Judy WTP water production. The average annual growth rate is 0.29 percent. Other forecasting methods, such as power regression, were examined but did not improve the data fit (i.e., coefficient of determination r^2). **Figure 2-4** presents the Judy WTP annual average and maximum day production forecast.

The maximum day demand forecast is critical to determine if the treatment plant capacity is adequate to meet production requirements in the future. The Judy WTP has a treatment capacity of 24 MGD, which is higher than the projected maximum day production requirements through 2046.

Figure 2-4: Judy WTP Average and Maximum Day Production Forecast Through 2046



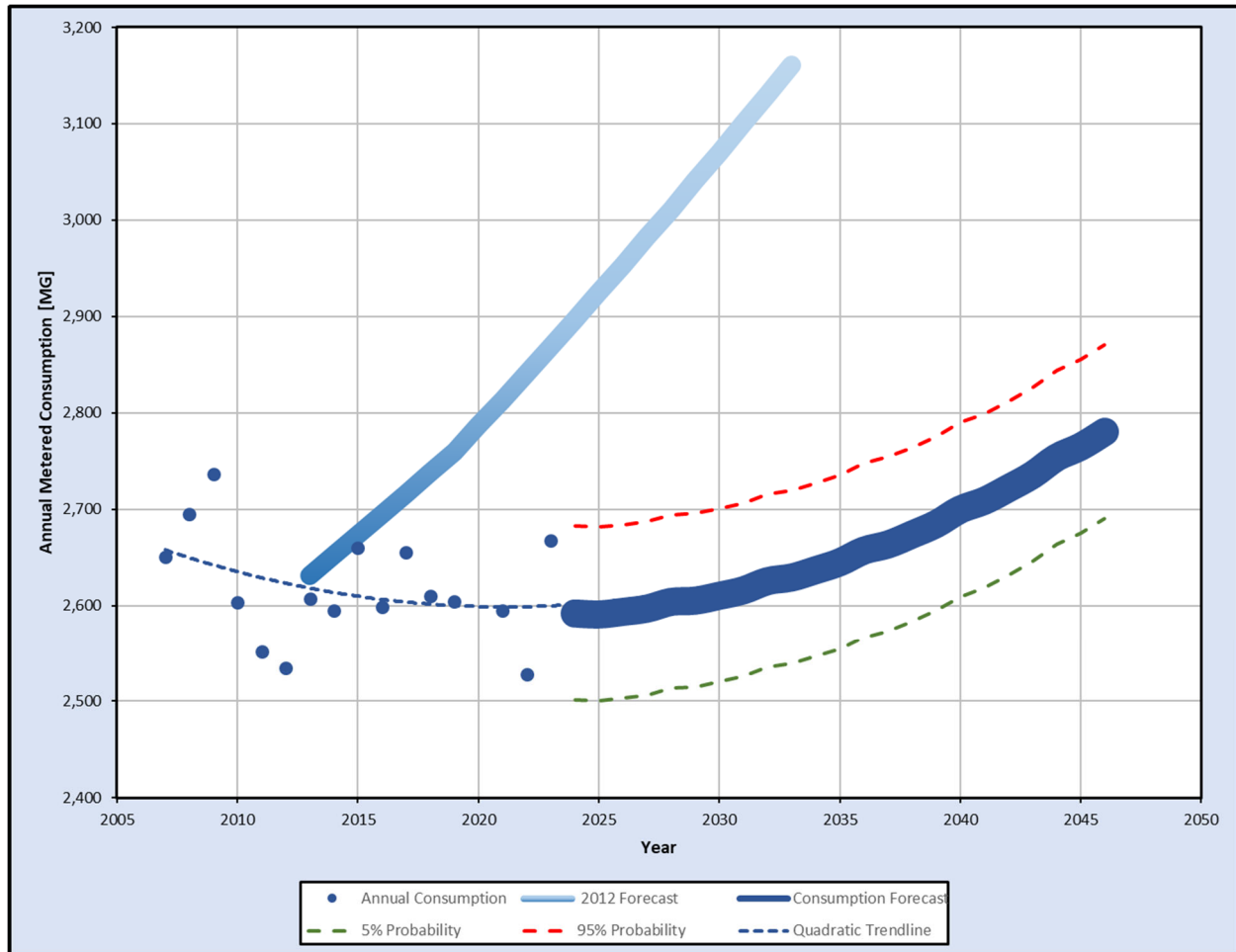
2.7.3 Consumption Forecast

Since metered billings are the sole source of revenue for Skagit PUD, accurate consumption forecasts are essential in establishing future rate structures and adopting capital improvement plans.

Each customer category has a unique consumption pattern. As a result, the historical annual water consumption from 2007 through 2023 determined forecasted water consumption for 2024 through 2046 for each customer category.

Table 2-12 (on page 2-23) shows the annual water consumption forecast for all customer categories for the planning period, including 2007 through 2023 as a reference point. **Figure 2-5** visually represents the historical and projected consumption.

Figure 2-5: Historical and Forecasted Consumption

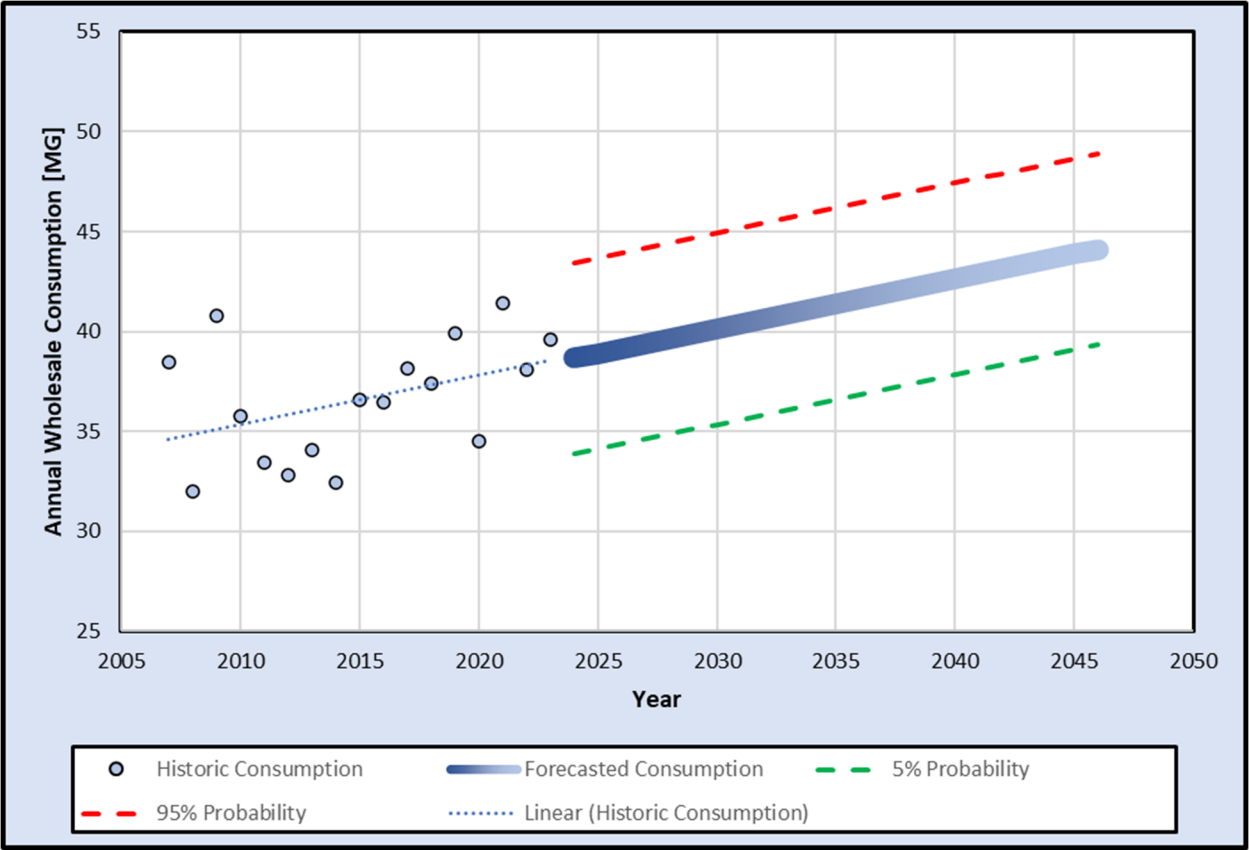


Historical annual water usage is widely dispersed, adding uncertainty to the consumption projections. Therefore, the 5 and 95 percentile boundaries are provided as a reference. Ninety percent of future water consumption values are expected to fall within these boundaries. If future consumption falls outside these boundaries, the forecast should be reexamined.

2.7.4 Wholesale Demand

Skagit PUD has two wholesale customers: the Samish Farms Water System and the North Fir Island Water System. The annual consumption for both customers in 2023 was 39.63 MG. Both wholesale customers are primarily rural-type developments with a mix of residential and agricultural activities. An analysis of the annual water demand indicated an increase of approximately 0.55% per year, similar to the forecasted residential demand forecast (0.52% annual growth rate) and higher than the forecasted Judy water system demand forecast (0.30% annual growth rate). The existing and forecasted demands for the two wholesale customers are presented in **Figure 2-6**.

Figure 2-6: Wholesale Customer Historical and Forecast Consumption



3 SYSTEM ANALYSIS AND ASSET MANAGEMENT

Water systems are complex networks that require analysis and management to ensure an efficient operation. The following chapter discusses asset management, regulatory compliance, water system standards, and capacity analysis. A water system analysis underscores the importance of these processes in ensuring the longevity and efficiency of the Judy Reservoir Water System.

3.1 Asset Management

Skagit PUD has implemented its Asset Management Program using Cityworks, an Enterprise Asset Management System (EAMS), to track and maintain its assets. The EAMS prioritizes maintenance tasks like valve repairs, pump replacements, and pipe replacements. It uses condition assessments to focus resources on assets that need replacement.

The EAMS also helps coordinate and prioritize maintenance. The PUD uses Cityworks to streamline and record inspections on valves, meters, hydrants, pipes, and treatment assets. Maintenance work orders are generated for all system repairs, and all maintenance activities are dispatched to field personnel tablets, eliminating the need for paper records.

The PUD also integrates Cityworks with its financial software to record the actual costs of maintaining individual assets. Information from inspections and work orders helps determine the remaining service life of an asset, allowing the PUD to focus resources on assets that need replacement.

The PUD has begun a multiphase implementation to select and prioritize capital improvement projects using Cityworks and GIS asset data. Proposed projects will be prioritized based on business risk exposure factors such as the consequence of failure, likelihood of failure, and redundancy. In the meantime, the PUD has developed a modified approach to its annual pipe replacement program.

3.1.1 Asset Inventory

The Water System Asset Inventory is a comprehensive record of all physical components constituting a water treatment and distribution system, from source to tap, from all the PUD water systems. This date inventory includes raw water sources, treatment facilities, storage tanks, transmission and distribution pipelines, and customer meters. The inventory is a crucial tool for effective asset management, enabling water utilities to track each asset's condition, age, maintenance history, and replacement cost.

A primary goal of any Asset Management Program is to locate all facilities and provide an accurate and reliable water system map. To achieve this, the PUD has constructed water treatment and distribution asset databases linked with a Geographic Information System (GIS). The PUD utilizes seven survey-grade Global Positioning System (GPS) units to update, maintain, and collect new coordinate information on the water meters, valves, fire hydrants, and pipe fittings.

Whenever possible, coordinates of underground assets and crossing utilities are captured before they are buried to ensure the precise depth is known. These coordinates are collected and posted in real-

time to the PUD's GIS asset database, eliminating any lead time for displaying newly installed individual assets and installation projects in the water system map.

In this way, the strategic planning, budgeting, and decision-making processes are supported, contributing to the reliable and efficient delivery of drinking water. The real-time updating, creation, maintenance, and display of assets throughout the organization further enhance this process. This comprehensive approach to asset management ensures that the water system map is accurate and reliable.

3.1.2 Asset Analysis

The PUD has initiated a multiphase implementation to select and prioritize capital improvement projects. This process utilizes data sourced from Cityworks and GIS asset data across all seven systems. The proposed projects are prioritized based on business risk exposure factors such as the consequence of failure, likelihood of failure, and redundancy. In parallel, the PUD has developed a modified approach to its annual pipe replacement program.

The Water System Asset Analysis complements this initiative, systematically evaluating the physical condition, performance, and future needs of the water system assets cataloged in the asset inventory. The analysis involves assessing the current condition of each asset, its remaining useful life, its likelihood of failure, and the consequences of its failure. Factors such as the asset's criticality to system operation, maintenance history, and regulatory requirements are also considered.

The outcome of this comprehensive assessment is a prioritized list of assets for repair, replacement, or upgrade. This list forms the basis for capital improvement planning across all seven systems and plays a crucial role in ensuring the long-term sustainability of these systems. Thus, through these concerted efforts, the PUD strategically manages its assets to ensure the reliable and efficient delivery of safe drinking water to the community.

The PUD developed a Business Risk Model that integrates into all GIS asset portfolios. This model uses a combination of spatial analysis outputs from GIS and condition/maintenance scores stored in Cityworks. Water mains are assigned business risk exposure scores to help prioritize pipeline replacement projects. The Water Treatment Plant (WTP) recently had a condition assessment, and the results are now stored in the WTP asset portfolio. Distribution control assets will be assessed next. Once defined, the current condition of assets, a key component of a strategic Asset Management Plan, will be incorporated.

3.2 Water Quality

This chapter documents the water quality compared to drinking water standards by reviewing current federal and State drinking water regulations per the Safe Drinking Water Act (SDWA). Skagit PUD's compliance is evaluated for the six years from 2017 through 2022. This chapter also discusses upcoming regulations and their impact.

3.2.1 Monitoring requirements

Skagit PUD is subject to federal and state regulatory requirements. Providing public health is a primary concern when operating public drinking water systems. Establishing adequate protection is accomplished through a monitoring program that covers source, treatment, distribution, and customer taps. Below is the list of all applicable rules for our drinking water systems.

3.2.1.1 *Safe Drinking Water Act*

The SDWA, passed in 1974, is the primary federal law that ensures the quality of drinking water in the United States. The U.S. Environmental Protection Agency (EPA) sets the standards for water quality and oversees the implementation of these standards by every state. Initially, the focus of the SDWA was on treatment, that is, providing safe drinking water at the tap. EPA subsequently issued two amendments in 1986 and 1996 that included water source protection, operator training, funding for water system improvements, and providing information to the public regarding water quality. With these amendments, SDWA protects water quality from source to tap.

3.2.1.2 *Washington Administrative Code*

The Washington State law incorporating the SDWA and its amendments is Chapter 246-290 of the Washington Administrative Code (WAC 246-290). The Washington State Department of Health (DOH) is the primacy agency responsible for implementing and enforcing state and federal drinking water laws.

Skagit PUD's Judy Reservoir System is a Group A public water system (PWS) (# 79500E) serving a population of approximately 80,000 as of 2022. The PUD is responsible for maintaining compliance with all applicable state and federal regulations for Group A public water systems that pertain to source water protection, treatment, monitoring, and water quality. The Judy System serves the cities of Burlington, Mount Vernon, Sedro-Woolley, and the surrounding rural and suburban areas. The PUD also operates six satellite water systems, which are also Group A community water systems. They including Alger, Cedargrove, Marblemount, Potlach Beach, Rockport, and Skagit View Village.

3.2.2 Current Water Quality Regulations

These regulations are separated into three categories: source water and treatment, distribution system, and others. Each regulation and how it applies is discussed below.

3.2.2.1 *Surface Water Treatment Rule*

The Judy System utilizes surface water as its source; therefore, the Surface Water Treatment Rule applies. The six satellite systems do not use a freshwater surface source; therefore, this rule does not apply.

Regulatory Elements

Public water systems (PWSs) using surface or groundwater under the direct influence of surface water as supply are prone to microbial contamination of their source. Pathogenic microorganisms can be

removed or inactivated by water treatment through sedimentation, filtration, and disinfection. EPA issued the Surface Water Treatment Rule (SWTR), which sets maximum contaminant level goals (MCLGs) for pathogens like *Legionella*, *Giardia lamblia*, and viruses at zero because exposure to these contaminants is considered a health risk.

The SWTR took effect in 1990 and requires that PWSs have sufficient treatment to reduce source water concentrations of *Giardia lamblia* and viruses by at least 99.9% (3.0 log) and 99.99% (4.0 log), respectively. Subpart B of Part 6 of Chapter 246-290 WAC details specific requirements to achieve sufficient treatment by (1) filtration (WAC 246-290-660); (2) disinfection to ensure that pretreatment, filtration, and disinfection in combination achieve at least 3.0 log reduction of *Giardia lamblia* cysts and at least 4.0 log reduction for viruses (WAC 246-290-662); (3) monitoring of source water coliform and source and filtered water turbidity; (4) monitoring to determine inactivation levels for *Giardia lamblia* cysts and viruses; and (5) monitoring of disinfectant residual concentrations entering and within the distribution system (WAC 246-290-664). The SWTR also includes requirements for reporting by filtered systems (WAC 246-290-666) and watershed control (WAC 246-290-668).

The SWTR requires after-treatment disinfection residuals of at least 0.2 milligrams per liter (mg/L) at the entry point and continuous disinfectant residual monitoring for water systems serving more than 3,300 people. If the residual level drops below 0.2 mg/L for more than 4 hours, the system is considered a treatment violation. Under the rule, systems are also required to maintain a detectable disinfectant residual for at least 95% of the monthly distribution system water samples (taken concurrently with routine and repeat total coliform samples). Alternatively, a plate count method may analyze samples for heterotrophic bacteria. A heterotrophic plate count (HPC) level of 500 colony-forming units (cfu) per milliliter or less is equivalent to a detectable disinfectant residual.

PUD's Status

Based on the direct filtration treatment and effluent turbidity levels achieved, Judy WTP receives the following physical treatment/removal credits:

- 2.0 log (99.0%) for *Giardia lamblia* removal
- 1.0 log (90.0%) for viruses

The credits for *Giardia lamblia* are achieved based on the direct filtration system (no sedimentation) listed in WAC 256-290-660 (2). To achieve 3.0-log removal of *Giardia lamblia*, the WTP must provide 1.0-log inactivation of *Giardia lamblia* by disinfection. Chlorine dioxide is injected at the raw water pump station into the raw water line that comes to the WTP; this is considered Stage 1. Chlorine can also be added at three discrete points (stages), which are as follows: (1) Stage 2 – before in-line static mixer (currently not in use), (2) Stage 3 – flocculation basin effluent, (3) Stage 4 – filter effluent line. At Stage 5, ammonia is injected before the finished water clearwells, which forms chloramines.

The credits for *Giardia lamblia* and virus inactivation are based on chlorination and filtration. WTP personnel determine the level of inactivation achieved daily and then decide whether this level is sufficient to meet the required level of inactivation. For 2017 through 2022, the WTP has maintained inactivation ratios (IR) well above 1; below this value would be considered a treatment technique violation.

In 1993, the PUD conducted a tracer study (at flow rates ranging from 4,800 gallons per minute [gpm] up to 8,200 gpm) to determine the T10/T for each disinfection stage to assist with the development of daily disinfection contact time (CT) profiles. A disinfection contacting model for the WTP was then developed to assess the levels of disinfection under the ranges of water temperatures and flow rates that generally occur at the WTP. As a requirement of the SWTR, CT values are calculated daily at each disinfection stage.

The Judy WTP provides continuous chlorine residual monitoring at this location for process control and reporting purposes. The entry-point total chlorine residual has not fallen under 0.2 mg/L. The chlorine residual is typically maintained at 1.2 to 1.8 mg/L. There have been no treatment technique violations based on this requirement.

Under this rule, PUD monitors chlorine residuals with each distribution system coliform sample, which is about 80 samples per month. PUD has maintained detectable chlorine in at least 95% of the monthly samples for the entire period from 2017 through 2022. The PUD has established a procedure to test for HPCs if the sample has non-detectable chlorine residual. Under the SWTR, the PUD performs monthly testing of the raw water from Judy Reservoir for fecal coliform (eight samples per month). In the months when Skagit River water is taken, the PUD is required to analyze one sample for fecal coliform per week.

3.2.2.2 Interim Enhanced Surface Water Treatment Rule

Regulatory Elements

The Interim Enhanced Surface Water Treatment Rule (IESWTR) builds on the SWTR by adding protection from *Cryptosporidium*. The IESWTR requires filtered systems to meet new turbidity standards for combined filter effluent (CFE) and individual filter effluent (IFE). Under the IESWTR, the CFE turbidity must be ≤ 0.3 Nephelometric Turbidity Units (NTU) (for 95% sample in 4-hour intervals) and the maximum turbidity 1.0 NTU for filtered water. Additionally, the rule requires unfiltered systems to include cryptosporidium control in their watershed control plans. The IESWTR applies to systems that serve more than 10,000 people. The IESWTR builds on the Total Coliform Rule by requiring sanitary surveys for all PWSs using surface water, regardless of size. The rule also requires covers for all new finished water storage facilities and disinfection profiling and benchmarking provisions to ensure that systems provide continued levels of pathogen protection while taking the necessary steps to comply with the disinfection by-product standards.

PUD's Status

Skagit PUD has established continuous turbidity monitoring of the raw and filtered water (from each filter) for process control, performance assessment, and compliance reporting.

Seasonal changes and storm events affecting the Cultus Mountain Watershed and the Skagit River - impact Judy Reservoir's raw water turbidity. These changes include windstorms, algae blooms, rain runoff, and turbidity, which can fluctuate significantly over a short period. When individual stream turbidities exceed 20 NTU or color exceeds 120 color units, water from that stream is typically not

diverted into Judy Reservoir. A maximum turbidity criterion of 25 NTU is used when deciding whether to divert Skagit River water into Judy Reservoir.

High levels of turbidity in the source water can protect microorganisms from the effect of disinfection and may indicate that *Cryptosporidium* can break through the filters and enter the water supply. In addition to disinfection, the WTP employs flocculation and coagulation before filtration to reduce turbidity levels.

Inorganic and organic liquid coagulants are used for flocculation and coagulation. All coagulants are NSF- or UL-approved. The combined dosage of these chemicals is rarely above 7.0 mg/L. Coagulant dosage is reported in the Monthly Surface Water Treatment Report and the DOH certification form annually.

Regarding the IESWTR compliance, the PUD conducts continuous turbidity monitoring of each IFE and CFE, with recordings taken at 15-minute intervals. As required per WAC 246-290-664, the CFE data recorded at 4-hour intervals are reported for IESWTR compliance purposes. The Judy WTP consistently achieves over 99.5% removal of source water turbidity, well above the 80% removal requirement specified in WAC 246-290-654.

3.2.2.3 Long Term 2 Enhanced Surface Water Treatment Rule

Regulatory Elements

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) builds upon the SWTR and IESWTR by supplementing existing microbial treatment requirements for systems where additional public health protection is needed against *Cryptosporidium*. The rule was developed in conjunction with the Stage 2 Disinfectants/Disinfection By-products Rule (D/DBPR), requiring systems to provide microbial protection while trying to minimize the health effects of disinfection by-products. Based on system size and filtration type, systems must monitor for *Cryptosporidium*, *E. coli*, and turbidity.

The LT2ESWTR requires systems to monitor their water sources for *Cryptosporidium* to determine treatment requirements, ensuring less than 1 oocyst per 10,000 liters of finished water. This approach involves the identification of source water vulnerability to *Cryptosporidium* and strategies minimizing the occurrence risk of *Cryptosporidium*. Filtered and unfiltered systems must conduct 24 months of source water monitoring for *Cryptosporidium*. Filtered systems must also record source water *E. coli* and turbidity levels. Filtered systems are classified into one of the four “bins” based on the results of their source water monitoring (see **Table 3-1**). Unfiltered systems calculate a mean *Cryptosporidium* level to determine treatment requirements.

Table 3-1: LT2ESWTR Bin Classification for Systems Required to Monitor for *Cryptosporidium*

Mean <i>Cryptosporidium</i> Conc.	Bin Classification
< 0.075 oocysts/L	Bin 1
From 0.075 to < 1.0 oocysts/L	Bin 2
From 1.0 to < 3.0 oocysts/L	Bin 3
≤ 3.0 oocysts/L	Bin 4

For filter plants classified in Bin 1, no additional *Cryptosporidium* treatment is required under the LT2ESWTR. Plants classified in Bins 2 through 4 need to provide the additional treatment for *Cryptosporidium* outlined in the EPA Microbial Toolbox. Filter plants classified in Bins 3 and 4 must achieve at least 1.0 log (90%) of additional *Cryptosporidium* treatment using one or more of the following, as specified in the Microbial Toolbox: bag filters, bank filtration, cartridge filters, membrane filtration, chlorine dioxide, ozone, and ultraviolet disinfection.

Under the LT2ESWTR, water systems that propose changes to their disinfection strategy must develop *Giardia lamblia* and virus disinfection profiles. The profiling requirements for large systems include daily measurements of operational data for 12 months to calculate inactivation ratios. This calculation builds upon the requirements for disinfection profiling under the IESWTR, which were triggered based on distribution system disinfection by-product levels.

PUD's Status

Skagit PUD belongs to Schedule 2 systems (service population between 50,000 and 99,999).

To comply with the LT2ESWTR, the PUD submitted a report to EPA in April 2007 with the test results of 26 samples for *Cryptosporidium* collected between January 2004 and December 2005. In a letter dated July 2, 2007, DOH indicated its approval of the submitted data for grandfathering based on CFR 141. 707.

The mean *Cryptosporidium* concentration of the 26 grandfathered samples in the Judy Reservoir source was 0 oocysts/L. Based on these results, the PUD was approved for Bin 1 classification, and under this classification, no additional treatment for *Cryptosporidium* is required. This bin classification satisfies the requirements under CFR 141.710.

A second round of source water monitoring was performed in 2019-2020, and it didn't lead to changes in the bin classification.

3.2.2.4 Additional Source Monitoring

This section describes some preventive tests the PUD performs to monitor source water quality.

Algae

Judy Reservoir can experience taste and odor issues, resulting in consumer complaints. Weekly raw water samples are collected for algal identification and counting. This protocol gives the PUD information on seasonal trends and changes in algal species, which could be used as a tool for treatment changes in case of algal blooms.

Total Organic Carbon

PUD started to monitor monthly total organic carbon (TOC) from Judy Reservoir raw water and Skagit River raw water. Over the years, sporadic TOC tests have been done on source water that shows a high organic presence. The Skagit River is known to have low TOC levels, which helps lower overall TOC levels when blended with Judy Reservoir water. Based on collected data, Judy Reservoir TOC levels vary from 1.5 mg/L to 2.5 mg/L; Skagit River (when in use) levels are usually below 1.0 mg/L.

3.2.2.5 Phase I, II, and V Roles

Regulatory Elements

Phase I, II, and V rules, also known as Chemical Phase Rules, define regulations regarding contaminants in three different groups: inorganic chemicals (IOCs), synthetic organic chemicals (SOCs), and volatile organic chemicals (VOCs), a total of 65 contaminants. EPA sets the MCL for each contaminant and the standardized monitoring framework where monitoring cycles are established for each contaminant group. EPA has established 9-year cycles divided into 3-year compliance periods, which could be further subdivided into annual and quarterly periods.

As part of the Phase II Rule, systems with a significant amount of asbestos-cement (AC) pipe must conduct periodic asbestos monitoring in the distribution system. In Washington state, DOH requires systems with more than 10% AC pipe in their distribution system to comply with this monitoring requirement. These systems must collect one sample in the distribution system at locations served by AC pipes and under conditions where asbestos contamination is most likely to occur.

PUD's Status

The PUD performs routine finished water monitoring for VOCs, SOCs, and IOCs based on the annual DOH-issued water quality monitoring reports. Waivers are granted for all of them based on non-detection levels and low-risk factors for contamination. None of these compounds exceeded the MCL levels during the 6-year period from 2017 through 2022. Asbestos is monitored once every nine years. The PUD performed asbestos monitoring in 2015 and none was detected.

3.2.2.6 Arsenic Rule

Regulatory Elements

Arsenic is either a naturally occurring element or is introduced via agricultural or industrial practices into the drinking water supply. Arsenic is known to cause some organ failures. EPA sets the MCL of arsenic at 0.010 mg/L, and it is based on the running annual average of results collected for each entry point in the distribution system. Systems could be eligible for reduced monitoring if their results are below the MCL; however, if arsenic is detected above the MCL in any individual sample, the monitoring frequency will be increased to quarterly.

PUD's Status

Arsenic is monitored as part of the suite of 16 primary IOCs. In 2022, arsenic was not detected.

3.2.2.7 Radionuclides Rule

Regulatory Elements

This rule includes requirements for uranium (30 picoCuries per liter [pCi/L]), combined radium-226 and radium-228 (5 pCi/L), gross alpha particle radioactivity (15 pCi/L), and beta particle and photon radioactivity (4 millirems per year).

PUD's Status

The PUD tested for radionuclides in 2021, and none were detected.

3.2.2.8 Unregulated Contaminant Monitoring Rule 4

Regulatory Elements

The Unregulated Contaminant Monitoring Rule 2 (UCMR2) was proposed in December 2016 and requires systems to monitor 30 chemical contaminants: 10 cyanotoxins (nine cyanotoxins and one cyanotoxin group) and 20 additional contaminants (two metals, eight pesticides plus one pesticide manufacturing by-product, three brominated haloacetic acid [HAA] disinfection by-products groups, three alcohols, and three semivolatile organic chemicals [SVOCs]).

PUD's Status

Between 2019 and 2020, the PUD performed entry-point sampling for the 30 contaminants. None of the cyanotoxins and SOCs were detected in the samples. HAA was detected in low levels.

3.2.2.9 Filter Backwash Recycling Rule

Regulatory Elements

The federal Filter Backwash Recycling Rule (FBRR) was published in the Federal Register on June 8, 2001. This rule is intended to reduce the opportunity for recycling practices to adversely affect the performance of drinking water treatment plants and help prevent microbes, particularly

Cryptosporidium, from passing through treatment systems and into finished water. The FBRR requires systems that recycle to return specific recycle flow (spent filter backwash water, thickener supernatant, or liquids from dewatering processes) through all processes of the system's existing conventional or direct filtration system or at an alternative location approved by the state.

PUD's Status

The filter backwash water at the WTP is diverted to the recycle basin and then sent to the two settling lagoons, where the decanted water is sent back to Judy Reservoir. Even though the WTP recycles its filter backwash water, this practice does not fall under this rule because the distance between the intake and recycle location is more than 800 feet (approximately 1,000 feet).

3.2.2.10 Total Coliform Rule

Regulatory Elements

The Total Coliform Rule (TCR) applies to all PWSs. Coliforms are easily detected in water and are used to assess a water system's vulnerability to pathogens. It requires systems to sample for coliform bacteria, which are used as an indicator of contamination. In the TCR, the EPA set an MCLG of zero for total coliforms. The EPA also set an MCL for total coliforms and required testing of coliform-positive cultures for *E. coli* or fecal coliforms, which indicate more immediate health risks from sewage or fecal contamination. If more than 5% of the monthly samples (for systems with at least 40 samples per month) contain total coliform, PWSs must report this to the state and the public.

PUD's Status

The PUD performs monitoring as outlined in its Coliform Monitoring Plans, which include the satellite water systems. This monitoring includes the monthly collection of at least 80 routine coliform samples from 32 dedicated sample sites located throughout its retail distribution system.

PUD has maintained compliance with the provisions of the TCR and WAC 246-290-300 (3).

3.2.2.11 Lead and Copper Rule

Regulatory Elements

Lead and copper are heavy metals that primarily enter the drinking water through plumbing materials. Exposure to lead and copper may cause health problems ranging from stomach distress to brain damage. In 1991, the EPA established regulations for controlling lead and copper, known as the Lead and Copper Rule (LCR).

Under the LCR, systems are required to monitor drinking water at customer taps. If lead concentrations exceed an action level of 15 parts per billion (ppb) or copper concentrations exceed 1.3 parts per million (ppm) in more than 10% of customer taps sampled, the system must implement corrosion control. If the action level for lead is exceeded, the system must inform the public about steps they should take to protect their health, which may include replacing lead service lines under their control.

PUD's Status

The PUD collects lead and copper samples from its customers' taps. Due to historically low lead and copper levels at customer taps, the PUD has approval from DOH for a reduced monitoring schedule requiring the collection of 30 tap samples every 3-year cycle. The PUD has continued to maintain compliance with lead and copper action levels and the broader requirements of the LCR.

The lead and copper rule also requires water quality parameter monitoring at the treatment plant and distribution system. Alkalinity and pH are provided at the treatment plant, and values are monitored when sampling for coliforms.

3.2.2.12 Disinfectants/Disinfection By-Products Rules

Regulatory Elements

The latest Stage 2 Disinfection By-Products Rule builds upon the existing rule and tightens compliance monitoring requirements for TTHMs and HAA5. This rule requires systems to meet maximum contaminant levels as an average at each compliance monitoring location in the distribution system (instead of as a running annual average [RAA]) for TTHM and HAA5. This rule aims to reduce DBP exposure and related health risks.

PUD's Status

Eight sites were identified for monitoring under the Stage 2 DBP rule. These eight sites represent the highest TTHM and highest HAA5. There are no violations for the current compliance period.

3.2.2.13 Consumer Confidence Reports and Public Notification Rule

Regulatory Elements

The Consumer Confidence and Public Notification Rule requires systems to provide customers with water quality information annually and when a regulatory violation occurs. The annual report must include the following information:

- Description of the source of drinking water
- Definition of terms used
- MCL for regulated contaminants and their levels in the drinking water
- Any violations and potential health effects
- Educational information on unregulated contaminants, if required
- Minimum requirements of the contents of the report per WAC 246-290-72001

While the Consumer Confidence Report (CCR) provides annual information regarding contaminant levels in the water, the Public Notification Rule (PNR) directs utilities to notify customers of acute violations when they occur. The PNR outlines public notification requirements for violations of MCLs, treatment techniques, testing procedures, monitoring requirements, and violations of a variance or exemption. If violations have the potential for "serious adverse effect," consumers and the State must be notified within 24 hours of the violation. The notice must explain the violation, potential health effects, corrective actions, and whether consumers need to use an alternative water source. The

notice must be provided to consumers within 30 days in an annual report or by mail or direct delivery service within one year, depending on the severity of the violation.

PUD's Status

The PUD prepares and publishes the CCRs every year by July 1 on the PUD's website. Regarding the PNR, because no acute violations have occurred since the promulgation of this rule, "timely" public notification has not been necessary.

3.2.3 Operator Certification

Regulatory Elements

Operator certification helps protect human health and the environment by setting minimum professional qualifications for individual operation of public water systems. The EPA established certification program guidelines for certifying and recertifying operators of community and non-transient non-community public water systems. Each state is responsible for establishing the minimum of these guidelines, including the following:

- A certified operator must maintain each treatment facility or distribution system.
- Operator certification must be equal to or greater than the system classification being operated.
- All process control personnel must be certified.
- At least one certified operator must be available on every shift.
- Operators must sit for and pass a validated exam demonstrating skills, knowledge, ability, and judgment necessary for the system classification.
- Each operator must have a high school diploma, a General Educational Development (GED) degree, or state-approved experience and training.

PUD's Status

The PUD fully complies with EPA and DOH operator certification requirements.

3.2.4 Anticipated Water Quality Regulations

Every year, new water regulations are issued or updated. This section discusses the anticipated water regulations and their impact on the PUD.

LCRI (Lead and Copper Rule Improvements)

The key provisions for the proposed LCRI include the replacement of lead service lines and certain galvanized service lines that are under the control of the water system within 10 years, the action level being lowered to 10 ppb, elimination of trigger level, and updated tap sampling protocol that would require systems to collect first-litter and fifth liter samples at sites with LSLs or lead premise plumbing, improved public education requirements.

PFAS (Per- and polyfluoroalkyl substances)

EPA is developing a proposal to add all per- and polyfluoroalkyl substances (PFAS) subject to reporting under section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) and section

6607 of the Pollution Prevention Act (PPA) to the list of Lower Thresholds for Chemicals of Special Concern (Chemicals of Special Concern).

3.2.5 Laboratory Certification

Each testing parameter, except algae, is performed in an Ecology or EPA-accredited laboratory. All microbiological samples have been processed in the PUD's certified laboratory since June 2012. The WTP lab is certified for SM 9223 B detection and enumeration, SM 9222 D&G, and Simplate.

3.2.6 Customer Water Quality Inquiries

The PUD is establishing a formal process for handling customer inquiries or complaints regarding water quality. Customer complaints are addressed within 24 hours. All calls regarding any water issues are transferred and processed by the Water Quality Program Facilitator. If a call is about water quality issues, staff members visit the customer's home and try to determine the problem. Usually, on-site staff measure chlorine residual and pH and collect samples for coliform bacteria. Other parameters could also be analyzed if the staff member determines it is necessary. Once the results are complete, the customer is informed. All water quality complaints are recorded and included in the monthly report submitted to DOH.

3.3 Design Standards

The Skagit PUD's Engineering Standard for Design and Construction [Standards] are incorporated by reference into the Water Policy Manual. This Manual encompasses all policies, procedures, and processes for managing water system infrastructure extensions and improvements. The Standards guide staff, developers, and consulting engineers in determining water service requirements and conducting plan reviews and approvals. For a new project to be reviewed, all submitted documents must comply with the Plan Review Checklist. Once approved, the design drawings are stamped and signed by the Engineering Manager.

The Standards are periodically updated and serve as a guide in designing infrastructure projects and selecting PUD-approved materials. They offer detailed insights into specific material standards and construction practices. Although part of the Water Policy Manual, the Standards are also available as a separate document. The most recent version can be found on the PUD website, with a link provided in **Appendix F**.

The Standards combine industry standards, PUD practices, and insights from PUD's experience. They are regularly updated to stay in line with current practices and regulations. By reference, the most current versions of the following standards are incorporated into the PUD's Standards:

- Water System Design Manual, Washington State Department of Health
- Minimum Design Standards, Chapter IV, Regional Supplement, Skagit County Coordinated Water System Plan
- Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction, including the American Public Works Association (APWA) Supplement
- Standards of the American Water Works Association

- International Association of Plumbing and Mechanical Officials (IAPMO) Uniform Plumbing Code
- International Conference of Building Officials (ICBO) Uniform Building Code
- Recommended Standards for Water Works, Great Lakes – Upper Mississippi River Board of State Sanitary Engineers
- Cross-Connection Control Requirements, AWWA Pacific Northwest Section
- PUD’s Cross-Connection Control Policy Manual

The PUD also has construction disinfection standards regarding the planned discharge of water during events such as water line flushing, hydrostatic test water, and water line draining to facilitate repairs. The standards involve de-chlorinating the water to a chlorine concentration of 0.1 ppm or less using sodium thiosulfate or ascorbic acid (vitamin C) and discharging it to either a storm sewer or a sanitary sewer. Where possible, discharges to a sanitary sewer are preferred because of the neutralizing capabilities of the organic matter in the sewer.

Additional discussion regarding PUD design and construction standards is provided in **Chapter 7**.

3.4 Capacity Analysis

As a water utility provider, Skagit PUD is responsible for ensuring that the water system can meet the needs of its customers. Capacity analysis is an essential component of a Water System Plan document. It involves assessing the hydraulic capacity of the water system and determining whether it can meet its customers’ current and future demands. The analysis also considers the water rights associated with the system and ensures that the system has adequate source capacity. The PUD conducts regular capacity analysis to ensure the water system operates efficiently and effectively.

3.4.1 Water Rights

According to its broad statutory authority under Title 54 RCW and RCW 90.03.015, the PUD is defined as a municipal water supplier. All PUD water rights held or acquired by the PUD qualify for municipal water supply purposes due to their beneficial use in serving 15 or more residential customers and governmental proprietary purposes.

Generally, the Judy System water supply is acquired from its related surface water rights. The PUD also has groundwater sources that serve its six satellite systems. Emergency backup supply for the Judy System is provided by multiple interties with the City of Anacortes, as previously described.

3.4.1.1 Judy System Water Rights

The Judy System water rights are governed by the 1996 Memorandum of Agreement [MOA], as discussed in Section 1.3.3. Skagit PUD currently holds nine water right certificates and five water rights in permit status for its Judy System due to the processing of MOA-based change applications, as shown in **Table 3-2** and discussed in this section. These water right applications, certificates, and changes were documented in the 1996 MOA. Seven more claims and two water right certificates are currently in standby status. The two standby water right certificates (CG1-00128C and G1-25755C) have been temporarily donated to the Washington State Trust Water Right Program.

Table 3-2: Summary of Judy System Water Rights

Cultus Mountain Surface Water Production Rights¹

Source	Document	Priority Date	Additive Qi	Additive Qa	Non-Additive Qa
Gilligan Creek	SWC 411	10/10/1929	1.5 cfs	1,086 afy	
Gilligan Creek	S1-00724C	10/30/1963	7.39 cfs	2,614 afy	1,086 afy
Mundt Creek	SWC 26	9/28/1917	2.5 cfs	1,810 afy	
Mundt Creek	S1-00737C	10/30/1963	5.5 cfs	2,076 afy	1,810 afy
Turner Creek	Claim 9333	Pre-1917	4.3 cfs	2,300 afy	
Turner Creek	S1-00739C	10/30/1963	6.2 cfs	722 afy	2,300 afy
Salmon Creek	Claim 9332	Pre-1917	1.8 cfs	307 afy	

Total Cultus Mountain Surface Water Production Rights: 10,915 afy

Skagit/Groundwater Production Rights²

Source	Document	Priority Date	Additive Qi	Additive Qa	Non-Additive Qa
Skagit River Ranney Well	GWP 3350	5/12/1954	8.91 cfs	6,400 afy	
Sedro Woolley Well	GWP 2911	3/26/1953	2.0 cfs	1,440 afy	

Total Skagit/Groundwater Production Rights: 7,840 afy

Storage/Reservoir Rights

Source	Document	Priority Date	Volume
Judy Reservoir	Vol 18, 8738	1/16/1946	1,500 af
Judy Reservoir	R1-00673C	4/24/1963	4,250 af

Total Storage/Reservoir Rights: 5,750 af

Permits-1996 MOA Related⁴

Source	Document	Priority Date	Additive Qi	Additive Qa	Non-Additive Qa	Status
Gilligan Creek/Skagit River	S1-25129P	11/16/1987	13.15 cfs		3,700 afy	Permitted
Mundt Creek/Skagit River	S1-27861	10/22/1997	18.56 cfs		3,886 afy	Permitted
Turner Creek/Skagit River	S1-27862P	10/22/1997	6.6 cfs		3,022 afy	Permitted
Salmon Creek/Skagit River	S1-18219P	10/30/1963	4.0 cfs		307 afy	Permitted
Skagit River	S1-27860	10/22/1997	12.8 cfs	362 afy	5,071 afy	Permitted

Total Additive Non-Storage Annual Production Quantity³: 19,117.4 afy

al Storage Rights Quantity (acre-feet stored when reservoir is filled to NOPL): 5,750 af

Total Authorized (1996 MOA)/Additive Instantaneous Quantity⁵: 55.39 cfs

Other Certificates and Claims (Standby/Reserve)

Source	Document	Priority Date	Qi (cfs)	Qa (afy)
Rock Springs Creek	Claim 009334	pre-1917	0.2 cfs	40 afy
Pigeon Creek	Claim 009335	pre-1917	0.2 cfs	40 afy
Unnamed creek	Claim 009336	pre-1917	0.1 cfs	20 afy
Cold Springs Creek	Claim 009337	pre-1917	0.2 cfs	40 afy
East Fork Nookachamps Creek	Claim 009338	pre-1917	1.1 cfs	110 afy
Samish River Park	G1-00128C	7/25/1971	0.33 cfs	30 afy
Mountain View	G1-25755C	6/26/1990	41 gpm	3.8 afy

1. The Skagit River has been added as an additional source for water rights associated with the Cultus Mtn. streams. Diversions from the stream sources under these water rights are subject to Cultus Mountain Instream Flows.

2. Skagit groundwater rights cited below changed to surface water diversions pursuant to 1996 MOA and reverted to permit status per water right changes approved in 2001.

3. The PUD has a total (non-storage) annual quantity limit of 23,417.4 afy from the Cultus Mountain Streams and the Skagit River, including 4,300 afy for reservoir bypass flushing. The PUD also has additive storage rights totaling 5,750 af.

4. Diversions from the stream sources under these water rights are subject to Cultus Mountain Instream Flows and diversions from the Skagit River are subject to Skagit River Instream Flows.

5. 1996 Memorandum of Agreement Regarding Utilization of Skagit River Basin Water Resources for Instream and Out of Stream Purposes (1996 MOA). Total combined instantaneous water right available from the river, streams, or a combination of both is 55.39 cfs (35.8 mgd). The PUD is further authorized under its senior Cultus Mountain and Skagit River water rights and the 1996 MOA to divert a total of 40.10 cfs from the Skagit River when Skagit River instream flows are not being met. The Skagit River has been added as an additional source for water rights associated with the Cultus Mtn. streams

The signatories of the 1996 MOA agreed not to challenge the PUD's water rights or water right changes documented in the MOA for 50 years from the date of signing. The 1996 MOA established the Skagit River Basin Instream Resources Protection Program Rule in 2001. This rule established instream flows¹ for the mainstem Skagit River and the Cultus Mountain streams (Gilligan Creek, Mundt Creek, Salmon Creek, and Turner Creek).

The river and stream water rights described in the 1996 MOA total a maximum instantaneous quantity² (Qi) of 35.8 million gallons per day (MGD). Withdrawals from the streams are subject to instream flow rules. Under the 1996 MOA, withdrawals from the Skagit River above an instantaneous quantity of 42.59 cfs are subject to the Skagit River instream flow rules. Under an agreement reached with Ecology in 2020 regarding the Mundt Creek water right, the above uninterruptible Qi total of 42.59 cfs was reduced to 40.10 cfs. The cumulative water rights for the Cultus Mountain streams are detailed in **Table 3-3**.

The Judy System surface water rights authorize a total additive (non-storage) annual quantity (Qa) of 23,417.4 afy, diverting from the Skagit River mainstem and Cultus Mountain tributaries. This annual quantity limit includes 4,300 afy for reservoir/bypass flushing. The PUD holds separate additive water rights for storage, which authorize a total impoundment of up to 5,750 afy in Judy Reservoir. Additional information related to the PUD's water rights, including satellite system groundwater rights, is provided in **Appendix C**.

Updated copies of the PUD's Water Right Self-Assessment forms for the Judy System and satellite systems are provided in **Appendix C**.

¹ The term "instream flow" is used to identify a specific stream flow needed to protect and preserve instream resources and values such as fish, wildlife, and recreation. An instream flow rule is, in essence, a water right for fish and other instream resources. While an instream flow rule does not affect existing water rights, water rights issued after the rule adoption are junior to the instream flow and can only be exercised when the instream flow is being met.

² The term "instantaneous quantity", or "Qi", is used to describe the continuous use of water delivered from a source through a diversion. Qi is measured as a rate of flow over some period, usually quantified in terms of cubic feet per second. Qi values related to this discussion have been converted to million gallons per day (MGD) by multiplying the cubic feet per second value by the number of seconds in a 24-hour period.

Table 3-3: Cumulative Water Rights – Cultus Mountain Diversion

Source	Document	Qi (cfs)	Additive Qa ¹ (afy)
Gilligan Creek	SWC 411	1.5	1,086
	S1-00724C	7.39	2,614
	S1-25129P	13.15	
Gilligan Creek Subtotal		22.04	3,700
Mundt Creek	SWC 26	2.5	1,810
	S1-00737C	5.5	2,076
	S1-27861	18.56	
Mundt Creek Subtotal		26.56	3,886
Turner Creek	Claim 9333	4.3	2,300
	S1-00739C	6.2	722
	S1-27862P	6.6	
Turner Creek Subtotal		17.1	3,022
Salmon Creek	Claim 9332	1.8	307
	S1-18219P	4	
Salmon Creek Subtotal		5.8	307
Subject to the 1996 Memorandum of Agreement Regarding Utilization of Skagit River Basin Water Resources for Instream and Out of Stream Purposes (1996 MOA). Total combined water right available from the river, streams, or a combination of both is 55.39 cfs (35.8 mgd). Withdrawals from the Cultus Mountain Streams (Gilligan, Mundt, Turner, and Salmon Creeks) are subject to Cultus Mountain Instream Flows. The Skagit River has been added as an additional source for water rights associated with the Cultus Mtn. streams 1. Total production/additive water right Qa of 19,117.4 afy excluding additive storage rights of 5,750 afy. The total authorized Qa of 23,417.4 afy includes 4,300 afy of water designated for Judy Reservoir flushing flow.			

3.4.1.2 Judy System Water Right Changes

Skagit PUD has implemented water right changes prescribed and authorized in the 1996 MOA for its Gilligan Creek, Mundt Creek, Skagit River, Salmon Creek, and Turner Creek surface water sources. These specific changes enable the PUD to divert authorized instantaneous and annual quantities from either its Cultus Mountain sources or the Skagit mainstem pump station, subject to applicable instream flows being met at either point of diversion and the 1996 MOA Qi limit of 55.39 cfs/35.80 mgd. The PUD is further authorized under its senior Cultus Mountain and Skagit River water rights and the 1996 MOA to divert 40.10 cfs from the Skagit River when Skagit River instream flows are not being met. A detailed description of water rights changes was included in the PUD's 2021 WSP Limited Update.

The PUD has also temporarily transferred water rights to Skagit County Drainage and Irrigation Improvement District #15 and Skagit County Consolidated Diking Improvement District #22 on multiple occasions since 2015. These changes authorized the PUD to temporarily transfer water rights to downstream points of diversion operated by these irrigation districts. A detailed description of these water rights changes through 2021 was included in the PUD's 2021 WSP Limited Update.

The PUD continues to work with local irrigation districts and agricultural customers to address seasonal water supply shortages in conjunction with Ecology.

3.4.1.3 Judy System Water Rights Evaluation

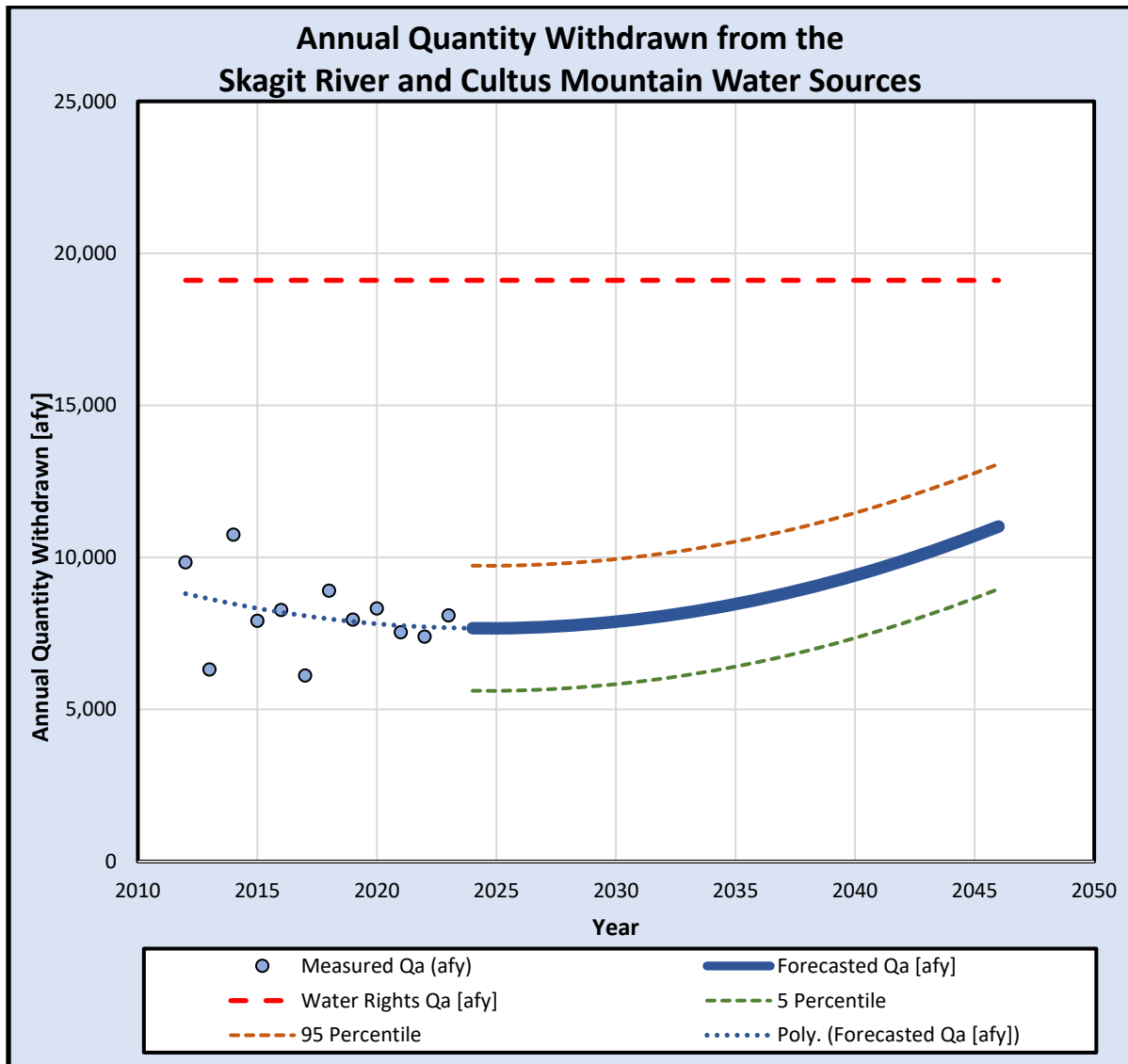
The current source production for the Judy System has reached a maximum annual quantity of 10,748 afy and a maximum instantaneous flow rate of 55.1 cfs. The 11-year (2035) annual quantity is forecasted to be 8,465.86 afy, and the 22-year (2046) annual quantity is forecasted to be 11,018.45 afy. The maximum instantaneous flow rate is forecasted to reach 55.39 cfs over the next 22 years regularly.

The Judy System water rights authorize a maximum instantaneous withdrawal of 55.39 cfs, with 40.1 cfs not subject to the Skagit River instream flow, and an annual quantity of 19,117.4 afy, not including 4,300 afy authorized for reservoir bypass flushing. By comparing these water rights to the existing and projected system demands for the 10-year and 22-year planning periods, the PUD is forecasted to have adequate water rights beyond the 22-year planning period. The PUD estimates that these water rights will have sufficient annual quantity until approximately 2065. An updated water rights self-assessment form is included in **Appendix C**, and **Figure 3-1** describes the PUD's water rights evaluation for the Judy System over the next 22 years.

While the PUD is forecasted to have adequate water rights beyond the 22-year planning period, the PUD has identified a potential action to apply for a new water right to increase the instantaneous withdrawal capability of the Judy System. This new interruptible water right could provide the PUD with more operational flexibility, and more research and analysis may be conducted in the future.

Unknown factors may result in additional future demand, such as new industrial or residential development beyond what is currently projected. The potential for these unknown demand needs has not been factored into the PUD's current demand forecasting, but any impacts are anticipated to primarily affect demand beyond the 22-year horizon.

Figure 3-1: Judy System Water Rights Evaluation



3.4.1.4 Satellite System Water Rights

The six satellite water systems have individual water rights, as described below. Each water system is self-contained with no interties to adjacent systems. Updated water rights self-assessment forms for each satellite system, except Potlatch Beach, are included in **Appendix C**. The Potlatch Beach System utilizes a saltwater source and does not need a water right.

Alger

The Alger System utilizes a single well and municipal purpose water right certificate GWC 3885 with a priority date of September 21, 1960. The water right authorizes an instantaneous quantity (Qi) of 100 gpm and an annual quantity (Qa) of 100 afy.

Cedargrove

The Cedargrove System utilizes a single well and municipal purpose water right certificate G1-25994C with a priority date of December 5, 1990. The water right authorizes an instantaneous quantity (Qi) of 262 gpm and an annual quantity (Qa) of 53.8 afy.

Marblemount

The Marblemount System utilizes a single well and municipal purpose water right permit G1-28137P with a priority date of June 4, 2002. The water right authorizes an instantaneous quantity of (Qi) of 150 gpm and an annual quantity (Qa) of 19.4 afy. On March 30, 2023, PUD requested a 35-year extension to put water to full beneficial use under G1-28137P. The extension request included a restatement of prior operating and reporting conditions provided under the permit. The PUD is awaiting a response from Ecology, but Ecology has provided written confirmation that this water right permit is in good standing during their review.

Rockport

The Rockport System utilizes a single well and municipal purpose water right certificate G1-25509C with a priority date of August 25, 1989. The water right authorizes an instantaneous quantity (Qi) of 95 gpm and an annual quantity (Qa) of 19 afy.

Skagit View Village

The Skagit View Village System utilizes a single well and municipal purpose water right permit G1-20763P with a priority date of July 24, 1973. The water right authorizes an instantaneous quantity (Qi) of 200 gpm and an annual quantity (Qa) of 38.4 afy. Eighty gpm of the Qi is subject to the Skagit River instream flow conditions. On April 28, 2021, Ecology granted the PUD a 15-year extension to put water to full beneficial use under G1-20763P by April 30, 2036.

3.4.2 Physical Capacity Analysis

Assessing a water system's physical and hydraulic capacity is crucial for ensuring it meets its customers' current and future demands. Identifying the limitations of the existing infrastructure is an essential component of this process. By assessing the physical capacity, you can determine whether, for example, existing storage tanks have sufficient standby storage capacity to meet peak demands. On the other hand, hydraulic capacity analysis helps identify any bottlenecks in the system that may limit its ability to deliver water to customers. Identifying these limitations is critical because it allows you to develop strategies to address them, such as upgrading or replacing undersized infrastructure. By doing so, you can ensure that the water system operates efficiently and effectively, providing safe and reliable water to its customers.

3.4.2.1 Judy System Source and Treatment Capacity

Judy Water Treatment Plant [Judy WTP] is the primary source of supply for the Judy System. The Anacortes WTP is a secondary supply that may be utilized during an emergency or if the Judy WTP is shut down for maintenance activities.

According to DOH planning requirements, supply must be sufficient to meet maximum daily demands (MDD). The supply capacity analysis presented below examines the ability of the existing treatment infrastructure to meet this requirement. The analysis compares the PUD’s water demand forecast, presented in Chapter 2, with current supply capacities.

Two levels of supply capacity evaluation were conducted. The first level uses the PUD’s water treatment plant as the supply source for the entire Judy System. This analysis includes the demands of all customers in the Judy system.

The second level of supply capacity evaluation is for all pressure zones and pressure zone combinations within the Judy System. A separate assessment was completed for each pressure zone or combination with a dedicated supply, typically involving a pump station. Zones fed by a pump station or a pressure reducing valve station are included in a supply analysis when they exclusively provide water to another zone. For example, the Fir-Waugh booster station provides water to the 560 pressure zone [PZ], serving the 420 PZ through PRVs. The source analysis for the 560 PZ would include the demand for the 420 PZ.

Table 3-4 includes the supply analysis for the entire Judy system. It shows a surplus of water supply available for the Judy System based on the water treatment plant’s capacity for this planning period.

Table 3-4: Judy System Source Adequacy Evaluation

	Year		
	2022	2034	2046
Projected ERUs and Demand ⁽¹⁾			
Equivalent Residential Units	47,462 ERUs	52,992 ERUs	56,659 ERUs
Average Day Demand	9.71 MGD	10.34 MGD	10.73 MGD
Maximum Day Demand	17.00 MGD	19.89 MGD	20.63 MGD
Available Treatment Source			
Judy Water Treatment Plant ⁽²⁾	24.0 MGD	24.0 MGD	24.0 MGD
Source Surplus/(Deficiency) ⁽³⁾	7.0 MGD	4.16 MGD	3.37 MGD

Notes:

1. Judy System projected demands are presented in Chapter 2. This includes all of Skagit PUD’s service areas, including industrial and wholesale customers. Average Day Demand per ERU is 145 gpd/ERU.
2. The maximum hydraulic capacity of the Judy Water Treatment Plant is 30 mgd. The maximum water rights equal 35.8 mgd but would require filtration treatment modifications to increase their throughput capacity.
3. Calculation based on Maximum Day Demand.

Table 3-5 summarizes the source analysis for individual pressure zones. Pressure zones with direct hydraulic connection to the Clearwells were not analyzed since there is an adequate supply under normal operating conditions. Only pressure zones served through pump stations were analyzed. The

individual pressure zone analysis includes the existing and projected number of ERUs for the given planning period.

Table 3-5: Source Supply Analysis per Pressure Zone Service Area

Service Area and Pressure Zones	Supply Source	Pum Station Capacity ¹	2023		2034		2046	
			ERUs	Excess Supply	ERUs	Excess Supply	ERUs	Excess Supply
Panorama 700 PZ	W1 Pump System	540,000 gpd	1,060	271,025 gpd	1,070	268,488 gpd	1,080	265,950 gpd
SE Mt. Vernon 420/558/645 PZ	Division Street PS Fir / Waugh PS	1,620,000 gpd	3,503	731,114 gpd	3,739	671,229 gpd	4,022	599,418 gpd
Blackburn 475 PZ	Blackburn PS No. 1	54,000 gpd	20	48,925 gpd	25	47,656 gpd	30	46,388 gpd
Cedar Hills 450 PZ	Cedar Hills PS	54,000 gpd	34	45,373 gpd	36	44,865 gpd	40	43,850 gpd
Sky Ridge PS 454 PZ	Little Mountain PS	216,000 gpd	68	198,745 gpd	70	198,238 gpd	73	197,476 gpd
Cascade Ridge 595 PZ	Cascade PS No. 2	216,000 gpd	10	213,463 gpd	12	212,955 gpd	15	212,194 gpd
Cascade Ridge 720/859 PZ	Cascade PS No. 3	216,000 gpd	35	207,119 gpd	37	206,611 gpd	44	204,835 gpd
Saratoga 600 PZ	Saratoga PS	64,800 gpd	7	63,024 gpd	26	58,203 gpd	26	58,203 gpd
Burlington Hill 415/504 PZ	Tina's Coma PS	280,800 gpd	77	261,261 gpd	82	259,993 gpd	88	258,470 gpd
Bow Hill 449 PZ	Bow Hill PS	810,000 gpd	52	796,805 gpd	56	795,790 gpd	60	794,775 gpd
Pleasant Ridge 290 PZ	Bradshaw PS Rudene PS	54,000 gpd	148	16,445 gpd	155	14,669 gpd	165	12,131 gpd
Conway Hill 422 PZ	Bulson Road PS	64,800 gpd	107	37,649 gpd	114	35,873 gpd	123	33,589 gpd
Conway Hill 575 PZ	Siness Road PS	54,000 gpd	67	36,999 gpd	74	35,223 gpd	82	33,193 gpd
Conway Hill 679 PZ	Lake 16 PS	108,000 gpd	61	92,521 gpd	63	92,014 gpd	65	91,506 gpd
Nookachamp Hills 450 PZ	Nookachamp Hills PS	189,000 gpd	199	138,504 gpd	254	124,548 gpd	324	106,785 gpd
Note 1: Pump station capacity is determined by the largest pump out of service and only operating 18 hours per day.								

The analysis shows that all pump stations are adequately sized to provide maximum day demand within their associated service areas.

3.4.2.2 Storage Capacity Analysis

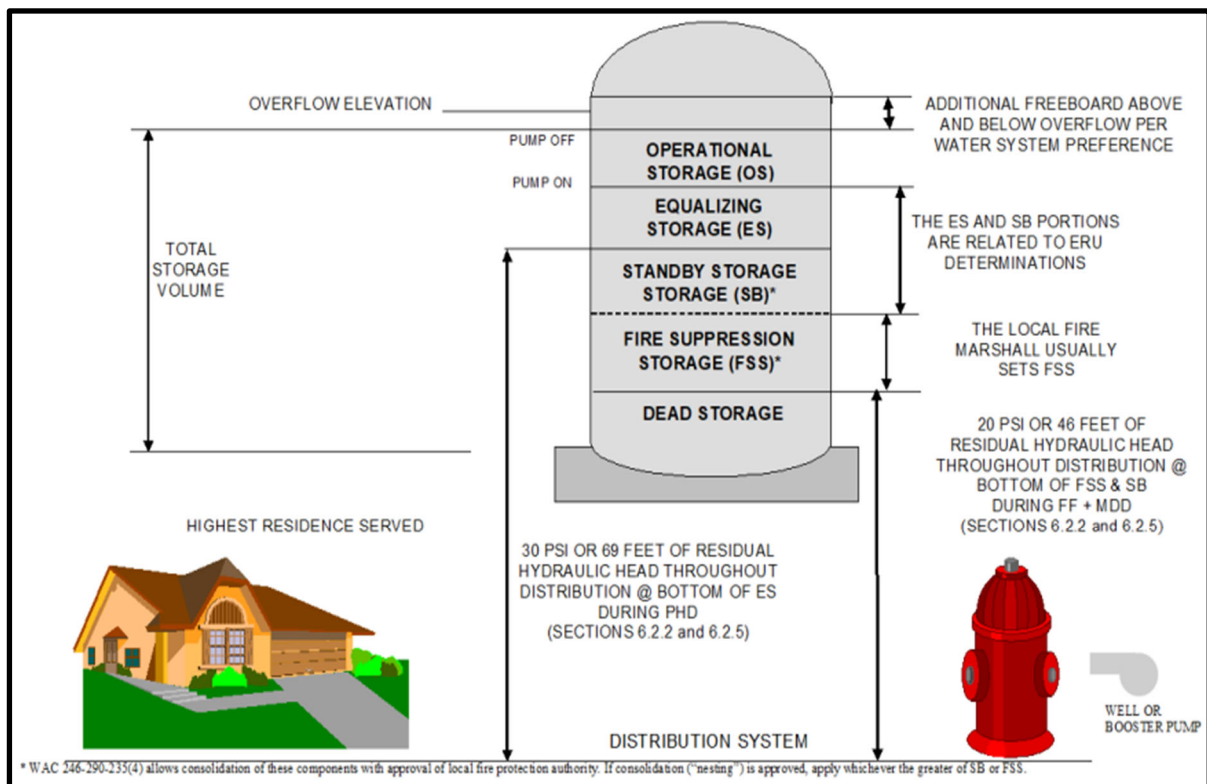
Water storage is required for the water distribution system to provide equalizing capacity for diurnal peak demands during high-demand periods and to provide emergency supply for fire protection and other purposes. According to DOH requirements, water system storage volume is comprised of five separate components:

- Operating storage
- Equalizing storage

- Fire suppression storage
- Standby storage
- Dead storage

These five components comprise the “total storage volume” of a particular tank or reservoir. Operating and dead storage volumes are subtracted from total storage to determine the “effective storage volume” available for equalizing, standby, and fire suppression. Skagit PUD considers the fire suppression storage part of the standby storage volume (i.e., nested in). These required volume components are illustrated in **Figure 3-2**. All storage components are described in more detail below.

Figure 3-2: Storage Tank Components



Source: Water System Design Manual, DOH Pub 331-123, June 2020

The demands on a storage tank are used to estimate equalizing and standby storage volume requirements. These demands are defined as any water volume required from a storage tank, even if the demands are not served by gravity. The criteria include demands that may be required of the storage tank by any means, including pump stations.

Operating Storage

Operating Storage [OS] is the water between high and low levels set points established by operations staff to control system pumps or flow control valves. The OS span of storage tanks is typically between 1½ and 5 feet and is set based on desired turnover objectives.

Equalizing Storage

Equalizing storage [ES] is the total volume needed to moderate daily fluctuations in diurnal demands during periods when the demand exceeds the capacity of the supply system. ES requirements are greatest on the day of peak demand. Operation of a properly balanced system results in 1) replenishment of storage facilities during times of day when demand is below the capacity of the supply system and 2) depletion of storage facilities when demand exceeds the supply capacity. The equalizing volume of a storage tank must be located at an elevation that provides a minimum pressure of 30 pounds per square inch [psi] to all customers served by the tank. Some storage tanks do not need ES since supply capacity exceeds peak hour demand [PHD].

ES volume can be estimated based on Equation 7-1 presented in the Department of Health Water System Design Manual (WSDM) – June 2020. This ES exceeds Equation 7-1 estimates or 5% of the maximum day demand. It should be noted that these calculations are only mathematical approximations for the actual ES.

The ES of existing storage tanks can be estimated based on SCADA system information. The lowest measured level in the storage tank under normal operating conditions is, by definition, the bottom of the ES. Skagit PUD used this methodology to evaluate all its tanks. This methodology resulted in mostly minor changes in the hydraulic grade line [HGL] in pressure zones with storage tanks.

Standby Storage

Standby storage [SB] is required to supply reasonable system demands during an emergency or outage. A key concept in establishing an SB volume is distinguishing between reasonable system outages and major system emergencies, as follows:

1. **Reasonable System Outages:** SB has addressed these. These are outages that can be expected to occur at any time, such as a pipeline failure, power outage, or valve failure.
2. **Major System Emergencies:** These are not addressed by SB. These are intended to be covered by emergency system operations planning since constructing sufficient reserve volume to accommodate sustained system demands under emergency conditions is not economically feasible. Examples include outages due to an earthquake or problems at the water treatment plant resulting in a longer-term plant shutdown.

DOH has established SB guidelines and a minimum required SB volume. The guideline is expressed in Equation 7-2 presented in the DOH WSDM (June 2020). It allows the water system governing body to determine the benefit/cost analysis associated with a given level of reliability. This analysis includes ERU demand, single or multiple sources, and an all-hazards assessment.

The minimum SB volume is 200 gallons per ERU served by the storage facility. This minimum is associated with storage facilities with multiple sources and other reliability measures.

Over the past five years (2018 through 2022), the average day demand (ADD) is 147 gpd/ERU. The maximum day demand peaking factor (MDD:ADD) over the same period is 1.8. Therefore, the PUD's ERU_{MDD} is 265 gpd/ERU.

Skagit PUD's goal is to have at least 200 gallons per ERU of SB storage for services areas with multiple sources of supply. For service areas with a single supply source, the goal is to have at least 300 gallons per ERU of SB storage. These values meet or exceed the DOH minimum guideline of 200 gallons per ERU. All storage tanks were analyzed using the requirement of 300 gallons per ERU.

The SB volume of a storage tank must be located at an elevation that provides a minimum pressure of 20 psi to all customers served by the storage facility.

Fire Suppression Storage

The required fire suppression storage [FSS] volume for a given pressure zone or zone combination is calculated as the necessary fire flow multiplied by the required duration established by the local fire authority. Required fire flows and durations vary across the service area, depending on the zoning and land use. The maximum fire flow requirement considered in this analysis is 1,500 gpm for one hour, which applies to portions of the retail service area where commercial and industrial development exists. Single-family residential fire flow requirements are 1,000 gpm for 60 minutes in urban growth areas. When provided, single-family residential fire flow requirements are 500 gpm for 30 minutes in non-urban growth areas. Details of the fire flow requirements for each storage analysis are documented in the storage table footnotes.

The FSS volume of a storage tank must be located at an elevation that provides a minimum pressure of 20 psi to all customers served by the storage facility.

With concurrence from local fire marshals, DOH allows for optional "nesting" of the SB and FSS storage volumes. Nesting is when only the larger component (SB or FSS) is used rather than the sum of both. Skagit PUD allows the SB and FSS storage to be nested.

Dead Storage

The dead volume is the volume at the bottom of the tank that cannot be used because it is physically too low to provide sufficient system pressure.

Storage Capacity Evaluation

Past evaluations of storage tanks have identified two main issues: 1) using inconsistent design datums and 2) estimating system pressures based on the tank overflow elevation.

Over the years, storage tanks have been designed using one of two vertical datums, NGVD29 and NAVD88, to measure elevations in the United States. These datums are not equivalent and require conversion factors for comparison. These conversion factors vary depending on location and land stability.

Advancements in technology and surveying methods, along with increased available data and accuracy, led to the creation of a new datum, NAVD88. NAVD88 is more accurate than NGVD29 as it uses more data and accounts for variations in gravity. Generally, NAVD88 is higher than NGVD29 in the western United States. In Skagit County, the conversion between the two datums ranges between 3½ and 4 feet.

For the storage evaluation, the PUD has made corrections to the storage components in each tank. **Table 3-7** (on page 3-32) summarizes the storage components for all reservoirs within the Judy System.

Minimum and maximum pressures must be maintained at customer meters. These pressure requirements are measured based on specific conditions within the storage tank. The PUD aims to maintain a pressure range of between 40 psi and 80 psi. For pressures above 80 psi, the PUD recommends that customers install pressure reducing valves (PRVs) on their services. If pressures exceed 120 psi, the PUD will install a PRV before the customer meter. The Department of Health (DOH) requires minimum pressures of 30 psi under normal operating conditions and 20 psi under abnormal and firefighting conditions.

The evaluation of storage capacity is based on two main calculations:

1. The first calculation compares the available storage to the required storage at an elevation that provides at least 30 psi to the highest customer in the zone during normal conditions. This calculation assesses the ability of existing storage facilities to provide the necessary operational and equalizing storage volumes under current and future conditions.
2. The second calculation compares the available storage to the required storage at an elevation that provides at least 20 psi to the highest customer or hydrant in the zone during emergencies. This calculation assesses the ability of existing storage facilities to provide the necessary operational, equalizing, standby, and fire suppression storage volumes under current and future conditions.

These calculations are performed for each pressure zone or combination of pressure zones. The pressure requirement must be met at the highest service area in the zone or zones served by gravity from the system's storage tanks. Given the locations of storage tanks and the interconnectedness of the various pressure zones via pressure reducing valves (PRVs), multiple pressure zone combinations were considered in this analysis.

As previously mentioned, the pressure zone HGL is established at the bottom of the ES. Based on this criterion, the combined OS and ES in the Judy System is 5,253,000 gallons, as summarized in **Table 3-7** (on page 3-32). The only services not meeting the minimum pressure of 30 psi are located on Bella Vista near the Tinas Coma storage tank.

The total SB storage in the Judy System is 22,548,000 gallons, as **Table 3-7** summarizes. The storage volumes were calculated based on providing a minimum of 20 psi at the bottom elevation of the SB and FFS. Any remaining storage below this minimum elevation is considered DS. The total DS in the Judy System is 2,101,000 gallons, as summarized in **Table 3-7**.

Each storage tank serves a specific pressure zone or group of interconnected pressure zones. **Table 3-8** (on page 3-33) lists all the storage tanks in the Judy System and groups them in the service area and pressure zones. This table lists the existing ERUs in each service area in 2023 and projected ERUs for 2033 and 2046. The ability of a storage tank to adequately meet the needs of a service area is the available volume of standby storage. For the Judy System, the volume of SB storage dedicated to each

ERU is 300 gallons per ERU when there is a single source and 200 gal/ERU when there are multiple sources.

The evaluation of available SB storage presents two current deficiencies and one potential deficiency in the future beyond 10 years. The first deficiency is in the Panorama service area, which includes the Judy WTP. The three Clearwells that store finished water for the entire system are unsuitable nor intended to provide SB storage. The bulk of the storage in the Clearwells is dedicated to chlorine contact to meet minimum CT values for the disinfection processes. Therefore, a new storage tank with dedicated SB storage is needed for the Panorama service area. The PUD is in the design phase of the Panorama Storage Tank with design plans at the 90% design stage.

The second deficiency is in the north Sedro-Woolley service area, which the Hoogdal Storage Tank currently services. This area is primarily residential development, which has experienced significant growth over the past decade. The Hoogdal tank serves two pressure zones: the 425 PZ, served directly by the tank, and the 350 PZ, served through PRVs. A new 350 or 425 PZ storage tank must provide adequate SB storage in this service area. The planning for this storage tank is scheduled to begin in FY2024.

The storage analysis for each of the six satellite systems is presented in their system capacity analyses in **Appendix E**.

3.4.2.3 Pump Station Analysis

The PUD manages 24 pump stations within its distribution system. Regular inspections lead to both preventative and corrective maintenance. As necessary, equipment is repaired, upgraded, or replaced. For instance, a failing transformer at the Skagit River Diversion Station was recently replaced. These maintenance actions ensure each pump station operates efficiently with minimal interruptions.

A significant part of the Judy water system relies on gravity. However, pump stations supply water to areas at higher elevations. These stations are designed to meet the water demand of their respective service areas, and currently, all are meeting these demands. The pump station's capacity is designed to meet the MDD in areas with a storage tank. In contrast, the pump station must meet the PHD in areas without storage. If there is a proposal for new development, the affected pump stations are evaluated, and necessary improvements and capacity adjustments are made.

Pump stations' operations are monitored via the PUD's SCADA system, allowing for prompt response to alarm conditions. The operations staff quickly address power outages, a common alarm condition. While most pump stations in the distribution system lack standby generators, many supply water to pressure zones with storage tanks. During power outages, this standby storage supplies water to customers. Seven pump stations are equipped with generator plugs, enabling operation with a portable generator when needed.

Their system capacity analyses present the pumping capacity for each of the six satellite systems.

3.4.3 Hydraulic Analysis

The water distribution system hydraulic model was used to perform the following two types of analysis:

Peak Hour Analysis: A minimum pressure of 30 psi must be maintained at all customer connections under peak hour demand (PHD) conditions, with equalizing storage depleted in the reservoirs.

Fire Flow Analysis: A minimum of 20 psi must be maintained for fire flows under maximum day demand (MDD) conditions, with standby and fire suppression storage depleted in the reservoirs.

Aging infrastructure, inadequately sized, or dead-end pipes, and increasing demands all contribute to areas of low pressure during peak hour demands and substandard fire suppression such that the existing system cannot provide adequate service during existing and future maximum day demand conditions.

For areas that did not meet the pressure criteria, the model was used to develop improvements using an iterative process until the pressure criteria were satisfied with a minimum of total pipe and facility additions.

3.4.3.1 Hydraulic Model Components

The model includes the following water system components:

- Pipes
- Storage tanks
- Pump stations
- Pressure reducing valves
- Fire hydrants

The hydraulic model is considered a static model. Information regarding the pipes, reservoirs, pump stations, and hydrants was based on design information, record drawings, maintenance records, and SCADA information. Based on discussions with distribution staff, facility controls, pump setpoints, and PRV settings were set. Fire hydrants were included in the model so that available fire flow could be modeled within the system.

The hydraulic model has been checked for network errors consisting of overlapping nodes, disconnected nodes, and closed valves and pipes. However, the hydraulic model has not been calibrated recently using operational data such as hydrant flow tests. The last calibration was in 2013.

3.4.3.2 Modeling Scenarios

Six steady-state hydraulic analyses were completed for each pressure zone for existing (2023), ten-year (2033), and 23-year (2046) demand conditions. The increase in demand for the ten-year and 23-year scenarios was allocated spatially based on available parcels and the PUD's knowledge of projected growth locations. The analyses considered peak hour demand and fire flow demand (MDD plus fire flow) conditions. **Table 3-6** describes the modeling scenarios listed in the sequence within which they were performed.

Table 3-6: Hydraulic Modeling Scenarios

Description	Demand
Existing Year (2023) Peak Hour	Existing Peak Hour Demand
Existing Year (2023) Fire Flow	Existing Year Maximum Day Demand plus fire flow
Plan Year 11 (2034) Peak Hour	Plan Year 10 Peak Hour Demand
Plan Year 11 (2034) Fire Flow	Plan Year 10 Maximum Day Demand plus fire flow
Plan Year 22 (2046) Peak Hour	Plan Year 22 Peak Hour Demand
Plan Year 22 (2046) Fire Flow	Plan Year 22 Maximum Day Demand plus fire flow

3.4.3.3 Peak Hour Analysis

Peak hour analyses were run for existing, 10-year, and 22-year demands. Peak hour analyses are run as steady-state evaluations, which evaluate system conditions at a single point in time. Initial tank levels for all reservoirs were set so that the equalizing and operating portions of the storage were depleted (i.e., the bottom of the equalizing storage).

For the most part, the transmission and distribution system is robust and well-gridded, resulting in efficient water conveyance from the source to the customers. Most pipelines identified as deficient are small (i.e., 4-inch diameter or less), isolated, or dead ends on the system periphery. Most of these pipelines have been identified as replacement candidates due to the age and material (i.e., asbestos concrete or plastic) and are in the pipeline replacement program.

One significant project identified during the peak hour analysis was the transmission line between Judy Reservoir and the City of Sedro-Woolley. The existing transmission pipeline has segments that are 18 to 20-inch diameter pipe. Specific segments include a portion of the transmission pipeline on the hillside above the Skagit River Diversion Pump Station and the pipe suspension bridge over the Skagit River. The peak hour analysis indicated these segments may have exceeded design velocities.

3.4.3.4 Fire Flow Analysis

Fire flow analyses were run for the existing, ten-year, and 22-year demands. Fire flow analyses are run as steady-state evaluations. For the water system, a batch fire flow analysis was run within each pressure zone using a requirement of 500 gpm for all hydrants within rural zoned areas and 1,500 gpm for all hydrants within urban and commercial zoned areas.

Available fire flow is the amount of water that can be withdrawn from a single fire hydrant without dropping the pressure at the hydrant or throughout the zone to less than 20 psi. Thus, a remote pressure from the flowing hydrant could limit the fire flow. Fire flow simulations assume that water levels in the storage reservoir are set with equalizing, operating, and fire flow storage completely depleted.

For hydrants that did not meet the pressure or flow criteria, the model was used to develop improvements using an iterative process until the pressure and flow criteria were satisfied with a

minimum of total pipe and facility additions. These improvements here also added to the pipeline replacement program.

3.4.3.5 Model Improvements

The PUD intends to integrate its stand-alone hydraulic model into its Asset Management Program. This integration involves a systematic process that enhances the PUD's ability to manage and optimize its water distribution system. The first step in this integration is establishing a data exchange framework between the hydraulic model and the Cityworks protocols. This step typically involves mapping data points from the model to corresponding assets in Cityworks, ensuring that the data is consistent and accurate. Once the data is integrated, Cityworks can leverage the hydraulic model's analysis to inform maintenance and investment decisions.

The potential benefits of integrating a hydraulic model into Cityworks are substantial. For one, it allows for real-time monitoring and management of the water distribution system, enabling the utility to respond promptly to changes in demand or system performance. It may also enhance the PUD's ability to conduct predictive maintenance, identifying potential issues before they become critical. This proactive approach can save significant costs by avoiding emergency repairs and reducing downtime. Additionally, the integration supports capital planning efforts by providing detailed insights into the distribution system's behavior and needs, which can inform long-term investment strategies and ensure the sustainability of the water system infrastructure.

3.5 Summary of System Deficiencies

Water systems face challenges due to aging infrastructure, population growth, and increased regulations. Inadequate planning and necessary improvements can lead to water scarcity, poor water quality, and reduced reliability, posing health and environmental risks. Remedies to issues identified in this chapter are discussed below. Several solutions have been proposed. These proposed solutions aim to ensure the availability and sustainable management of water for all customers.

3.5.1 Storage Tank Improvements

A few storage deficiencies have been identified, as described in the analysis presented in this chapter.

- Update the pressure zones based on a common datum and definition of operating conditions.
- Construct additional storage in the Hoogdal service area to accommodate existing and future connections.
- Construct the Panorama Storage tank to provide FSS and SB storage in the Panorama service area and for the Judy WTP.
- Perform seismic studies on critical storage tanks.

3.5.2 Pump Stations Improvements

Some pump station deficiencies have been identified by PUD operations staff.

- Upgrade the W1 pump system at the Judy WTP to include VFDs on all three pumps for this closed system.

- Upgrade the Nookachamp Hills pump station by adding capacity and an emergency standby generator.
- Perform seismic studies of critical pump stations.

3.5.3 Hydraulic Model

Skagit PUD has embarked on a multi-year upgrade to its hydraulic model. The existing model, developed on the Innovyze platform, has been updated with new and replaced facilities but has not been recalibrated since 2013.

The new GIS-based model will integrate the Innovyze hydraulic model with the Cityworks digital water system model. This integration will improve model upgrades and expansions. The hydraulic model will be simultaneously updated as the digital water system model is updated and expanded.

3.5.4 Service Pressure Modifications

There are five (5) meters at the top of Bella Vista near the Tinas Coma storage tank at an elevation that does not provide the minimum 30 psi under normal operating conditions. A small booster pressure zone is needed to correct the pressure at these five services.

Table 3-7: Storage Component Analysis

Storage Tank Analysis for the Mount Vernon Subarea Areas													
Tank	NAVD 88 Base Elev.	Sidewall Depth	Tank Diameter	Storage Volume	Unit Storage per Foot	Observed Min Level	Bottom ES	Proposed New HGL	Max. Elev. Served	Highest Hydrant	OS and ES Volume	SB and FSS Volume	Dead Storage Volume
Buchanan Hill	311.4 ft	58 ft	55 ft	1,031,000 gal	17,780 gal	55.5 ft	366.9 ft	367 ft	297 ft	259 ft	44,000 gal	420,000 gal	567,000 gal
Eaglemont	536 ft	29 ft	174 ft	5,158,000 gal	177,860 gal	22.2 ft	558.0 ft	558 ft	467 ft	461 ft	1,209,000 gal	3,949,000 gal	0 gal
Eagles Nest	538.5 ft	111 ft	40 ft	1,043,000 gal	9,400 gal	77.1 ft	615.6 ft	616 ft	530 ft	530 ft	319,000 gal	371,000 gal	353,000 gal
Division Street	290 ft	40 ft	165 ft	6,398,000 gal	159,950 gal	33.3 ft	323.3 ft	323 ft	228 ft	219 ft	1,065,000 gal	5,333,000 gal	0 gal
9th and Highland	179 ft	39 ft	147 ft	4,951,000 gal	126,950 gal	34.2 ft	213.1 ft	213 ft	110 ft	104 ft	609,000 gal	4,342,000 gal	0 gal
Little Mountain	435 ft	32 ft	52 ft	508,000 gal	15,880 gal	19.0 ft	453.9 ft	454 ft	348 ft	344 ft	206,000 gal	302,000 gal	0 gal
Cascade Ridge No. 1	292 ft	34 ft	20 ft	80,000 gal	2,350 gal	26.3 ft	318.3 ft	318 ft	202 ft	196 ft	18,000 gal	62,000 gal	0 gal
Cascade Ridge No. 2	582 ft	14 ft	17 ft	24,000 gal	1,710 gal	9.6 ft	591.6 ft	592 ft	492 ft	466 ft	8,000 gal	16,000 gal	0 gal
Cascade Ridge No. 3	848 ft	14 ft	20 ft	33,000 gal	2,360 gal	11.0 ft	859.0 ft	859 ft	789 ft	760 ft	7,000 gal	26,000 gal	0 gal
Saratoga	580 ft	18 ft	29 ft	89,000 gal	4,940 gal	15.0 ft	595.0 ft	595 ft	454 ft	435 ft	15,000 gal	74,000 gal	0 gal
Storage Tank Analysis for the Burlington and Sedro-Woolley Subarea Areas													
Tank	NAVD 88 Base Elev.	Sidewall Depth	Tank Diameter	Storage Volume	Unit Storage per Foot	Observed Min Level	Bottom ES	Proposed New HGL	Max. Elev. Served	Highest Hydrant	OS and ES Volume	SB and FSS Volume	Dead Storage Volume
Dukes Hill	185 ft	32 ft	166 ft	5,180,000 gal	161,880 gal	26.0 ft	211.4 ft	211 ft	115 ft	114 ft	979,000 gal	4,201,000 gal	0 gal
Hoogdal Road	414 ft	19 ft	30 ft	100,000 gal	5,260 gal	1.3 ft	415.4 ft	415 ft	357 ft	352 ft	93,000 gal	7,000 gal	0 gal
Tinas Coma	471 ft	39 ft	32 ft	235,000 gal	6,030 gal	33.0 ft	504.0 ft	504 ft	435 ft	435 ft	36,000 gal	139,000 gal	60,000 gal
Bow Hill	371 ft	87 ft	45 ft	1,035,000 gal	11,900 gal	77.9 ft	448.9 ft	449 ft	330 ft	344 ft	108,000 gal	701,000 gal	226,000 gal
Bayview Ridge	225 ft	70 ft	84 ft	2,902,000 gal	41,460 gal	60.9 ft	285.9 ft	286 ft	194 ft	190 ft	377,000 gal	1,903,000 gal	622,000 gal
Storage Tank Analysis for the Conway Subarea Areas													
Tank	NAVD 88 Base Elev.	Sidewall Depth	Tank Diameter	Storage Volume	Unit Storage per Foot	Observed Min Level	Bottom ES	Proposed New HGL	Max. Elev. Served	Highest Hydrant	OS and ES Volume	SB and FSS Volume	Dead Storage Volume
Hermway Heights	401.8 ft	26 ft	20 ft	61,000 gal	2,350 gal	20.0 ft	421.8 ft	422 ft	300 ft	279 ft	14,000 gal	47,000 gal	0 gal
Sinnes Road	554.6 ft	24 ft	30 ft	254,000 gal	10,580 gal	20.8 ft	575.4 ft	575 ft	487 ft	516 ft	34,000 gal	142,000 gal	78,000 gal
Lake 16 Standpipe	636.6 ft	52 ft	14 ft	60,000 gal	1,150 gal	42.0 ft	678.6 ft	679 ft	568 ft	558 ft	12,000 gal	48,000 gal	0 gal
Storage Tank Analysis for the Big Lake Subarea Areas													
Tank	NAVD 88 Base Elev.	Sidewall Depth	Tank Diameter	Storage Volume	Unit Storage per Foot	Observed Min Level	Bottom ES	Proposed New HGL	Max. Elev. Served	Highest Hydrant	OS and ES Volume	SB and FSS Volume	Dead Storage Volume
Nookachamp Hills	300 ft	59 ft	38 ft	501,000 gal	8,490 gal	53.0 ft	353.0 ft	353 ft	267 ft	277 ft	51,000 gal	255,000 gal	195,000 gal
West Big Lake	333 ft	26 ft	30 ft	137,000 gal	5,270 gal	23.4 ft	356.4 ft	356 ft	273 ft	264 ft	14,000 gal	123,000 gal	0 gal
East Big Lake	349 ft	11.5 ft	30 ft	122,000 gal	10,610 gal	8.2 ft	357.2 ft	357 ft	251 ft	245 ft	35,000 gal	87,000 gal	0 gal
Totals											5,253,000 gal	22,548,000 gal	2,101,000 gal

Table 3-8: Standby Storage Analysis per Pressure Zone Service Area									
Service Area and Pressure Zones	Storage Tank (No. of Sources) ¹	Standby Storage	2023		2033		2046		Individual Storage Tank Notes
			ERUs	Excess SB	ERUs	Excess SB	ERUs	Excess SB	
Panorama 459/700 PZ	Clearwells 1, 2 & 3 (Single Source)	0 gal	1,060	(318,000) gal	1,070	(321,000) gal	1,080	(324,000) gal	There is no designated standby storage in the Clearwells. Water storage below the bottom of the equalizing storage is reserved for chlorine contact time.
Clearlake 284/367 PZ	Buchanan Hill (Single Source)	420,000 gal	521	263,700 gal	556	253,200 gal	598	240,600 gal	
SE Mt. Vernon 256B/420/558/645 PZ	Eaglemount Eagle Nest (Multiple Sources)	4,320,000 gal	3,503	3,619,400 gal	3,739	3,572,200 gal	4,022	3,515,600 gal	The Eagle Nest storage tank is currently (2024) set at a lower elevation since there are no active services at this time. Only fire suppressions storage is provided.
South MV/Conway 220/330A & B PZ	Division Street (Single Source)	5,333,000 gal	7,994	2,934,800 gal	8,533	2,773,100 gal	9,179	2,579,300 gal	
MV,West County 195/213C,D, F & G PZ	9th & Highland (Multiple Sources)	4,342,000 gal	14,063	1,529,400 gal	14,826	1,376,800 gal	15,729	1,196,200 gal	
Sky Ridge 454 PZ	Little Mountain (Single Source)	302,000 gal	68	281,600 gal	70	281,000 gal	73	280,100 gal	
Cascade Ridge 595/600/720/859 PZ	Cascade 1, 2 & 3 Saratoga (Single Source)	178,000 gal	176	125,200 gal	180	124,000 gal	190	121,000 gal	
Burlington/SW 202/213A,B, E & H PZ	Dukes Hill (Multiple Sources)	4,201,000 gal	15,758	1,049,400 gal	16,820	837,000 gal	18,094	582,200 gal	
North Sedro-Wolley 350/425 PZ	Hoogdal (Single Source)	7,000 gal	566	(162,800) gal	800	(233,000) gal	950	(278,000) gal	Need additional storage in this service area, especially in the 350 PZ.
Burlington Hill 415/504 PZ	Tina's Coma (Single Source)	139,000 gal	77	115,900 gal	82	114,400 gal	88	112,600 gal	There are 5 existing services that are at an elevation above 435 feet that do not have 30 psi at the bottom of the ES.
Bow Hill 449 PZ	Bow Hill (Single Source)	701,000 gal	52	685,400 gal	56	684,200 gal	60	683,000 gal	
Bayview 230/245A/270/286 PZ	Bayview Ridge (Multiple Sources)	1,903,000 gal	4,046	1,093,800 gal	4,319	1,039,200 gal	4,646	973,800 gal	
Conway Hill 422/575/679 PZ	Hermway Heights Siness Road Lake 16 (Single Source)	237,000 gal	235	166,500 gal	251	161,700 gal	270	156,000 gal	
Big Lake 356A/450 PZ	Nookachamp Hills West Big Lake East Big Lake (Single Source)	465,000 gal	1,225	97,500 gal	1,367	54,900 gal	1,680	(39,000) gal	Need a new storage tank in the 450 PZ in the Montborne area.
		22,548,000 gal	49,344	11,481,800 gal	52,669	10,717,700 gal	56,659	9,799,400 gal	
General Notes: 1. Per PUD Policy, storage tanks supplied by a single source are required to provide 300 gallons per ERU. Storage tanks supplied by multiple sources are required to provide 200 gallons per ERU.									

4 WATER USE EFFICIENCY PROGRAM

Water is a precious, limited resource. Water use affects our neighbors, businesses, farms, and the environment. In Washington state and elsewhere, residential development, industry, agriculture, and recreation growth have increased demand and, thus, competition for water. In addition, dwindling salmon stocks and their listing under the Endangered Species Act have heightened concern about excessive water use and compliance with water resource laws. As the potential to develop new water sources diminishes, efficient water use is necessary to meet future demand.

The purpose of this chapter is to provide information on state-mandated conservation requirements for municipal water suppliers, the PUD's level of compliance with those requirements, the PUD's current adopted water use efficiency program, and the water use efficiency program that will be implemented from 2024 through 2030, and may be extended to 2034.

The following section discusses the regulatory requirements concerning the Washington State Municipal Water Law and the status of the PUD's compliance with each requirement.

4.1 Source and Service Metering

The PUD completed meter installations in 2003. All water consumed by legal customers is metered. The PUD also has system meters throughout its distribution system and at interties.

Proper maintenance of water meters is essential for water utilities. It ensures the accurate measurement of water usage, which is crucial for billing purposes and identifying potential leaks or losses within the distribution system.

Due to the mechanical nature of some water meters, accuracy decreases as the meter ages. Regular inspections and timely repairs can extend the lifespan of the meter, reducing the need for costly replacements. Furthermore, it aids in conserving water resources by promoting responsible usage and detecting wastage. Thus, the role of well-maintained water meters assists in the smooth operation of a water utility and supports sustainable water management practices.

4.1.1 Large Meter Testing

Since 2005, the PUD has worked with a meter repair contractor to perform testing, recalibration, and repair work on 2-inch and larger meters within the distribution system and fire hydrant meters leased to mobile or transient customers. The meters are flow-tested for high, medium, and low accuracy rates. Meters that are under-reading or leaking are repaired or replaced. Approximately one-third of the system's large meters (70+) are tested yearly. These include source meters, zone meters, customer service meters, and fire service meters.

In the spring, hydrant meters (40+) are tested and calibrated before customer demand increases during the summer for construction projects, crop irrigation, and livestock watering.

4.1.2 Service Meter Testing

Service meters less than 2 inches are not tested on any regular interval. These small meters are typically a disk-type, positive displacement measurement. These small meters are commonly used for residential and small commercial customers.

The typical lifespan of a small service meter is 25 to 35 years. This meter lifespan is typically twice the lifespan of our remote read transmitters. Remote read transmitters are replaced as they fail. After replacement, the service meters are expected to have an additional useful life of 15 to 20 years.

Some service meters are checked for accuracy, typically when a customer is concerned about their water bill. These random and infrequent tests indicate that the service meters are accurate and reliable. Also, PUD staff tracks high-use meters to check their accuracy, and meter technicians routinely replace service meters showing inaccuracy or failure.

4.2 Distribution System Leakage

A distribution leakage program is vital to a water utility's operations. It plays a crucial role in ensuring the efficiency and sustainability of the water supply. By identifying and addressing leaks promptly, the program helps to prevent water loss. Moreover, it aids in maintaining the integrity of the infrastructure, avoiding costly damages, and prolonging its lifespan. The program also contributes to accurate billing, as undetected leaks can lead to significant discrepancies in water usage data. Therefore, a leak reduction program is economically beneficial and essential for the stewardship of water resources.

4.2.1 Annual Water Audits

The annual water audit is essential for monitoring and controlling distribution system leakage (DSL). The DSL for the Judy System and all six satellite systems is conducted annually and reported to the DOH. The DSL is calculated as the difference between the total water delivered and authorized consumption.

4.2.1.1 Water Supplied

The Judy Reservoir Water System has produced (treated) and purchased water sources. The produced water is from the Judy WTP and is the primary source. The PUD can also buy water from the city of Anacortes. It is included in the calculation despite water being purchased in typically small amounts and only used under abnormal operating conditions.

Water produced is measured through three meters: the Mount Vernon meter, the Sedro-Woolley meter, and the Panorama Zone meter. All three meters are located at the Judy WTP. The Mount Vernon and Sedro-Woolley meters are installed at the beginning of their respective transmission pipelines; therefore, transmission pipeline leakage is included in the DSL calculation. The Panorama meter measures water supplied to the Panorama service area northwest of the Judy WTP.

Water purchased from the city of Anacortes is measured through 11 intertie meters located on their transmission pipeline between the Anacortes Water Treatment Plant and the Berentson Bridge. Intertie meters at Josh Green Lane and Bayview-Edison Road are the primary supply to PUD customers

in the Judy retail service area. The remaining intertie meters are used on an emergency basis or during abnormal operating conditions.

4.2.1.2 Authorized Consumption

Authorized consumption (AC) originates from a variety of sources. The primary AC is from customers. All customer meter usage is recorded on a monthly or bimonthly billing cycle. Customer meters include two wholesale meters for the Samish Farms and North Fir Island water systems.

Other AC sources include hydrant meters and fill stations, maintenance flushing, fire department usage, and metered water usage at PUD facilities. Hydrant meters are loaned out to contractors or customers for short periods to draw water from fire hydrants throughout the system.

4.2.1.3 System Leakage

DSL originates from both apparent and actual water losses. One noticeable real loss is from water pipeline breaks. The break repair documentation estimates the volume of water lost through master meter records, leak geometry, and system pressures. Other sources of actual losses include water theft, which is identified and corrected continuously. Apparent losses can be from meter inaccuracies, minimized through meter servicing, calibration, or replacement.

4.2.1.4 Calculation and Reporting

Skagit PUD uses the DSL calculation methodology outlined in the Water Usage Efficiency Guidebook (3rd edition, Jan. 2017). The DSL volume is calculated using the following equation:

$$\text{Volume of DSL} = \text{Total Water Produced and Purchased [TP]} - \text{Authorized Consumption [AC]}$$

The percentage of DSL is calculated using the following equation:

$$\text{Percent DSL} = [(\text{TP} - \text{AC}) \div \text{TP}] \times 100$$

The DSL volume and percentage are reported to the Department of Health annually. The annual reports for the Judy system can be found on the DOH Sentry website and are published in the Consumer Confidence Reports.

4.3 Water Use Efficiency Program

In January 2008, Skagit PUD established measurable water-saving goals, including the supply and demand side of the distribution system. The Municipal Water Law requires these goals to be selected through a public process. The goals provide a benchmark for achievement and play a significant role in defining the success of this Water Use Efficiency Program. To remain in compliance with the update to the Water System Plan, the PUD re-established its 6-year WUE goals in 2013 for the 10 years from 2014 through 2019. The PUD extended these goals for the five years from 2020 through 2024.

The community relations manager administers many parts of the Water Use Efficiency Program and coordinates public notifications and input. The PUD's WUE goals and the measures taken to help meet those objectives are described below.

4.3.1 WUE Goals

1. Reduce consumption from 146 gallons per day per ERU [gpd/ERU] to 138 gpd/ERU by 2030 and 136 gpd/ERU by 2034.
2. Maintain distribution system leakage (DSL) 3-year rolling average at 10% or less of total water supplied annually.

4.3.2 WUE Program Elements

The PUD's Water Use Efficiency program for 2024 to 2034 consists of the same nine measures listed in the 2014 WSP and the 2021 WSP Limited Update.

4.3.2.1 Public Outreach

The PUD encourages customers to be mindful of their water usage. Through community events, PUD staff educate the public on identifying leaks, conserving water, and using water efficiently.

The PUD's bi-monthly *Pipeline* newsletter offers seasonal water-saving tips and highlights the Water Use Efficiency Program. The PUD also employs its website and social media to promote water-wise habits.

The PUD sponsors events to raise awareness about water efficiency, conservation, and resource protection. These initiatives aim to educate the community about protecting our watershed and conserving resources.

The PUD will continue its various public outreach activities. In addition, the PUD will explore workshop opportunities and partnerships that address drip irrigation systems, pre-rinse spray valves in commercial and institutional kitchens, low-water demand landscaping, and toilet and urinal retrofits. This evaluation will track the number of programs conducted annually.

4.3.2.2 School Outreach

The PUD offers school groups free tours of Judy Reservoir, the water treatment plant, and streams within the watershed. In 2012, the PUD introduced "The Story of Drinking Water" program to elementary classrooms. This program emphasizes the importance of a safe and reliable water supply.

The PUD provides teachers with a free guide that includes 33 water-related activities. Students using the curriculum receive an illustrated booklet. The activities align with national Science Process Standards and Bloom's revised Cognitive Taxonomy of Educational Objectives. The materials cover various subjects, including science, math, social studies, and language arts.

The PUD also participates in school science fairs, distributing water-saving items and engaging students and parents.

The PUD will continue providing school-based education programs. This evaluation will track the number of programs conducted and students reached annually in these education programs.

4.3.2.3 Indoor Retrofit Kits

The PUD is a conservation partner with the U.S. Environmental Protection Agency's [EPA's] WaterSense program to help customers decrease water use through water-efficient products and simple water-saving practices. The program encourages customers to look for WaterSense-labeled products, which have been independently certified for efficiency and performance while promoting water-saving techniques that reduce stress on water systems and the environment. The kits were first available through the PUD in 2008 but were not heavily marketed. New kits were developed in 2012 and include one 1½ gpm low-flow showerhead, plus a kitchen and bathroom aerator, which are available for sale at the PUD office.

According to the EPA, the average family could save 2,700 gallons of water a year by switching to a certified low-flow shower head. The EPA also states that the average family could save up to 700 gallons of water annually by switching from a standard-flow faucet to a WaterSense-labeled aerator faucet. Also, these savings will reduce demands on water heaters, leading to additional energy savings.

The PUD will continue providing customers with showerheads and faucet aerators to replace their less efficient fixtures. The PUD tracks the number of showerheads and aerators provided.

4.3.2.4 Toilet Leak Kits

Toilet leaks are caused by worn or damaged parts in the flush tank. Toilet leaks can be a significant source of water wastage. According to the EPA, toilet flushes account for nearly 30 percent of daily water consumption. When a toilet leaks, it can lead to thousands of lost gallons every month.

Specifically, a leaking toilet can account for up to 7% of water usage or 4,000 to 7,000 gallons per year. Furthermore, about 20% of all toilets leak. These figures underscore the importance of regular maintenance and timely repairs of toilet fixtures to prevent leaks and conserve water.

The PUD will continue providing customers with free toilet leak detection kits containing dye tablets. Messaging will include detailed information on why toilet tanks typically leak and how to fix leaks. Toilet leak repair by customers is not trackable, but the PUD will track the number of leak detection kits provided to customers.

4.3.2.5 Shower Timers

Standard showerheads use 2.5 gallons of water per minute; low-flow showerheads use less than 2 gallons. So, an average 8-minute shower uses 16 to 20 gallons of water. For every minute shaved off shower time, customers are saving water. By setting the timer to 5 minutes, customers can save 6 to 7.5 gallons per shower, which can add up.

The PUD will continue offering customers free shower timers. The shower timer is one of the PUD's most popular event giveaway items. The timers provide a visual reminder that people can quickly

reduce household water consumption by shortening the time spent in the shower. Customers' use of shower timers is not trackable, but the PUD will track the number of timers distributed.

4.3.2.6 *Soil Moisture Meters*

According to the EPA, homeowners use between 30% and 70% of their water outdoors. Experts estimate that 50% of the water used outdoors goes to waste due to evaporation, wind, or runoff caused by overwatering. In 2012, the PUD began offering customers the soil moisture meter, which promotes healthier lawns, gardens, and shrubs and helps save water by eliminating improper watering. The meters accurately measure the moisture in the soil at the root level where it counts. By inserting the probe into the soil at the root level, customers can read the meter and know instantly if too much watering has occurred. This process takes the guesswork out of watering.

The PUD will continue providing customers with soil moisture meters. This evaluation will track the number of soil moisture meters provided to customers annually.

4.3.2.7 *Rain Barrel Program*

In October 2010, the PUD introduced its Rain Barrel Program to single-family and commercial customers to create awareness and visibility around water use practices. As part of the program, PUD staff conducted small group workshops that taught customers how to build, set up, and maintain their rain barrels. The act of collecting rainwater can be an inspiration to find other ways to conserve water around the home. Due to the program's popularity, the PUD is often invited to speak at various clubs and school events about the benefits of harvesting rainwater. Rain barrels are also donated to non-profit auction events to help market the program and raise awareness for the need to be good water stewards.

The PUD will continue offering workshops and selling customers rain barrels. This evaluation will consist of annually tracking the number of rain barrels sold and distributed. This value will then be multiplied by the estimated gallons saved per barrel during the growing season to determine the total water savings achieved. The PUD will also seek partnerships with outside organizations to market and creatively promote the rain barrel program.

4.3.2.8 *Customer Leak Detection and Repair*

The PUD's customer leak detection program is proactive. It consists of being aware of probable customer leaks, notifying customers, following up with customers, and maintaining a leak adjustment policy that encourages prompt repair.

The PUD has transitioned to the Badger ORION Automated Meter Reading (AMR) system since the fall of 2005. During the reading process, the AMR system alerts meter technicians via a radio signal of possible leaks if a water meter has not stopped moving for at least 1 hour over 24 hours. Likewise, the billing system identifies customers with abnormally high consumption during bill preparation. Customer notification and follow-up occur through various means, including door hangers, emails, mailings, and phone calls.

The PUD will continue with its leak detection and repair program. This evaluation will track the number of water leak repairs processed annually.

4.3.2.9 Consumption History of Customer Bill Summary

The PUD provides historical consumption data on bills to assist customers in understanding how their use varies throughout the year and from year to year. This information helps customers make informed choices about managing their water use, including implementing conservation efforts. Additionally, unexpected increases in use can alert customers to possible leaks. The PUD's customer bills have included data on historical use since 1991. The bills include a bar graph showing water use for the previous 24 months, which can help show customers the difference between their summer and winter water use.

The PUD will continue providing bills that show consumption history. The effectiveness of this consumption history is not trackable.

In summary, water conservation efforts are essential for sustainable water management, and the PUD's multifaceted approach ensures that both individuals and the community play a role in preserving this precious resource.

4.4 Water Use Efficiency Savings

The PUD's conservation program consists of the nine measures previously discussed. Descriptions of each measure are provided below. All measures will be implemented during the next six to ten years. The program reflects a continuation and enhancement of many of the measures from previous WUE programs.

4.4.1 WUE Program Implementation

The WUE program will be funded through customer rates and is included in the updated budget discussed in this WSP. The savings achieved by the program and the corresponding progress toward reaching the PUD's savings goal will be estimated by tracking the number of devices distributed and multiplying that number by their per-unit savings. The program is anticipated to be implemented evenly over the 6-year planning period.

The 2014-2019 WUE Program was established and presented in the 2014 Water System Plan. The stated WUE goals were:

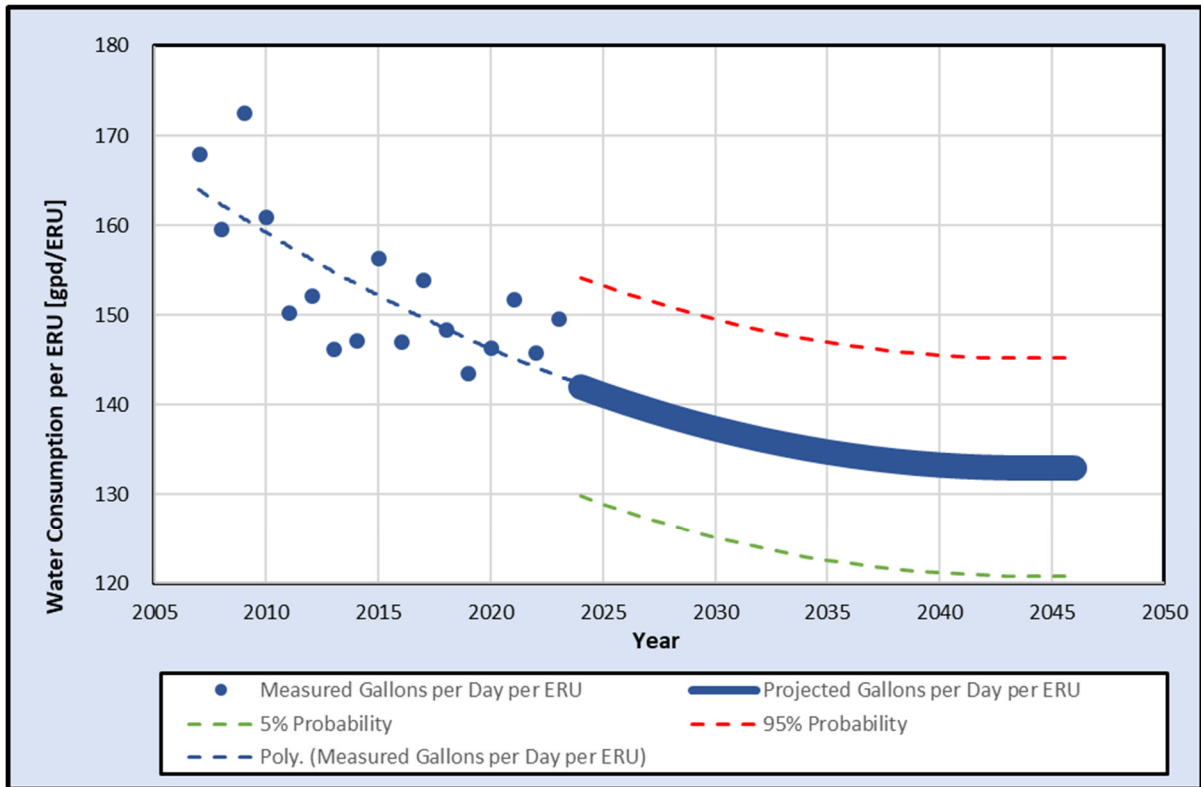
1. Save a cumulative total of 6 million gallons of water by 2019.
2. Reduce distribution system leakage to 10% or less of total water production annually.

The first goal is an average savings of 1 MG per year for the 6-year WUE Program. These savings are difficult to measure since total annual consumption varies considerably depending on weather and rainfall patterns.

Regarding the second goal, the PUD typically has a distribution system leakage of less than 10% for a three-year running average.

A better measure of WUE is to evaluate water use per ERU. **Figure 4-1** illustrates water use per ERU since 2007 and the current WUE goal of 138 gpd/ERU by 2030 and 136 gpd/ERU by 2034.

Figure 4-1: Historical and Projected Water Use Efficiency Trend



Based on this projection, estimated water savings are presented in **Table 4-1** for the next 22 years. The demand forecast without water use efficiency assumes that water demand per ERU remains constant at 146 gpd/ERU.

Table 4-1: Demand Forecast With and Without Projected WEU Savings

Year	Average Day Demand [ADD]		Maximum Day Demand [MDD]	
	No WUE	With WUE	No WUE	With WUE
2025	2,666 MG	2,583 MG	16.43 MGD	15.92 MGD
2026	2,684 MG	2,585 MG	16.57 MGD	15.96 MGD
2027	2,701 MG	2,588 MG	16.71 MGD	16.00 MGD
2028	2,719 MG	2,591 MG	16.84 MGD	16.04 MGD
2029	2,737 MG	2,594 MG	16.97 MGD	16.09 MGD
2030	2,755 MG	2,599 MG	17.10 MGD	16.13 MGD
2031	2,772 MG	2,604 MG	17.22 MGD	16.18 MGD
2032	2,789 MG	2,609 MG	17.34 MGD	16.22 MGD
2033	2,807 MG	2,615 MG	17.46 MGD	16.27 MGD
2034	2,824 MG	2,622 MG	17.57 MGD	16.31 MGD
2046	3,019 MG	2,758 MG	18.52 MGD	16.92 MGD

4.4.2 Water Rate Structure

Skagit PUD utilizes an increasing block rate structure where water unit costs increase as consumption rises. An increasing block rate structure is a pricing model water utilities use to encourage conservation. As customers consume more water and move into higher blocks, the price per unit increases. Essentially, the more water customers use, the higher their rate per unit becomes.

By charging higher rates for excessive water use, an inverted tier structure encourages customers to be mindful of their consumption. People have become more conscious of wasteful practices and seek ways to reduce water usage.

Inverted rates promote fairness. Basic water needs are covered at a lower rate, ensuring affordability for all. Those who use water sparingly pay less, while heavy users pay a premium for their higher consumption.

Reduced water consumption positively impacts the environment. It helps conserve natural resources, protects ecosystems, minimizes energy-intensive water treatment processes, and delays the replacement of capacity-limited facilities.

While our water rate structure aims for fairness, some argue it disproportionately affects large, low-income households. If essential water needs fall into higher-priced blocks, vulnerable populations may struggle to afford their bills.

Although the goal is conservation, some customers might respond by reducing essential water use (e.g., hygiene) to avoid higher rates. Balancing conservation with maintaining public health is crucial.

In summary, an increasing block rate structure plays a vital role in promoting water conservation, but it requires thoughtful implementation to address equity concerns and maintain financial stability for utilities.

5 SOURCE WATER PROTECTION

As an owner and operator of drinking water sources of supply, the PUD is responsible for meeting requirements for source water protection. Source water for the Judy System is obtained from surface water sources at the Skagit River, and the Cultus Mountain Watershed, with a minimal amount of treated water also received from interties with the City of Anacortes. The City of Anacortes also uses the Skagit River as its source. These sources of supply and sources for the satellite systems are shown in **Figure 5-1**. The PUD protects the sources of water it is responsible for through watershed control and wellhead protection programs.

Under the Public Water System Coordination Act of 1977, purveyors of public drinking water systems that utilize surface water must develop and implement a watershed control plan. A watershed control plan aims to control sources of potential contamination to the supply of a public drinking water system. These plans and their general strategies are discussed below.

Designated sanitary control areas are described within the watershed control plans. The Judy System does not utilize any groundwater well sources. Therefore, no Wellhead Protection Program is associated with the Judy System. However, the PUD's satellite systems use groundwater, and Wellhead Protection Programs associated with those systems are described below.

5.1 Sanitary Control Area

The Potlatch Beach water system uses saltwater as its primary water source but also has an emergency backup well with an established SCA. The remaining five satellite systems (Alger, Cedargrove, Marblemount, Rockport, and Skagit View Village) utilize groundwater wells for their water supply sources.

These six groundwater well sources must have an established and maintained Sanitary Control Area [SCA]. This controlled area is intended to be a front-line protection against contamination. The status of the SCAs for each of these six wells is discussed below.

SCAs related to the surface water sources for the Judy water system have been established by PUD and are described in the section dedicated to Watershed Control Programs.

5.1.1 Alger Well (AER-350)

The Alger well was drilled in 1960 on Skagit County property at 1434 Alger Cain Lake Road. In 1997, the Skagit PUD acquired the water system from the Alger Water Department and the Alger Water District through an LUD process. Subsequently, Skagit PUD installed a new well pump and treatment system.

In 2019, the PUD obtained a utility easement from Skagit County and recorded it under Auditor's File No. 201901070090, which established an easement around the well and pump house, secured ingress, egress, and utility access, and created a 100-ft diameter SCA around the well through a restrictive covenant. The Restrictive Covenant is in paragraph 2.3 of the easement document.

5.1.2 Cedargrove Well (AET-033)

The Cedargrove well was drilled in 1989 on PUD-owned property (Parcel P90198) at 45748 Concrete Sauk Valley Road for use by the Cedargrove area community. Currently, there is no Declaration of Restrictive Covenant on the property for a 100-ft diameter SCA.

5.1.3 Marblemount Well (AHB-745)

The Marblemount well was drilled in 2003 on private property at 7870 Tessa Lane (Parcel P135148). The well serves the Marblemount water system, which was developed through an LUD.

In 2004, a utility easement was obtained from Skagit County and recorded under Auditor's File No. 200405060156, which established an easement around the well and pumphouse, secures ingress, egress, and utility access, and delineates the 100-ft diameter SCA. In 2005, a Restrictive Covenant was established on this utility easement and recorded under Auditor's File No. 200501120034 as part of the Source Water Protection Plan.

5.1.4 Potlatch Beach Backup Well (AAE-847)

The Potlatch Beach well was drilled in 1983 and is located on two easements west of West Shore Road. The first easement recorded under Auditor's File No. 9811170081 is on private property at 5433 West Shore Road (Parcel P46832). The second easement recorded under Auditor's File No. 200101250043 is also on private property identified as Parcel P46834.

This permit-exempt well is used as an emergency water source for Guemes Island (RCW 90.44.050) and is not explicitly designated for the Potlatch Beach water system. Neither easement includes a Restrictive Covenant around the well.

5.1.5 Rockport Well (AET-032)

The Rockport well was drilled in 1976 and is owned by the Washington State Parks and Recreation Commission [WSPR]. The WSPR and Skagit PUD entered into a cooperative water use agreement in 1989, designating mutual use. The well is in the Rockport State Park at 51905 State Route 20. The park is closed, and the PUD operates and manages the well and storage tank. There is no known SCA or Restrictive Covenant established for this well.

5.1.6 Skagit View Village Well (AET-015)

The Skagit View Village well was drilled in 1973 to serve the Wilderness Village Community Association Water System. The well SCA and Restrictive Covenants are shown on the plat map recorded under Auditor's File No. 788213. A replacement well site with its own SCA is also shown on the plat map.

In 2001, the Skagit PUD assumed ownership of the water system. The well is within an easement parcel P78258, which the Wilderness Village Community Association owns. The utility easement is

recorded under Auditor’s File No. 200506160085, establishing an easement around the well and pumphouse and securing ingress, egress, and utility access.

5.2 Wellhead Protection Program

The Safe Drinking Water Act requires that every state develop a Wellhead Protection Program [WHPP]; in Washington State, the Department of Health administers this program. Washington’s WHPP requirements are designed to prevent contamination of groundwater used for drinking with the following criteria, which apply to all Group A public water systems:

- A Groundwater Contamination Susceptibility Assessment for each well
- A delineated Wellhead Protection Area for each well
- An inventory of potential contaminant sources within the WHPP
- Documentation showing that the water system sent delineation and inventory findings to the required entities
- Contingency plans for providing alternate drinking water sources if contamination does occur
- Coordination with local emergency responders for appropriate spill or incident response measures

Skagit PUD owns and maintains groundwater wells in its six satellite water systems (Alger, Cedargrove, Marblemount, Potlatch Beach, Rockport, and Skagit View Village) that use groundwater wells as a supply source. The Washington State Department of Health requires owners of Group A water systems (with more than 25 connections) to develop and implement a WHPP to help prevent contamination of groundwater used for drinking water. The WHPP includes delineating wellhead protection areas for each of the wells, with supporting documentation, an inventory of potential contaminants, and implementation measures for the program. Skagit PUD has developed and implemented a WHPP for the satellite water systems; the latest revision is March 2024. The document is large and is not included in this WSP. A summary of how this WHPP meets the requirements is presented below.

5.2.1 Susceptibility Assessment

A Susceptibility Assessment (DOH Form #331-274) has been prepared for each groundwater well source covering all satellite systems and is included in the WHPP.

5.2.2 Wellhead Protection Area Delineation

Two of the six wells (Alger and Marblemount) have wellhead protection areas developed by GeoEngineers for Alger in 2001 and Marblemount in 2004. In both instances, the WPA boundaries were estimated using a numerical groundwater computer model (MODFLOW) and a conceptual hydrogeologic model considering local hydrogeologic conditions, topography, and recharge conditions. One-year, five-year, and ten-year time-of-travel (ToT) boundaries were delineated.

The Calculated Fixed Radius (CFR) method was used to estimate the WPAs for the remaining four wells (Cedargrove, Potlatch Beach, Rockport, and Skagit View Village). The fixed radius for the various ToT is presented in **Table 5-1**.

Table 5-1: Time-of-Travel Zones Using the Calculated Fixed Radius Method

Satellite System	6-Month ToT	1-Year ToT	5-Year ToT	10-Year ToT
Cedargrove	412 ft	582 ft	1,302 ft	1,841 ft
Potlatch Beach	48 ft	67 ft	150 ft	213 ft
Rockport	245 ft	346 ft	774 ft	1,094 ft
Skagit View Village	348 ft	492 ft	1,100 ft	1,556 ft

5.2.3 Contaminant Source Inventory

After delineating the WHPAs associated with the six satellite system wells, an inventory of existing and potential sources of groundwater contamination was compiled using maps and data from multiple sources (including Skagit County IMAP, USGS streams, Ecology well and cleanup site tools, Health septic system and SWAP maps). The PUD's GIS department created a web map application that includes the data layers for future use.

The potential contamination sources located near the PUD's wells include residential septic systems (predominant), the decommissioned dump near Alger, a parcel used for forestry, and a parcel used as a utility corridor, the latter two of which may be susceptible to pesticide and herbicide use.

Letters were sent to notify landowners that pose potential contaminant sources in the inventory findings. A copy of the letter template is included in the PUD's WHPP. In the case of the Potlatch Beach well, a document informing the current and future property owners of Parcel P46832 of the presence of a WPA encumbrance was recorded (Auditor's File No. 202109080098).

5.2.4 Contingency Plan

The Skagit PUD's contingency plan consists of the following components:

- **Susceptibility Assessments:** In addition to considering the Washington State Department of Health (DOH) ranking of the wells, the PUD has completed the Ground Water Contamination Susceptibility Assessment Survey Form [DOH 331-274F] for each of the Skagit PUD's wells.
- **Emergency Response:** The Operation and Maintenance crew assumes responsibility for emergency response and will contact Skagit County Emergency Management authorities and the Department of Health as needed. The PUD will respond immediately to shut down well water systems in an emergency and determine if the tank storage contents are safe for potable use. The PUD's engineering staff will assist in appropriate follow-up and cleanup measures.
- **Short-Term and Long-Term Water Supplies:** Assuming the storage tanks are nearly full during the emergency shutdown and water quality is acceptable, the tank associated with each of the wells would provide approximately a two-day water supply to the customers. Due to a lack of infrastructure connecting the satellite systems, bottled water and tanker trucks represent the most appropriate alternative water supply for remote areas during an emergency. The PUD owns a 300-gallon mobile vehicle with eight water fountains and eight water bottle dispensers, which

may assist in an emergency to a limited capacity. The PUD also owns and operates three automated bulk water fill stations in Conway, the Bow Hill area, and east of Sedro-Woolley. These would be relatively close locations for customers to fill bulk water containers. The PUD would supply pre-loaded credit cards in this situation.

5.3 Watershed Control Program

Watershed control is a vital program aimed at safeguarding our water resources. This program comprehensively manages water quality and quantity within a watershed's drainage basin. By implementing a range of strategies, from monitoring and controlling potential sources of contamination to promoting sustainable land use practices, the watershed control program strives to ensure our water sources' long-term health and viability. This proactive approach protects our water supply and contributes to the watershed's ecological integrity.

Source water for the Judy System is obtained from the Skagit River and the Cultus Mountain Watershed. The PUD protects these sources of water through two watershed control plans. These plans and their general strategies are discussed below.

5.3.1 Cultus Mountain Watershed

The Cultus Mountain Watershed has historically been the Judy System's primary water source since 1939. The PUD developed a Watershed Control Plan for the Judy System in 1994. This plan addressed the protection of source water from the Cultus Mountain Watershed only since the ability to withdraw water from the Skagit River was not established until 2009. The Cultus Mountain Watershed Management Plan, updated in 2013 and 2020 and referenced in **Appendix F**, has been developed to expand the PUD's efforts to control potential sources of contamination to runoff water obtained from this area. The updated plan includes the following components:

- Description of the watershed and water system components
- Identification of watershed activities and land uses detrimental to water quality
- Watershed control measures
- System operation and emergency provisions
- Water quality trends
- Recent changes in the watershed
- Opportunities for improved watershed control

This plan describes significant improvements in the PUD's watershed control efforts, especially regarding communication with watershed landowners and monitoring their activities. The PUD will continue to build on these improvements by addressing the opportunities for improved watershed control listed in the updated plan.

5.3.2 Skagit River Watershed

In 2004, the PUD and the City of Anacortes developed the Skagit River Watershed Control Plan. The program area for this plan focused on the 43-mile length of the river in the vicinity of water withdrawal

points used or planned by the PUD and the City of Anacortes. An update to the plan was developed in 2010 by the City of Anacortes and is referenced in **Appendix F**, along with the table of contents from the original 2004 Watershed Control Plan.

The 2004 Skagit River Watershed Control Plan and the 2010 update prepared by the City of Anacortes include program strategies to minimize potential contamination risk to each organization's public drinking water supplies. The PUD intends to coordinate with the City of Anacortes to address implementation goals related to each of the categories listed below:

- Public Education
- Emergency Notification
- Ecology Permit Holder Notification
- Interlocal Agreements
- Cooperation

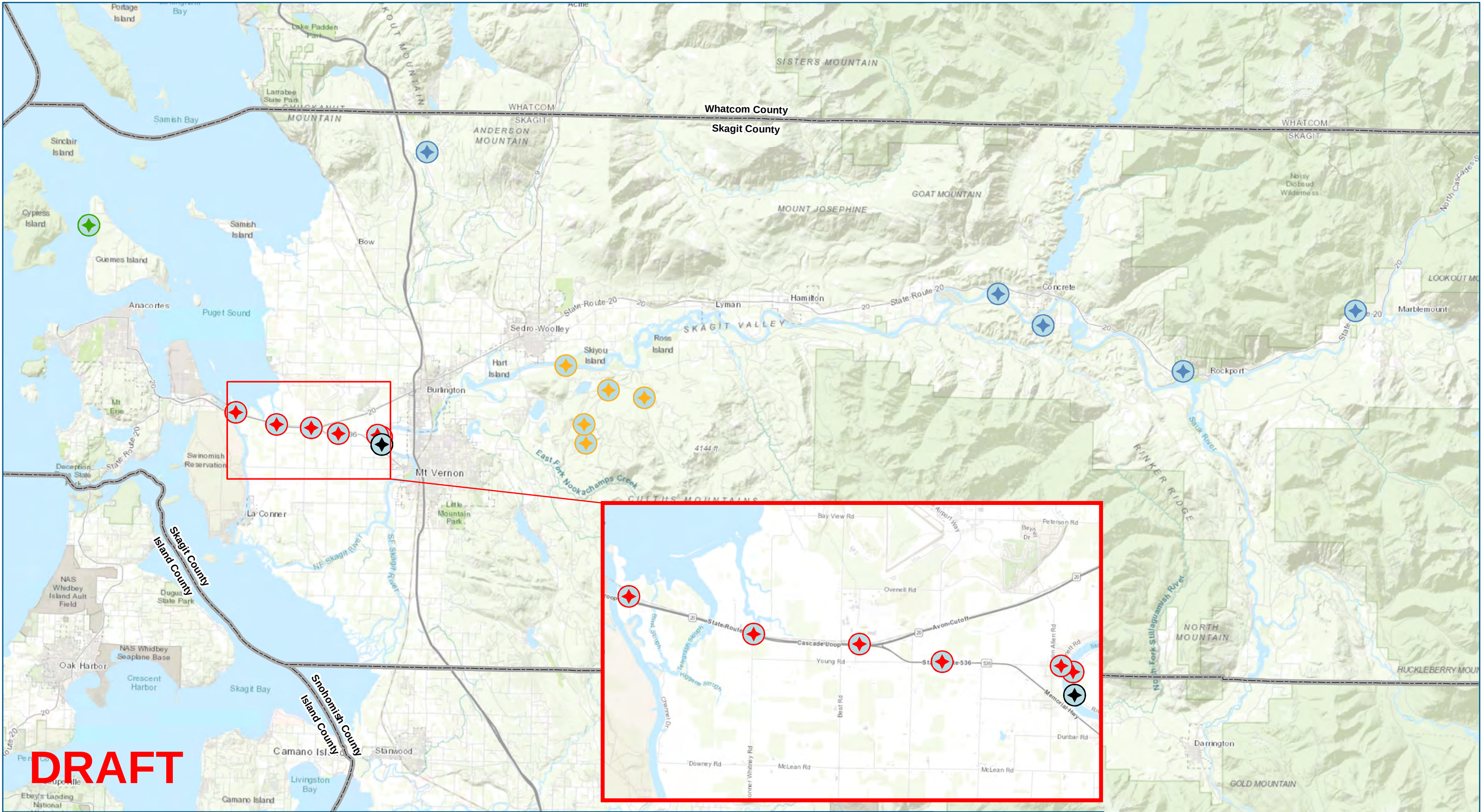


Figure 5-1.

Sources of Supply

2024 Water System Plan

Satellite Systems

-  PUD Groundwater
-  PUD Marine Water

Judy System

-  PUD/Anacortes Intertie
-  PUD Surface Water

-  Anacortes Surface Water

This map was created from available public records and existing map sources, not from field surveys. While great care was taken in this process, maps from different sources rarely agree as to the precise location of geographic features. The relative positioning of map features to one another results from combining different map sources without field verification.

The PUD #1 of Skagit County disclaims any warranty of merchantability or warranty of fitness of this map for any particular purpose, either expressed or implied. No representation or warranty is made concerning the accuracy, currency, completeness or quality of data depicted on this map. Any user of this map assumes all responsibility for use thereof, and further agrees to hold the PUD #1 of Skagit County harmless from any damage, loss, or liability arising from the use of this map.



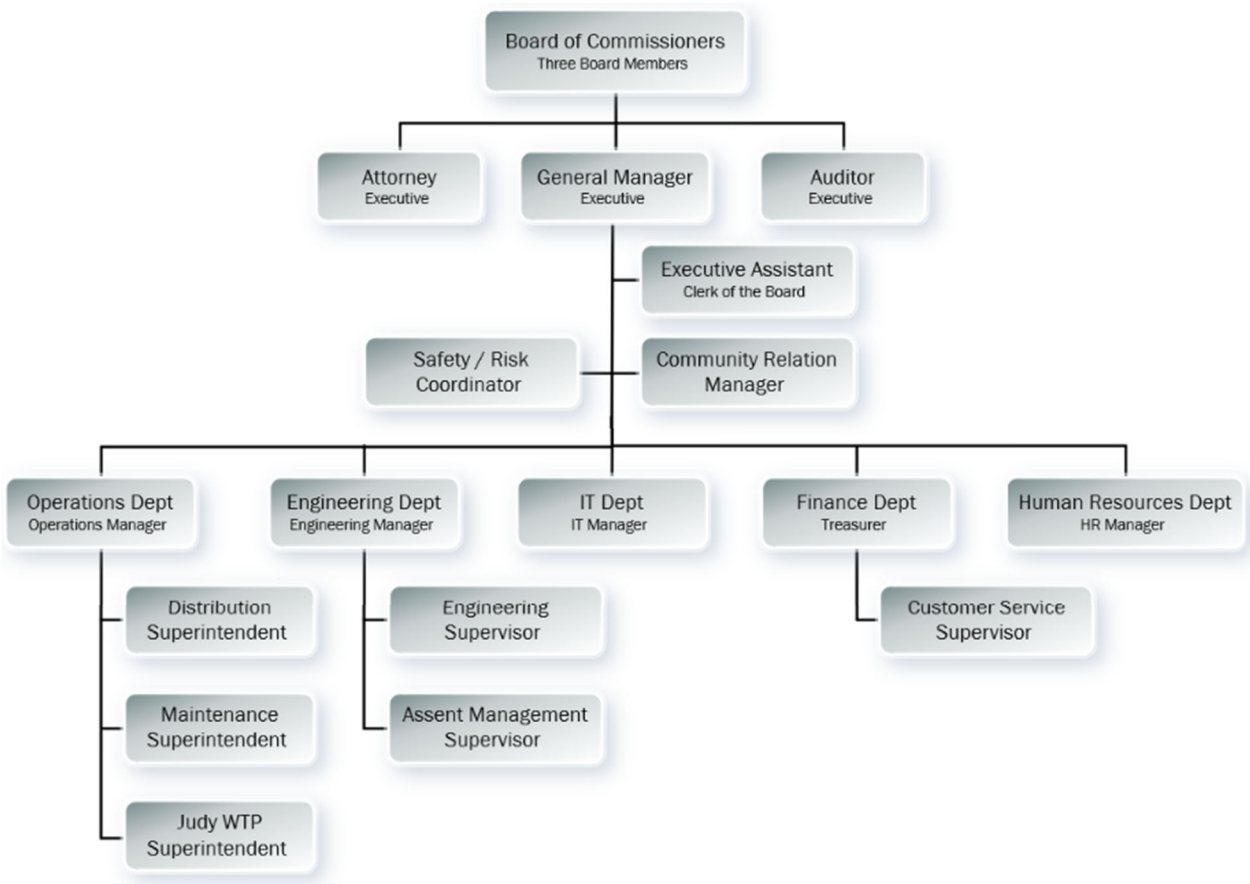
6 OPERATION AND MAINTENANCE PROGRAM

This chapter summarizes the programs and procedures to ensure a reliable potable water supply to PUD customers. It describes water system management and personnel, operator certification requirements, system operations, supervisory control and data acquisition (SCADA) and telemetry systems, asset management, the emergency response program, safety procedures, the cross-connection control program, the records keeping and reporting program, design and construction standards, and any recommended improvements.

6.1 Management and Personnel

Skagit PUD is guided by a Board of three Commissioners elected by the public and serving 6-year terms. Each Commissioner represents a given area with political boundaries similar to those of the three elected Skagit County Commissioners. The Commissioners are responsible for establishing PUD policies and appointing three executive officers. The executive team is accountable for achieving the Commission’s goals. **Figure 6-1** provides a high-level organizational chart of the Skagit PUD management framework.

Figure 6-1: Organizational Chart of Skagit PUD Management



6.1.1 Executive Team

The Commissioners appoint the executive team, including the General Manager, Financial Manager/Treasurer, Auditor, and legal counsel. The General Manager oversees PUD operations, sets business plans, and executes capital improvements and operational goals through the Engineering and Operations Managers.

The Finance Manager/Treasurer handles financial management, directs fiscal and accounting functions, participates in planning, maintains systems and procedures in line with accounting principles, laws, and PUD resolutions, and oversees the annual budget preparation.

The Auditor, reporting to the General Manager, monitors financial activities, prepares financial analyses, and establishes and monitors internal controls and financial policies.

The executive assistant assists the executive team with managing and executing its responsibilities. Also, the executive assistant is responsible for the organization's documentation and records retention.

6.1.2 Operations Department

The Operations Department ensures the reliable delivery of water to the customers. This department oversees the day-to-day operations of the water treatment plants, storage tanks, transmission and distribution systems, pump stations, and control systems. They monitor and control water quality and pressure, respond to emergencies, and perform routine maintenance and repairs. Their work requires a deep understanding of the treatment processes and water delivery infrastructure.

The Operations Manager manages the Operations Department with the support of the Maintenance Superintendent, Distribution Superintendent, and Judy Water Treatment Plant Superintendent.

6.1.2.1 Operator Certification

State law requires public water system operators to be certified through the Washington State Water Works Certification Program to ensure a reliable water supply. The Judy Water Treatment Plant has nine staff members, including a supervisor with a WTPO-4 certification, and mandates a WTPO-3 certification for solo operators. Skagit PUD promotes employee education and certification by providing in-house training for exams and tying advancement to certification attainment. They also ensure employees receive the necessary triennial 3.0 CEUs to maintain certifications and encourage participation in local and beneficial out-of-state training.

As illustrated in **Table 6-1** below, Skagit PUD's internal culture results in a wealth of redundant knowledge and certificated employees.

Table 6-1: Skagit PUD Staff Certifications

Certification	Number
Cross-Connection Specialist	43
Water Distribution Specialist	10
Water Distribution Manager 1	1
Water Distribution Manager 2	14
Water Distribution Manager 3	4
Water Distribution Manager 4	14
Basic Treatment Operator	0
Water Treatment Plant Operator 1	5
Water Treatment Plant Operator 2	3
Water Treatment Plant Operator 3	2
Water Treatment Plant Operator 4	9

6.1.2.2 Operation Continuity

Inadequate staffing places the reliability of drinking water at risk. Without adequate backup staff, critical functions and continuity of operations are at risk during emergency events.

Operations personnel with the right qualifications and experience performing the necessary functions, protecting public health, building consumer trust, and minimizing costs. Without adequate frontline and backup staff, critical functions and continuity of operations are at risk during emergency events. The current staffing level at Skagit PUD is 86 FTEs. The PUD assesses that existing staffing levels are adequate for critical functions and continuity of operations, even during emergency events.

The Operations Department is divided into three divisions that address different operational areas: specifically, the distribution department, the maintenance department, and the Judy WTP. The distribution and maintenance departments are fully staffed and work 7:00 a.m. through 3:30 p.m., Monday through Friday. During these regular working hours, the operations staff engage in various operations and maintenance activities outlined in various operational plans or assigned through the PUD's Asset Management program.

The Judy WTP is staffed continuously. Various sampling and monitoring are performed through continuous monitoring or grab samples, and process modifications are performed as needed to optimize the treatment process.

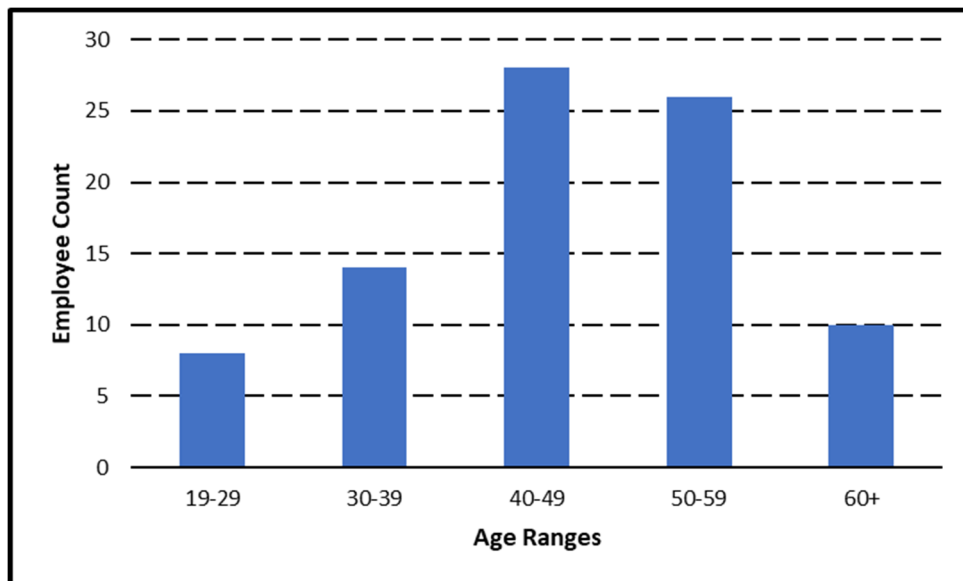
The Distribution Department maintains the treatment processes at the satellite systems sites. These processes include ion exchange for iron and manganese removal, reverse osmosis treatment at Potlatch Beach, and hypochlorination for disinfection. This department is also responsible for collecting monthly bacteriological samples from all distribution systems at specified intervals. These sampling and analysis efforts are recorded and summarized in DOH monthly reports.

Currently, the operations staffing level is adequate for routine operation and maintenance. However, additional staff will be hired if the Asset Management Program shows a backlog of maintenance activities.

Outside of regular working hours, various staff members are assigned as in-charge or on-call to respond to system emergencies or leaks to help ensure continuing operations.

The American Water Works Association predicts that 30 to 50 percent of the current water system operator workforce will retire in the next five to ten years. This loss represents a significant reduction in expertise and experience. Currently, Skagit PUD is not experiencing the “silver tsunami.” **Figure 6-2** provides a histogram of the age ranges for the PUD staff. The median age is in the mid-forties.

Figure 6-2: Employee Count by Age Ranges



6.1.3 Engineering Department

The Engineering Department ensures efficient and reliable water delivery to the customers. This department is responsible for planning and designing water infrastructure, including water treatment plants, storage tanks, pipelines, pumping stations, and control facilities.

Staff work to meet regulatory standards, optimize system performance, and plan for future needs. Their expertise in design, hydraulic modeling, and project management is crucial in maintaining the reliability and sustainability of the water systems.

The Engineering Manager manages the Engineering Department with the support of the Engineering Supervisor and Asset Manager.

6.1.4 IT Department

The Information Technology Department is responsible for the direction, management, and integrity of the data and phone networks, internet, applications, and web environments. This department is responsible for information systems infrastructure and services to support PUD operational and administrative functions, including physical and digital security and the PUD's supervisory, control, and data acquisition [SCADA] systems.

6.1.5 Finance Department

The Finance Department monitors and maintains the financial health and sustainability of the organization. This department manages accounts receivable and payable, ensuring that all financial transactions are accurately recorded and processed. The department oversees billing, customer engagement, and budgeting. It also handles shutoffs for nonpayment. Through these activities, the finance department helps to ensure the utility has the funds necessary to maintain and improve infrastructure, invest in new technologies, and provide reliable service to all customers.

6.1.6 Human Resources Department

The Human Resources Department focuses on the organization's human assets. HR is responsible for recruiting, hiring, and retaining skilled employees. They manage employee benefits, handle labor relations, and ensure compliance with labor laws. The department also oversees training and development programs, helping employees expand their skills and knowledge in the water industry. They also handle employee grievances and maintain a positive, productive work environment. The department contributes to the utility's mission of providing reliable and efficient water services through these activities.

6.1.7 Community Relations Manager

Skagit PUD has a full-time Community Relations Manager who strengthens and maintains strong relationships between the PUD, its customers, and the public. The responsibilities of the Community Relations Manager are responses to media inquiries and news releases to keep the community informed about PUD issues and activities. Additional responsibilities include providing evening and weekend on-call duty to meet public information responsibilities regarding water outages and emergencies such as fires and accidents and promoting outreach events. Also, in the absence of the General Manager, the Community Relations Manager temporarily assumes those responsibilities.

6.1.8 Safety Coordinator

Skagit PUD's safety programs are guided by the Safety and Risk Coordinator, who reports to the General Manager. The Safety Coordinator develops, reviews, modifies, and implements the safety policies and procedures and works with a Safety Committee composed of staff from several functional work groups.

The Safety Committee is organized with a Chair, Secretary, and regular members. The term is two years. The committee consists of seven voting members, with the Safety and Risk Coordinator acting as an ex-officio member with no regular voting authority. Members must meet quarterly to approve

minutes, review recent incidents, voice safety concerns, and consider new procedures. Safety and health training are assigned to work groups based on the type of work and hazards employees face.

6.2 Operations and Preventative Maintenance

Chapter 3 of this Water System Plan describes the PUD's facilities in detail and should be referenced for design information relating to the system's characteristics. This section focuses on operating and maintaining major system components and facilities.

The Judy System and the six satellite systems are divided into four major system components, including:

- Source Water
- Treatment
- Transmission and Distribution
- SCADA and Telecommunications

6.2.1 Source Water

In our commitment to deliver reliable drinking water to our customers, Skagit PUD utilizes diverse water sources, including surface water, groundwater, and saltwater. Surface water provides a substantial portion of our supply for the Judy System and is occasionally supplemented by treated water from the City of Anacortes. Groundwater is a reliable source for five of our satellite systems, including Alger, Cedargrove, Marblemount, Rockport, and Skagit View Village. Lastly, saltwater, through advanced desalination processes, is utilized at the Potlatch Beach satellite water system. Below is a discussion of how these water systems utilize these sources to ensure the consistent delivery of potable water to our customers.

6.2.1.1 *Judy System Source Water*

Judy Reservoir is supplied by five sources of raw water: Gilligan Creek, Mundt Creek, Turner Creek, Salmon Creek, and the Skagit River. Source water facilities are the responsibility of the Operations Department. The Water Treatment Plant Superintendent and treatment staff operate the source water facilities. These staff operate and maintain raw water intake structures and facilities, Judy Reservoir raw water impoundment, and the Judy WTP.

The Skagit River is the primary water source for the Judy System, supplemented by four Cultus Mountain streams. The PUD balances these sources to maintain efficiency, instream flows, and water quality.

Water from the streams is gravity-fed to Judy Reservoir, while water from the Skagit River requires significant power for pumping. Power rates include a demand charge, applied monthly, and a usage charge. Electrical demand charges are highest from December through March, leading to the shutdown of the Skagit River Diversion Station.

Pump use is constrained by Puget Sound Energy's (PSE) power provision. With advance notice to PSE, the PUD can use 3 of the 5 pumps anytime and 4 or 5 pumps in emergencies. Continuous use of 4 or 5 pumps would require a PUD-funded PSE facilities upgrade.

Water is not diverted into Judy Reservoir if Cultus Mountain stream turbidities exceed 5 NTU, color exceeds 35 color units, or Skagit River turbidity exceeds 10 NTU. The PUD selects the most suitable source based on these criteria and instream flow restrictions.

Routine preventative maintenance of water system infrastructure is paramount for maintaining reliable water service to customers. It ensures the longevity and efficiency of the system, reduces the likelihood of unexpected disruptions, and safeguards the quality of water supplied to the community. Regular inspections, cleaning, and replacements of parts can prevent minor issues from escalating into major problems that could disrupt service and incur significant repair costs. Moreover, it helps preserve the integrity of the infrastructure, extending its lifespan. In essence, preventative maintenance is a proactive approach that underscores water utility management.

6.2.1.2 *Anacortes Water*

The PUD also obtains water for the Judy System from the City of Anacortes through interties as needed. These interties are connected to the City's transmission line, which starts from its water treatment plant adjacent to the Skagit River in Mount Vernon and extends westward to the City of Anacortes. Water is purchased from the City of Anacortes under the terms of a water contract. The City obtains water from the Skagit River through its certificated water rights.

6.2.1.3 *Satellite System Sources*

Each satellite system has its separate water sources. Five of the six systems utilize groundwater wells. The Potlatch Beach water system uses saltwater from the Puget Sound for its raw water supply.

6.2.2 Treatment Processes

Skagit PUD utilizes a variety of treatment processes in its various water systems. The following sections discuss these processes in detail.

6.2.2.1 *Judy Water Treatment Plant*

Water treatment in the Judy System is the responsibility of the Water Treatment Plant Superintendent. Operators perform the daily tasks of operating the water treatment plant facilities, auxiliary systems, and appurtenances.

The Judy WTP is a direct filtration facility placed in service in 1990 and expanded in 2008. The WTP has a treatment capacity of 24 MGD with a peak hydraulic capacity of 30 MGD. A detailed discussion of the Judy WTP is presented in **Section 6.8**.

6.2.2.2 *Iron and Manganese Treatment*

Iron and manganese ion-exchange treatment systems are installed at four wells in the satellite system: Alger, Cedargrove, Rockport, and Skagit View Village water systems. These water treatment systems are sized to meet or exceed the capacity of the well pumps. The treatment systems are operated and maintained per the manufacturer's recommendations.

6.2.2.3 Reverse Osmosis Treatment

The Potlatch Beach water system uses a reverse osmosis [RO] treatment system to desalinate seawater for its water source. After 15 years of service, the PUD replaced the original RO system with a new one. The RO systems are operated and maintained per the manufacturer's recommendations.

6.2.2.4 Disinfection

The Judy System and five satellite systems are disinfected using chlorine. The Marblemount system does not require disinfection treatment of its groundwater source.

At the Judy WTP, the raw water receives pre-disinfection with chlorine dioxide (ClO₂) and is pumped to the control building. After flocculation and filtration, the filtered water is disinfected again with chlorine and flows by gravity to three finished water clearwells to provide chlorine contact time. Caustic soda (NaOH) and ammonia (NH₃) are added before the clearwells to produce a chloramine residual, which is maintained in the distribution system.

The five satellite systems utilize hypochlorination systems to disinfect their groundwater as it enters the distribution system. Chlorine contact time is provided through the distribution pipeline before the first connection.

6.2.3 Transmission and Distribution

Transmission and distribution account for the storage tanks, pumps, valves, and pipes. The daily tasks relating to these operational functions are the responsibility of the Operations Department.

The Operations Superintendent supervises distribution operators and the Water Quality Program Coordinator to help maintain the distribution system. The Operations staff operate and maintain the mechanical systems, storage tanks, pressure control valves, and interties.

The Maintenance Superintendent supervises the maintenance workers and the Maintenance Foreman. The Maintenance Superintendent oversees facility repair projects, maintains hydrants and mains, and exercises valves.

6.2.3.1 Piping and Valves

The maintenance workers are typically sent out in groups to perform various maintenance tasks, including small water line replacement projects, tie-ins to the existing system, leak repairs, meter service installations, and other maintenance-type projects.

Skagit PUD has implemented a Computerized Maintenance Management System (CMMS) to utilize a software program called Cityworks. This program will assist in implementing and coordinating a maintenance program for the distribution system involving maintenance duties such as valve exercising, valve repairs, raising valve boxes, and the overall identification of the status of the distribution system. The Operations Manager and the Maintenance Superintendent will coordinate the efforts of the maintenance workers, along with the Distribution Operators, to perform the preventative maintenance planned through the CMMS.

6.2.3.2 Pump Stations and Control Valves

Operational data associated with the PUD's pumps and control valves are contained in Chapter 3. Control valves are monitored regularly. These valves are generally pressure-reducing valves [PRVs] between pressure zones and altitude valves on storage tanks and are monitored with these other facilities as scheduled. Control valves are repaired or rebuilt as deemed necessary. Control valves are principally of the diaphragm type. New valves are ordered with an interior epoxy coating and stainless-steel trim to minimize maintenance requirements.

The SCADA system monitors the booster pump sites, which notifies the on-call personnel of specific failures and allows immediate response via a computer connection at any time from almost any location. Operators monitor the booster stations and visit them at least twice weekly.

As mentioned in Chapter 3, not all the booster pump stations have a dual pump setup to provide for redundancy. However, the PUD keeps at least one spare pump in stock at the warehouse if a failure occurs at any booster pump station. Operations staff can install a replacement pump within hours.

Skagit PUD has a large standby generator and transfer switches at critical facilities. The priority during a widespread power loss would be refilling critical storage tanks. If the power loss is limited to a closed system, operators would consider using a generator or booster stations depending on the duration of the outage and the ability to avoid interference with electrical repair crews.

Distribution operators visit booster pump stations regularly. Booster pumps are checked for power source and pressure inconsistencies, overheating, and leaks two to three times per week. Preventative maintenance on motors is performed annually or as required. Pumps are checked regularly to ensure that their power source is intact, their input and output pressures are within range, and there are no indications of imminent failure.

6.2.3.3 Storage Tanks

Most of the PUD's storage tanks are located where they can obtain the best hydraulic advantage, in some cases remote from dense populations. Storage tanks are checked regularly to ensure they are intact, working correctly, and the water is cycling adequately. The PUD monitors storage tanks through the SCADA system and regular site inspections.

Skagit PUD has developed a regular interior and exterior cleaning schedule for its storage tanks, including a painting schedule. Exterior cleaning is scheduled when a tank's appearance is undesirable or it becomes difficult to monitor exterior finish integrity.

Underwater diving services perform Interior cleaning in each storage tank at least every 5 to 7 years. Timing depends on the need and the complexity of draining a storage tank and removing it from service for repairs. Recent diving technology improvements allow interior cleaning and repair of storage tanks while they remain in service. While this method is more expensive, it mitigates other negative impacts and makes the process more desirable than conventional methods. Skagit PUD considers this option when selecting a maintenance method.

6.2.3.4 Meters

Under the supervision of the Operations Department, the meter technicians conduct meter readings, replacement, and repair. Meter technicians are responsible for reading meters on predetermined routes and schedules. Technicians are also responsible for the activation and shutoff of water services when requested or because of delinquent payment or cross-connection issues.

When these technicians are not reading meters, they perform repairs or maintenance. One high-cost maintenance item over the next decade is the replacement of meter transmitters. The technicians are conducting this maintenance activity as failed transmitters are identified.

The PUD contracts with a third-party provider yearly to calibrate meters 2 inches and larger. The number of meters calibrated yearly is one-third of the meters in this size range. Therefore, each meter is calibrated every third year. Beyond performing routine maintenance on meters 2 inches and larger, the meter technicians conduct spot repairs as needed.

6.2.4 SCADA and Telemetry Systems

Skagit PUD has extensive SCADA systems throughout its service area. SCADA systems are typically found on storage tanks, pump stations, mainline meters, intakes, and treatment facilities. The degrees to which SCADA can control the systems vary from site to site depending on the equipment and type of communication connections.

The capabilities of these sites range from full control to simply monitoring. Many sites have full control because they can be fully monitored and operated from remote locations and mobile devices. The remaining sites have monitoring capabilities only. In general, monitoring-only sites are being converted to fully controlled sites. Types of communication lines serving the sites include PUD-owners fiber, telephone, radio, and Wi-Fi/internet.

The Distribution Operators monitor the SCADA systems. During regular business hours, the systems are monitored from the PUD headquarters. After regular working hours, the on-call Distribution Operator monitors the systems. While the operators monitor the systems for necessary corrective action before an alarm goes off, additional protections are in place should an event or power outage be overlooked. Redundancy includes an alarm system that automatically places multiple calls to operators and managers when an alarm is activated.

6.3 Water Quality Monitoring

Skagit PUD is committed to providing high-quality water for our consumers by implementing a comprehensive water quality monitoring program that allows continuous assessment and management of water quality. This program is designed to meet regulatory requirements, safeguard public health, and maintain consumer confidence in our water supply.

Table 6-2 on page 6-17 summarizes upcoming water quality monitoring requirements for the next 11-year period from 2025 to 2035. The table is intended to serve as a monitoring roadmap. The PUD will consult with DOH and refer to its annual Water Quality Monitoring Report (WQMR) for DOH-mandated sampling and monitoring requirements. The table does not consider monitoring requirements

associated with potential new or revised regulations, nor does it consider potential future waivers that may take effect.

6.4 Emergency Preparedness and Response

A reliable water system is vital to every community. Planning for storms, wildfires, drought, floods, earthquakes, pandemics, and cybersecurity attacks is essential to managing a drinking water system.

Each emergency has unique effects on different parts of a water system. Events that demand a response range from routine operating emergencies such as system breaks and malfunctions, coliform contamination, and power outages to more serious non-routine emergencies that may result from intentional acts of sabotage, chemical spills, floods, earthquakes, windstorms, or droughts.

All supervisory and senior staff members from the PUD have obtained certifications from the Federal Emergency Management Agency (FEMA) for Incident Command System (ICS) 100 and 200, National Incident Management System (NIMS) 700, and National Response Framework (NRF) 800. This training will allow the PUD to respond and integrate more efficiently and effectively with local, state, and federal agencies in an emergency or disaster.

Depending on the type of incident, different PUD staff members are responsible for filling the various roles. **Table 6-3** summarizes the Incident Command System roles and responsibilities regarding how it applies to the PUD and which staff are typically assigned to specific roles.

Table 6-3: Incident Command System Roles and Responsibilities

Title	Roles and Responsibilities During an Emergency	PUD Staff
Incident Commander	- Provides overall leadership for incident response. - Delegates authority to others. - Takes general direction from agency administrator/official. - Ensures incident safety. - Provides information services to internal and external stakeholders. - Establishes and maintains liaison with other agencies participating in the incident. - Establishes incident objectives. - Directs staff to develop the Incident Action Plan. - Assess the need for staff. - Takes responsibility for all activities and functions until delegated and assigned to staff.	Typically filled by the first respondent and transferred to more senior staff as they arrive on-site. PUD role will likely be filled by: General Manager, or Operations Manager, or Engineering Manager
Public Information Officer [PIO]	Advises Incident Commander on information dissemination and media relations. The Incident Commander approves information that the PIO releases.	Community Relations Manager

	- Obtains information from and provides information to the Planning Section. - Obtains information from and provides information to the community and media.	
Safety Officer	- Advises Incident Commander on issues regarding incident safety. - Works with Operations to ensure the safety of field personnel. - Ensures the safety of all incident personnel.	Safety Coordinator
Liaison Officer	- Assists Incident Commander by serving as a point of contact for agency representatives who are helping to support the operation. - Provides briefings to and answers questions from supporting agencies.	Engineering Manager, or WTP Superintendent
Operations Section Chief	- Develop and implement strategies and tactics to carry out the incident objectives. - Organizes, assigns, and supervises the tactical field resources. - Supervises resources in the staging area.	PUD role will likely be filled by: Operations Manager, or Engineering Manager, or WTP Superintendent or Maintenance Superintendent
Planning Section Chief	- Gathers, analyzes, and disseminates information and intelligence. - Manages the planning process. - Compiles the Incident Action Plan. - Manages technical specialists.	PUD role will likely be filled by: Engineering Manager, or Capital Program Manager
Logistics Section Chief	- Provides resources and services required to support incident activities. - Develop portions of the Incident Action Plan and forward them to Planning Section. - Contracts for and purchases goods and services needed at the incident.	PUD role will likely be filled by: Chief Storekeeper, or Operations Coordinator
Finance/Admin Section Chief	- Responsible for financial and cost analysis. - Oversees contract negotiations. - Tracks personnel and equipment time. - Processes claims for accidents and injuries. - Works with logistics to ensure resources are produced.	Finance Manager/Treasurer

The PUD's Emergency Response Plan [ERP] was revised in 2021 to reflect the protocols of the ICS and NIMS systems so that the PUD can cooperate efficiently and effectively with local, state, and federal

agencies in an emergency. The ERP addresses some situations in which the PUD will be required to lead in an incident, such as a major water line break or a water treatment plant disaster. However, it is more likely that the PUD will be required to support other agencies by providing water for fire suppression, potable water for residents, or shutting down portions of the system to reduce damage.

Because the ERP may contain sensitive information, it will not be incorporated into the Water System Plan. The ERP will be stored in a secure location both in hard copy and on a secure server that is available in times of emergency.

6.5 Cross-Connection Control Program

Skagit PUD actively manages a Cross-Connection Control Program (CCCP) to protect the public water system from contamination. The CCCP, administered by the Cross-Connection Control Coordinator, includes monitoring, enforcement, and annual reporting to the Department of Health (DOH).

Washington Administrative Code 246-290-490 establishes the minimum requirements for public water systems to be protected from contamination via cross-connections. The authority to operate the CCCP is granted by PUD's Water Policy Manual 2004 Section 2.5.5, and the policies that meet or exceed the minimum requirements are described in the CCCP Manual.

PUD's responsibility for cross-connection control ends at the point of delivery to the consumer's water system. The responsibility for cross-connection within the consumer's water system lies with the Authority Having Jurisdiction (AHJ). The local authorities in PUD's service area include Skagit County and the cities of Burlington, Mount Vernon, and Sedro-Woolley. The CCCP Manual, adopted in 2020 and last updated in June 2023, includes policies such as premises isolation for non-residential connections, tying the agricultural rate to CCC compliance, and an incentive program for existing customers.

In 2020, PUD instituted an incentive program to provide financial assistance to a limited number of customers who are required to install backflow preventers at an existing water service location. Providing financial assistance to customers in these situations can benefit the PUD's efforts to protect the public water system. This assistance can reduce staff time enforcing cross-connection policy and may expedite the installation of backflow preventors at unprotected service locations.

PUD completes a Public Water System Cross-Connection Control Activities Annual Summary Report and submits this report to DOH. The report assists DOH and PUD in assessing the effectiveness of the CCCP.

6.6 Sanitary Survey Findings

The DOH Regional Engineer, with the cooperation of the PUD staff, conducts regular sanitary surveys of the Judy Reservoir water system. Erika Lindsey conducted the last sanitary survey on November 10, 2020; the results were presented in a report dated November 17, 2020. The previous sanitary survey was conducted five years prior, in 2015.

Five significant deficiencies and findings were observed. These deficiencies are listed below with associated remedies.

1. The combined overflow/drain line at the Big Lake Tank was submerged in standing water. Drainage was modified and improved to eliminate this standing water condition.
2. Several tanks had old-style vents that allowed rain, dust, and wind into the storage tank. The PUD has been designing, fabricating, and replacing these tank vents to comply with the 10 State Standards.
3. The Hermway Heights tank level indicated did not prevent contaminants from entering the storage tank. The PUD had Mt. Baker Silo install a new level indicator with a better seal.
4. A few storage tanks had screens larger than 24 mesh. The PUD has corrected these observed deficiencies.
5. The Bulson Tank has an access hatch that is difficult to assess. The PUD staff has modified the access hatch to improve the hatch seal.
6. The Skyridge Tank has a tar-based interior lining. This tank is intended to be removed from service by 2033 through an agreement with the City of Mount Vernon.

6.7 Recordkeeping, Reporting, and Customer Complaint Program

Historically, Skagit PUD has maintained several hard-copy file storage systems. The Engineering Department's Construction Order (CO) files catalog all construction-related projects. Administrative staff maintains financial and administrative files, including Commissioners' actions, meeting minutes, resolutions, and contracts. The Judy WTP keeps its files at the facility, including daily logs, water quality reports, and the Surface Water Treatment Protection Plan.

Recently, Skagit PUD transitioned to a primarily electronic-only file storage system. For physical assets, much of this information is now included in the Geographic Information System (GIS), which references all infrastructure for improved Asset Management Program implementation.

Procedures for records management, archive storage, file retention, and naming conventions are being developed. Despite a backlog due to the volume of information needing scanning, the goal is to make all documents electronically available.

6.8 Surface Water Treatment

Skagit PUD operates the Judy Water Treatment Plant, a multi-media direct filtration treatment plant that treats surface water from the Skagit River and four tributaries on Cultus Mountain. This facility is designed, operated, and maintained to meet the Surface Water Treatment Rule requirements.

6.8.1 Treatment Process

Judy Reservoir's water treatment involves chlorine pretreatment, coagulation, flocculation, filtration, disinfection, pH adjustment, and quality monitoring, ensuring safe distribution to the PUD's customers. Raw water undergoes initial disinfection with chlorine dioxide before being pumped to the control building for coagulation and filtration. After mixing, it enters two-stage flocculation basins and filtration through anthracite and sand media. Post-filtration, the water is disinfected with chlorine, pH adjusted with caustic soda and ammonia, and sent to three clearwells,

including a 3-million-gallon tank and two 1.22-million-gallon tanks. The treated water then travels by gravity to customers.

The operators alternate between filter basins to ensure continuous water production and perform regular filter backwashing to eliminate trapped solids. Backwash water is recycled through settling lagoons, with most water returned to the reservoir and settled solids disposed of off-site.

The operators employ various analyzers to monitor and optimize water quality throughout the treatment stages. These include monitors for coagulant dose, turbidity, particle count, chlorine levels, and pH. Routine grab samples assess chlorine, pH, temperature, turbidity, chlorite, color, and alkalinity.

6.8.2 Operation

The Judy WTP is semi-automated to allow unattended operation, although operators are on-site 24 hours per day, seven days per week. Operators work one of three shifts: day, swing, or night. Operators are directly responsible for the WTP operation while on duty. Operators must collect all pertinent readings and perform all lab checks, dosage checks, equipment inspections, routine operations and maintenance, and other tasks as assigned. Operators must fill out the Weekly Operator Checklist for their shift, record all chemical feed data, record all completed maintenance tasks in equipment logs, calculate and log CT at the end of the shift, and record a brief description of shift events on the daily calendar.

The WTP Superintendent schedules work shifts and oversees the day-to-day operation of the WTP. The control building at the WTP is centrally located, allowing operators to control and monitor WTP functions and receive WTP alarms. The control system includes trending software to log WTP processes and production data.

The WTP control system is facilitated by a supervisory control and data acquisition (SCADA) system, providing monitoring and alarm indication from remote water facilities, remote data logging, and control of specific functions at the remote sites.

6.8.3 Maintenance

Routine preventative maintenance on the Judy WTP is critical in maintaining a reliable water supply. Regular inspection, cleaning, and timely repairs help identify and address issues before they escalate into costly and potentially hazardous situations. This proactive approach not only extends the lifespan of the infrastructure but also enhances its efficiency and reliability.

6.9 Summary of O&M Program Expenditures

The Operation and Maintenance Program for our water utility is designed to ensure the sustainable management and reliable performance of the PUD water systems. The planned expenditures for the upcoming 11 years, presented in **Table 6-4** on page 6-18, are strategically allocated to address infrastructure upkeep, regulatory compliance, and system efficiency. Investments will be directed towards routine maintenance and infrastructure renewal that align with our commitment to providing

reliable and affordable water services. By prioritizing these expenditures, the PUD aims to uphold its service standards while adapting to our community's and the environment's evolving needs.

Table 6-2: Water Quality Monitoring Roadmap for 2025-2035							
Test Panel	Judy	Alger	Cedargrove	Marblemount	Potlatch	Rockport	Skagit View Village
Coliforms	100 samples / month	1 sample / month	1 sample / month	1 sample / month	1 sample / month	1 sample / month	1 sample / month
Lead& Copper	Standard 30 samples / 3 years	Standard 5 samples / 3 years	Standard 5 samples / 3 years	Standard 5 samples / 3 years	Standard 5 samples / 3 years	Standard 5 samples / 3 years	Standard 5 samples / 3 years
Arsenic	Waiver 1 sample / 9 years	Standard 1 sample / 3 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years
Asbestos	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years
DBPs	Reduced 4 samples / quarterly	Standard 1 sample / 3 years	Standard 1 sample / 3 years	N/A	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years
Nitrate	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years
IOC	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years
VOC	Waiver 1 sample / 6 years	Standard 1 sample / 3 years	Waiver 1 sample / 6 years	Waiver 1 sample / 6 years	Waiver 1 sample / 6 years	Waiver 1 sample / 6 years	Waiver 1 sample / 6 years
Herbicides	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years	Waiver 1 sample / 9 years
Pesticides	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years
Soil Fumigants	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years	Waiver 1 sample / 3 years
Radionuclides	Standard 1 sample / 6 years	Standard 1 sample / 6 years	Standard 1 sample / 6 years	Standard 1 sample / 6 years	Standard 1 sample / 6 years	Standard 1 sample / 6 years	Standard 1 sample / 6 years
PFAS	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years	Standard 1 sample / 3 years
UCMR	Standard 1 sample / 5 years	N/A	N/A	N/A	N/A	N/A	N/A

Table 6-4: 10-Year Operations & Maintenance Plan (in 2024 dollars)											
Description	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
District Headquarters											
HVAC Maintenance	40,000	40,000	45,000	45,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Shop Doorway Overhang	10,000	200,000									
District Headquarters Total:	\$ 50,000	\$ 240,000	\$ 45,000	\$ 45,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000
Judy WTP O&M											
Gilligan Creek Flow Control System		100,000									
Seismic Resiliency of WTP Infrastructure			100,000	500,000	100,000	500,000	100,000	500,000	100,000	500,000	100,000
Judy WTO O&M Total:	\$ -	\$ 100,000	\$ 100,000	\$ 500,000	\$ 100,000	\$ 500,000	\$ 100,000	\$ 500,000	\$ 100,000	\$ 500,000	\$ 100,000
Distribution System O&M											
Critical Facility Seismic Resiliency	400,000	125,000	410,000	125,000	410,000	125,000	410,000	125,000	410,000	125,000	410,000
PRV Rebuild	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Badger ORION Meter Transmitter Replacement	2,250,000	2,000,000	500,000	500,000	400,000	400,000	300,000	300,000	250,000	250,000	250,000
Distribution System O&M Total:	2,700,000	2,175,000	960,000	675,000	860,000	575,000	760,000	475,000	710,000	425,000	710,000
Storage Tank O&M											
Clearwell Recoating				1,658,000							
9th & Highland Storage Tank Recoating		900,000									
Storage Tank Recoating Program			250,000		250,000	250,000	250,000	250,000	250,000	250,000	250,000
Steel Storage Tank Cathodic Protection	90,000	33,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Seismic Resiliency of Storage Tank Infrastructure	205,000	75,000	410,000	75,000	410,000	75,000	410,000	75,000	410,000	75,000	410,000
Tank Diving Inspection and Repair	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Storage Tank O&M Total:	315,000	1,028,000	730,000	1,803,000	730,000	395,000	730,000	395,000	730,000	395,000	730,000
Pump Station O&M											
SRD Pump and Motor Refurbishment	500,000			500,000			500,000			500,000	
Nookachamp Hills Pump Refurbishment	25,000										
9th & Highland Pump Station Study			100,000								
Pump Station Rehabilitation		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Pump Station O&M Total:	525,000	50,000	150,000	550,000	50,000	50,000	550,000	50,000	50,000	550,000	50,000
Total Operation & Maintenance	\$ 3,590,000	\$ 3,593,000	\$ 1,985,000	\$ 3,573,000	\$ 1,790,000	\$ 1,570,000	\$ 2,190,000	\$ 1,470,000	\$ 1,640,000	\$ 1,920,000	\$ 1,640,000

7 DISTRIBUTION FACILITY DESIGN AND CONSTRUCTION STANDARDS

The PUD’s Water Policy Manual describes the water system design and construction standards and the PUD’s policies, procedures, and processes for extensions and improvements to the water system infrastructure. PUD staff also use these standards to provide water service requirements and plan review and approval. The current versions of the Water Policy Manual, Standard General Notes, and Design Standards are available on the Skagit PUD website. **Appendix F** provides links to these documents.

7.1 Project Review Procedures

When a new project is submitted, all the documents must meet the requirements of the Plan Review Checklist before being reviewed by an Engineering Technician. Plans are submitted electronically in a “flattened native” PDF format (created directly from an electronic version rather than from print).

In the case of a project that includes the design of multiple utilities, the PUD requires that the design of the water distribution facilities be provided separately from the other utilities.

After review and acceptance of the documents, the cover sheets will receive a Plan Approval stamp from the Engineering Manager with his signature.

7.2 Policies and Requirements for Outside Parties

Policies and requirements for developers and other outside parties are presented in the Water Policy Manual and are summarized in Standard Operating Procedures [SOPs].

The benefited party pays for the design and construction of water system extensions. Before construction, the PUD approves all plans for extensions, improvements, or additions to water facilities. The PUD policies and requirements guide civil engineers and developers when developing plans for PUD review.

7.3 Design and Construction Standards

Design and construction standards at Skagit PUD are derived from published standards and local experience. The PUD design standards and construction practices aim to provide facility longevity and reduced life-cycle costs, improving system reliability and resiliency. The following is a discussion regarding standards for water mains, storage tanks, and pump stations.

7.3.1 Design and Construction Standards for Water Mains

Design and construction standards for potable water pipelines are well-documented. Standard details have been developed for appurtenance installations. A principal resource is Chapter 6 of the Water System Design Manual (DOH Publication 331-123).

7.3.1.1 Pipeline Materials

Through the decades, the PUD has used or allowed a variety of pipe materials. Some have proven effective, while others have experienced reduced longevity and early replacement. The PUD's Water Policy Manual outlines standard material and construction specifications. The design standards and material/construction specifications are the minimum allowed, with the potential for more stringent requirements based on the project's integration into the overall water system development.

Acceptable pipeline materials include cement-lined ductile iron, welded steel, HDPE, and C-900 and C-909 PVC pipe. Rehau PEX tubing and bronze fitting are used for small-diameter service lines up to 2 inches in diameter. Pipeline materials that have been historically used but are no longer allowed include asbestos concrete, thin-wall PVC or other plastics, bar-wrapped concrete cylinder, galvanized iron, and copper. Lead pipe has never been used in the PUD water system.

Some soils in the Skagit Valley are corrosive and prematurely degrade ductile iron pipe. To prevent premature pipe degradation, corrosivity surveys are conducted during project design. Sometimes, active or passive corrosion reduction measures are employed.

All pipe, fittings, and appurtenances are required to be ANSI/NSF Standard 61 certified material.

Pipe bedding shall meet the requirements of Section 9-03.12(3) of the WSDOT Standard Specifications. Installing pipelines with a minimum of 3 feet of cover and a maximum depth of 5 feet is desirable. This practice typically allows small-diameter storm drains to be above and sanitary sewer lines to be below the water pipeline. Water pipelines must be at least 10 feet from sanitary sewer lines, and it is desirable to be 5 feet from other utilities.

7.3.1.2 Minimum Pipe Size

The minimum pipeline size is 8-inch diameter. The PUD's Engineering Department must approve a pipe size smaller than 8-inch diameter. Criteria for smaller pipe size include:

- Acceptable pipeline velocities demonstrated through a hydraulic analysis
- There is no fire hydrant connection
- No ability for pipeline extensions

Refer to the Water Policy Manual for specific issues related to waterline construction as they pertain to new development.

7.3.1.3 Pressures

The PUD has a desirable and allowable pressure range for all new connections, as measured at the water meter. The desired pressure is between 40 and 80 psi. However, system pressure at the meters is allowed to be 30 psi under normal operation conditions. System pressures are allowed to drop to 20 psi under emergency or firefighting conditions.

Due to local topography, some water pipelines can experience pressures approaching 125 psi. Individual pressure-reducing valves are required on each service connection if the system pressure is greater than 80 psi at the water meter.

Under firefighting conditions, a minimum of 20 psi must be maintained at the nearest fire hydrant and throughout the distribution system.

To prevent damage from asymmetric pressure forces, concrete thrust blocks or restrained joints are required for mechanical joint fittings and pipe joints 60 feet on each leg of the fitting.

7.3.1.4 Valves

Water valves are usually placed on each of the legs of a tee or a cross fitting, depending on the location of nearby valves. The minimum spacing is 2,000 feet.

Air and vacuum relief valves shall be placed at local high points in the water line and locations as directed by the Engineering Manager. Also, blow-offs or hydrants are required at the end on dead-end lines. The size of the valve shall be proportional to the size of the pipeline.

Backflow prevention assemblies are required for all non-residential connections and services that have been determined to provide a potential risk of backflow. The PUD's cross-connection program is discussed in more detail in Section 6-5.

Pressure-reducing valves and other control valves have been standardized using Cla-Val products. The PUD crews are trained to perform routine maintenance on Cla-Val PRVs.

Other specific valve location requirements are provided in the Water Policy Manual.

7.3.1.5 Fire Protection

Although already addressed in the Water Policy Manual, fire suppression requires a specific discussion because it is tied to the Coordinated Water System Plan's Regional Supplement. Fire suppression by fire hydrants or by other means shall be as required by the Fire Marshall for the County or respective Cities. The Fire Marshall shall determine Fire hydrant spacing using **Table 7-1** on page 7-4 as a minimum standard. The cost of each hydrant installation required by the Fire Marshall for a customer project shall be borne totally by that customer. The cost for each new hydrant installation required by the Fire Marshall for a PUD-sponsored waterline replacement project shall be borne by Skagit PUD. The cost of each additional fire hydrant requested by another party outside of the Fire Marshall requirements shall be borne by that party.

Table 7-1: Minimum Fire Flow and Hydrant Spacing

Minimum Fire Flow Design Standards For New And Expanding Water Systems ⁽¹⁾			
Land Use Designations Or Densities	Minimum Fire Flow (Gallons Per Minute)	Minimum Duration (Minutes)	Maximum Hydrant Spacing (Feet)
Urban Growth Areas ⁽²⁾			
Industrial	1500	60	⁽³⁾
Commercial	1500	60	⁽³⁾
Multi-Family Residential	1500	60	500
Single-Family & Duplex Residential	1000	60	500
Non-Urban Growth Areas			
Commercial / Industrial	1500 ⁽⁴⁾	60 ⁽⁴⁾	⁽⁴⁾
1 Dwelling Unit Per Lot Less Than 2.5 Acres	500 ⁽⁵⁾	30 ⁽⁵⁾	900 ⁽⁵⁾
1 Dwelling Unit Per Lot 2.5 Acres Or Larger	NONE ⁽⁵⁾	NONE ⁽⁵⁾	NONE ^{(5), (6)}
Natural Resource Lands	NONE ⁽⁵⁾	NONE ⁽⁵⁾	^{(5), (6)}

- (1) The design standards may be amended to reflect changes to Comprehensive Plan land use designations and/or their densities. Proposed amendments will be presented to the Skagit County CWSP WUCC for approval.
- (2) These criteria establish a minimum water system design standard. Each water system in an urban growth area must comply with the standards of the local government with jurisdiction. When there are different or conflicting standards, the most stringent standard shall apply. Prior to the issuance of a development permit, the approving authority shall establish fire flow, duration, and hydrant spacing requirements.
- (3) As determined by the appropriate fire official.
- (4) Fire flow for individual buildings or groups of buildings is to be determined by the Skagit County Fire Marshal per Uniform Fire Code Appendix IIIA and the Skagit County Fire Marshal policy on fire flow. The application of lesser or alternative standards shall be in accordance with Section 4.3.5 (Interpretation of Standards).
- (5) Fire flow will be required for a Conservation and Reserve Development (CaRD) land division as follows.

CaRD Characteristics	Fire Flow Requirement
5 or more lots	Option 1: Fire flow of 500 gpm for 30 minutes with hydrant spacing of 900 ft. or, Option 2: Fire Marshal approved fire prevention water system that provides adequate pressure and flow to support NFPA 13D sprinkler systems is required for all residential dwellings. In addition, if the property is located in an Industrial Forest, Secondary Forest, or Rural Resource designated land the fire protection requirements as listed in Skagit County Code 14.04.190(14)(b)(iii)(b-e) also apply.
4 or fewer lots	None required, unless the property is located in an Industrial Forest, Secondary Forest, or Rural Resource designated land. If the property is located in such designated land the fire protection requirements as listed in Skagit County Code 14.04.190(14)(b)(iii)(b-e) apply. However, NFPA 13D sprinklers are only applicable to residential dwellings.

As of the effective date of the CWSP, where in-fill development or extension of an existing water system occurs to serve an existing platted lot, the Skagit County Fire Marshal may limit the requirement for fire flow or fire suppression in accordance with Table 4-1 to the newly developed lot only. Group B public systems may choose to separate the fire flow from water flow. Separate tank and hydrant(s) location is subject to Skagit County Fire Marshal approval.

- (6) Hydrants shall be installed when water lines are installed or replaced and are capable of supplying a tanker truck with a minimum of 500 gallons per minute at a minimum residual pressure of 20 psi. Tanker truck filling hydrants are to be located at major roadway intersections and along roads at a spacing not to exceed one mile to assist in fire protection.

7.3.1.6 Pipeline Testing

The PUD has construction standards for testing pipelines before acceptance and connection to the water system. These standards include disinfection, flushing, hydrostatic pressure testing, and bacteriological sampling and testing.

To protect sensitive aquatic environments, the PUD has requirements regarding water discharge during events such as water line flushing and draining. The standards involve de-chlorinating the water to a chlorine concentration of 0.1 ppm or less using sodium thiosulfate or ascorbic acid (vitamin C) and discharging it to either a storm sewer or a sanitary sewer. Where possible, discharges to a sanitary sewer are preferred because of the neutralizing capabilities of the organic matter in the sewer.

Upon project completion, and as part of the acceptance process, Record Drawings shall be prepared by the Engineer of Record based on notes and records provided by the contractor and PUD staff.

7.3.2 Design and Construction Standards for Storage Tanks

Design and construction standards for potable water storage tanks are well-documented and widely accepted. The American Water Works Association (AWWA) provides comprehensive guidelines in their manual M42. This manual covers the selection, design, construction, maintenance, inspection, and repair of steel tanks for potable water storage. It assists in tank sizing, configuration, site selection, design, operation, and maintenance.

For prestressed concrete tanks, ISO 18407:2018 provides guidelines for the planning, designing, and constructing a cylindrical tank for use with potable water. These standards ensure the safety and longevity of water storage tanks, contributing to public health and infrastructure reliability.

New storage tanks can have an impact on the existing water system. Considerable planning and design are necessary to ensure the new facility meets its intended purpose. The PUD has minimum design standards for storage tanks but will require additional design criteria to meet the overall level of service goals. For example, a steel tank may be less expensive, but the PUD may require a concrete tank to reduce ongoing maintenance costs. In past projects, PUD staff have provided direct input on the facility design basis to ensure overall project goals are reached.

The following are general guidelines the PUD considers when planning a new storage tank. In addition to site-specific needs and constraints, other design parameters depend on specific project requirements, local regulations, and the characteristics of the water system.

The topography of the service area typically determines storage tank location. Tanks are usually placed at the highest point in the area to utilize gravity for water distribution. The site should be easily accessible for maintenance and have a stable foundation.

A service area map showing the elevations of all service connections is essential for designing the storage tank, as it estimates system pressures and the height at which the tank should be placed. The overflow elevation is the maximum height at which water can be stored in the tank, while the bottom

of the equalizing storage sets the pressure zone hydraulic grade line. Ideally, the tank base is at an elevation that eliminates dead storage. These elevations are critical for maintaining desirable water pressure in the distribution system.

The storage tank capacity is determined based on the service area's average and peak water demand, fire flow requirements, standby storage requirements, and the volume of water the source can supply during peak demand periods. The tank should be large enough to meet these requirements while minimizing fluctuations in distribution system pressures.

Hydraulic analysis involves using computer models to simulate the operation of the water system under various conditions. This analysis helps evaluate the impact of the storage tank on the system's performance and in designing the tank and the associated infrastructure.

Level control systems maintain the water level within the operating storage [OS]. Alarms alert operators to abnormal conditions such as high or low water levels. SCADA systems provide remote monitoring capabilities, allowing operators to monitor the water level and collect data for analysis and reporting.

The tank residence time can affect water quality. A water quality monitoring program is essential to reduce the likelihood of water quality degradation.

7.3.3 Design and Construction Standards for Pump Stations

The following are general guidelines the PUD considers when planning a new pump station. In addition to site-specific needs and constraints, other design parameters depend on specific project requirements, local regulations, and the characteristics of the water system.

The location of pump stations is crucial for the efficiency and effectiveness of the water system. They are typically situated at low points at the source of the water supply, such as a storage tank or transmission pipeline. The site should be easily accessible for maintenance and repair. It's also essential to consider flood risk, geological conditions, and proximity to 3-phase power sources.

A pump station capacity is determined based on the peak demand of the water system it serves. This capacity includes consideration of daily and seasonal variations in water usage, fire flow requirements, and future growth projections. Pump stations are designed to meet the maximum demand, with the largest pump out of service, to allow for maintenance and unexpected pump failures.

A hydraulic analysis is essential to evaluate the impact of pump station operation on the pressure zones. This analysis uses the PUD's Innovzye hydraulic modeling software to simulate various operating conditions and scenarios, including peak demand, fire flow, and power outage situations. The analysis helps determine the optimal pump size, control strategy, and system configuration to ensure reliable and efficient operation.

Flow and pressure control are critical for maintaining the reliability of the water delivery system and are often integrated with storage tanks. These controls involve valves, meters, and motor control systems to regulate the flow rate and pressure within the distribution network. Control systems include monitoring and adjusting the operation of the pump station to respond to changes in demand and operating conditions. These controls can be achieved through manual controls or automated systems.

Pump station controls, status, and alarms need to be integrated into the PUD's SCADA system for essential monitoring and responding to potential problems. Alarms alert operators to abnormal conditions such as high or low pressures, pump failures, and power outages. The PUD's SCADA system provides remote monitoring and control capabilities, allowing operators to monitor system performance, control pumps and valves, and collect data for analysis and reporting.

7.4 Construction Certification

Skagit PUD intends to implement the Project Report and Construction Document submittal exceptions authorized under WAC 246-290-125 through continued use of standard construction specifications for distribution mains and design and construction standards for distribution-related projects. As described in the text above:

- The project will be constructed under the direct supervision of a PUD inspector and using the PUD's construction standards.
- Construction inspection procedures, including pressure test and disinfection procedures, if applicable, and water quality sampling requirements will be appropriately performed.
- Design and construction record drawings will be prepared and retained as required.
- Construction completion forms will be completed for each project and signed by the Engineering Manager.

8 CAPITAL IMPROVEMENT PROGRAM

This Capital Improvement Plan [CIP] is a tool prepared by Skagit PUD to create a long-term plan for capital improvements and rates for the Judy System and all satellite systems, and provides the following benefits:

- Applying PUD strategic goals and objectives,
- Developing rate structures that balance resiliency, affordability, and financial prudence,
- Synchronize operating and capital budgets, and
- Inform ratepayers of PUD investments.

Capital planning allows the PUD to conduct efficient planning, execution, and completion of capital projects that provide long-term benefits to our customers.

Skagit PUD completed several projects listed in the 2013 Water System Plan and the 2020 Water System Plan Amendment. These projects are listed in **Table 8-1**.

Table 8-1: Completed Projects from 2015 through 2023

No.	Project Description	Completed
P-1	Fir Island Road Pipeline Replacement	2015
P-2	Josh Wilson Road Improvements	2017
P-3	North 30 th Street and Digby Road Pipeline	2016
P-5	McLean Road Pipeline Replacement	2019
P-6	Best Road Pipeline Replacement	2019
R-1	East Division Street Reservoir and Pump Station	2018
FO-1	Josh Wilson Road Fiber	2017
O-2	Dukes Hill Pump Station	2015
O-3	Cedar Hills Booster Station Replacement	2015
O-4	WTP Chemical Feed System Replacement	2017
	Township Street Pipeline Replacement	2018
MP-5	McLean Road Pipeline Replacement – Phase 1	2018
MP-5	McLean Road Pipeline Replacement – Phase 2	2019
MP-6	Best Road Pipeline Replacement	2019
	Mountain View Road Pipeline Extension	2020
	Fir Street and North 18 th Street pipeline Replacement	2020

MO20-8	Flocculator Motor Replacement and Drive Box Refurbishment	2021
MO20-1	Raw Water Pump Station Replacement	2022
MO20-10	Concrete Maintenance – Crack Injection & Caulking	2022
MP13-7	Burkland/Cedardale Road Pipeline	2022
MT13-4	Judy Reservoir to Mount Vernon Transmission Pipeline - Phase 2	2023
MO13-6	Chlorine Scrubber Replacement	2023
MO20-9	Clearwell 3 Roof Recoating	2023
MP20-3	Sky Ridge Pipeline Replacement	2023

8.1 Prioritization

The selection and prioritization of capital projects play a critical role in the strategic growth and sustainability of the PUD. These decisions, often involving substantial financial investments, have long-term implications on the organization’s operational efficiency, level of service, and overall performance. This section discusses the strategic objectives, competing values, and planning criteria for selecting and prioritizing capital projects. The discussion underscores the importance of balancing cost-effectiveness, risk mitigation, regulatory compliance, and stakeholder interests in this critical decision-making process.

8.1.1 Strategic Objectives

The strategic objectives of capital project prioritization are multifaceted. The primary goal is to minimize overall costs. Careful planning and efficient execution of projects avoid unnecessary expenditures. Maintaining the established Level of Service (LoS) is also crucial. It ensures that the quality of service provided to the end-users is not compromised during or after the implementation of the project.

Risk mitigation is another significant objective. It is essential to identify and mitigate unacceptable risks that could jeopardize the project or its outcomes. These include financial and operational risks and risks associated with the project’s impact on the environment and the community.

Stabilizing rate increases and lowering loan and bond interest rates are financial objectives to ensure the project’s economic viability. By stabilizing rate increases, organizations can avoid sudden hikes in service rates that could burden our customers. Similarly, securing lower interest rates for loans and bonds can significantly reduce the cost of financing projects.

8.1.2 Balancing Competing Values

Balancing competing values is a complex task in capital project prioritization. As infrastructure ages, the risk, or probability, of failure increases. However, replacing or upgrading infrastructure involves costs. Therefore, balancing the expected savings from the reduced likelihood of failure against the project’s costs is necessary.

Rate increases are often necessary to fund capital projects. However, there is a need to balance these against the customers' tolerance to rate increases. Excessive rate hikes can lead to customer dissatisfaction.

Regulatory requirements and constraints also play a significant role in project prioritization. Projects must comply with all relevant regulations, and potential regulatory consequences must be considered during prioritization.

8.1.3 Planning Criteria:

The planning criteria for capital project prioritization include expected risk mitigation, safety, infrastructure criticality, and regulatory consequences. Expected risk mitigation involves assessing how much the project will reduce the risk of infrastructure failure.

Safety is a paramount concern. Projects that enhance the safety of the infrastructure and the customer or PUD staff are given high priority. Infrastructure criticality - the essentiality of the service provided - also influences project prioritization. Infrastructure critical to maintaining the Level of Service is often given higher priority.

Finally, regulatory consequences are a crucial planning criterion. Projects that help the organization comply with regulatory requirements and avoid potential regulatory penalties are given high priority.

8.1.4 Priority Criteria

The criteria typically used by the PUD include the following:

- **Capacity** – Does the project expand or improve the water system's capacity?
- **Quality** – Does the project improve the quality of the water supply?
- **Reliability / Resiliency** – Does the project improve the reliability or resiliency of the water system?
- **End of Life** – Does the project replace infrastructure at the end of its useful life or show signs of failure? Is the project upgraded with new technologies?
- **Flexibility** – Does the project improve operational flexibility?
- **Agency Mandate** – Is this project required by another agency or mandated through a franchise requirement?

In conclusion, capital project prioritization is a complex process that involves balancing various strategic objectives, competing values, and planning criteria. It requires careful planning, risk management, and stakeholder engagement within limited resources to successfully implement capital projects.

8.2 Capital Improvement Program

Major CIP projects include the construction of new and expanded infrastructure. Typical infrastructure projects include water supply and treatment, transmission and distribution pipelines, storage tanks, pump stations, and fiber communication networks.

Major CIP projects are developed based on two planning frameworks:

- **WSP Capacity Analysis:** As described in **Chapter 3**, source, storage, and distribution facilities were analyzed to determine whether they have sufficient capacity to meet current and future demands. When deficiencies were identified, CIP projects were developed to rectify them.
- **Condition Assessment:** PUD staff and consultants identify facilities and infrastructure near the end of their useful life. Characteristics of end-of-life include equipment failure, pipeline leaks and breaks, and increased maintenance, resulting in facilities and infrastructure that no longer function as intended.

Maintenance costs are routine expenses that keep assets in their original or intended operating condition. On the other hand, capital projects are large-scale projects that require a significant amount of capital expenditure. These projects are investments made to increase the value of the assets. Common capital expenditure projects for the PUD include constructing or replacing water pipelines, storage tanks, and pump stations, implementing facility modifications to increase reliability, and implementing new technologies to improve operations.

The list of CIP projects through the year 2034 is summarized in **Table 8-2** (page 8-18). In addition to the projects planned as part of the water system capacity analysis or condition assessments, some “future” projects are identified to be undertaken from 2035 through 2046. These CIP projects are summarized in **Table 8-3** (page 8-20).

Some projects are not anticipated to be completed by the PUD but are intended to be driven by outside entities and financed through outside funding such as state or federal loans or grants, private funding from developers, or a Local Utility District (LUD) process. These projects are identified in this Water System Plan, so they are open to potential funding sources if they commence within the current planning period.

8.2.1 Distribution Pipeline Program

Skagit PUD’s distribution system is aging, and several older pipes are undersized for their service requirements. As a result, replacing existing pipelines is the primary focus of the projects described in this section. Skagit PUD is also refining its process for selecting replacement pipelines based on a business risk exposure model currently being developed using asset management tools. The following pipeline replacement projects are being considered.

MP13-8 North Fork Skagit River Crossing

This project is in rural Skagit County, on the North Fork of the Skagit River between Pleasant Ridge and Fir Island. Currently, the PUD does not have a crossing of the North Fork to connect the water pipelines on Fir Island and Pleasant Ridge. This limitation results in unnecessary shutdowns during periods of construction or leak repair. A new crossing of the North Fork would loop the PUD’s system in this area so that water can be delivered from different directions and reduce the need for system shutdowns and flushing of dead-end lines. Skagit County is proposing to replace the North Fork Bridge at an unspecified future date. The new water line could be built as part of constructing a new bridge

across the Skagit River. However, Skagit PUD may prefer to install a subsurface crossing of the river so that any future issues with the bridge will not impact the water pipeline.

MP20-2 Bored and Cased Crossings

This project comprises of six crossings underneath State Routes 9 and 20. Each crossing will be bored and jacked, and the existing undersized water lines must be replaced. The crossings are distributed between the cities of Burlington and Sedro-Woolley and the community of Clear Lake.

These crossings were postponed until the PUD implemented its asset-based model for selecting pipeline replacement projects.

MP20-4 College Way Pipeline Replacement

This project replaces the existing water pipeline along East College Way from Urban Avenue to North LaVenture Road. The land use along this major arterial is primarily commercial. In addition to the new pipeline installation, numerous tie-ins will be required at side streets, fire services, and large meters. The crossing under the BNSF railroad will also be upgraded. Existing pipelines in this area consist of 8-inch AC pipes installed in the 1960s and 1970s.

MP20-5 Skagit County Club Pipeline Replacement

This project replaces existing pipelines in a residential area in the Skagit Golf & Country Club development. Pipeline replacement will occur on Eagle Drive and Country Club Drive. Existing pipelines in this area consist of approximately 10,900 LF of small-diameter plastic and AC pipe installed in the 1960s and 1970s, including 200 services.

MP20-6 North Burlington Pipeline Replacement

This project replaces existing pipelines in a residential and commercial area in northwest Burlington. Pipeline replacement will occur on Avon Avenue (SR 20), N. Spruce Street, S. Alder Street, N. & S. Walnut Street, N. Oak Street, N. Cherry Street, N. Pine Street, N. Anacortes Street, and Magnolia Avenue. Existing pipelines in this area consist of approximately 7,600 LF of small-diameter pipe installed in the 1960s and 1970s, including 127 services.

MP20-7 Belmont / Clarmont Pipeline Replacement

This project replaces existing pipelines on Belmont Terrace, Claremont Place, E. Montgomery Street, and N. 18th Street in Mount Vernon. Existing pipelines in this area consist of approximately 3,000 LF of small-diameter AC and PVC pipes installed in the 1950s and 1960s.

This pipeline replacement project was postponed until the PUD implemented its asset-based model for selecting pipeline replacement projects.

MP20-9 Peterson Road Pipeline Replacement

This project replaces a pipeline along Peterson Road from Avon Allen Road to Pulver Road in Skagit County, west of Burlington. The existing pipeline along this road is approximately 4,500 LF of 6-inch AC pipe installed in 1958.

This pipeline replacement project was postponed until the PUD implemented its asset-based model for selecting pipeline replacement projects.

MP20-10 Hillcrest Community Pipeline Replacement

This project replaces existing water pipelines along S. 10th Street, S. 11th Street, S. 12th Street, S. 13th Street, Hazel Street, and Section Street within the Hillcrest area of Mount Vernon. Existing pipelines in this area consist of small-diameter AC, PVC, and cast-iron pipes installed in the 1940s and 1950s. The pipeline length is approximately 6,400 LF.

MP20-11 Bayview Community Pipeline Replacement

This project replaces existing water pipelines along Second Street, Third Street, B Street, and E Street within the Bayview community in Skagit County. Existing pipelines in this area consist of small-diameter AC and plastic pipes originally installed in the 1960s.

This pipeline replacement project was postponed until the PUD implemented its asset-based model for selecting pipeline replacement projects.

MP24-1 Conway Community Pipeline Replacement

This project is in rural Skagit County, in the Conway community. The project will replace an existing 3-inch, 6-inch, and 8-inch pipeline installed in the 1960s to improve system pressures and capacity to the Conway area and Fir Island. The existing pipe is undersized, which creates a bottleneck in delivering adequate capacity to these service areas. The new pipelines will connect the 12-inch PVC pipeline under I-5, installed in 2019, and the 14-inch HDPE pipeline on Fir Island Road, installed in 2014. The project will also provide a second crossing of the Skagit River to Fir Island.

MP24-2 Alta Vista Pipeline Replacement

This project is in rural Skagit County along SR-20 between Burlington and Sedro-Woolley. The project will replace 3,400 LF of existing 2-inch plastic and 4-inch and 6-inch AC pipelines installed in 1955. Pipeline replacement will occur on Alto Vista Drive, Vista View Drive, Plaza Drive, and SR-20. The completed project will improve this 56-lot development's capacity and reliability.

MP24-3 East Division Street Pipeline Replacement

This project replaces existing pipelines along East Division Street and Mount Vernon Big Lake Road. The small-diameter pipes in this area limit the pipeline's capacity on Mountain View Road. The existing pipes comprise 1,400 LF of 4-inch AC and 6-inch PVC pipelines. The replacement pipeline will be 12-inch C909 PVC.

MP24-4 Ball Road Pipeline Replacement

This project is in rural Skagit County along the southerly extension of Ball Road. The existing 12-inch ductile iron pipeline is deteriorating due to corrosive soil. Other pipeline segments have already been replaced. The pipeline length is approximately 1,350 LF.

MP24-5 South Mount Vernon Pressure Zone Realignment

The PUD currently leases property from the City of Mount Vernon for the Little Mountain Storage Tank. The PUD and City have mutually agreed to terminate the lease in the next 10 years. Therefore, the Little Mountain Tank will need to be removed, and the pressure zone will need to be supported by other hydraulic means.

This project may also be an opportunity to combine three isolated service areas into one contiguous pressure zone. The service areas include the Skyridge 465 PZ, the Cedar Hills 450 PZ, and the East Blackburn 475 PZ. Possible sources include a new PRV from the Eaglemont 560 PZ or a new pump station from the Division Street 330 PZ. There are several options to address a variety of goals. Therefore, an extensive predesign phase exploring pipeline routes and pump station options is needed to refine this project's scope.

MP24-6 Sedro-Woolley Central Area Pipeline Replacement

This project replaces existing water pipelines along Talcott Street, Nelson Street, and Bennett Street within Sedro-Woolley near Central Elementary and Mary Pursell Elementary schools. Existing pipelines in this area consist of small-diameter AC, PVC, and cast-iron pipes installed in the 1940s, 1950s, and 1960s. The increase in pipe size will also increase the fire flow potential in this service area. The pipeline length is approximately 5,000 LF.

MP24-7 East Victoria Street Pipeline Replacement

This project is in Burlington. The existing 4-inch AC pipeline, installed in 1956, is deteriorating and has experienced several leaks. More of the other pipelines in this area have already been replaced. PUD crews will install a new 8-inch DI pipeline. The pipeline length is approximately 620 LF.

MP24-8 Annual Pipe Replacement Infill

As the PUD's pipes age, additional pipelines will show increased leaks and require increased maintenance. Approximately \$2,000,000 to \$4,000,000 per year is set aside to address the replacement of these pipelines.

8.2.2 Transmission Pipeline Program

Transmission pipelines provide the backbone for the Judy distribution system. Transmission pipelines are typically larger than 14 inches, convey water from the PUD's Judy WTP, and have limited direct connections. The following are proposed transmission pipeline projects.

MT13-9 Sedro Woolley Transmission Line – Phase 3 (River Crossing)

This project replaces the existing aerial crossing over the Skagit River from South Skagit Highway to River Road east of Sedro-Woolley. The 20-inch aerial pipeline, installed in 1957, may reach its hydraulic capacity within the next decade, depending on growth and water demand within the service area north of the Skagit River. The new pipeline size, alignment, and installation method (aerial or boring) have not been determined.

Stantec inspected the pipe bridge in 2022. A February 10, 2023, report summarized the inspection procedure and assessment conclusions. The structure was observed to be in overall good structural condition. The assessment team proposed both reactive and proactive recommendations. The conclusion is that preventative measures and repairs will extend the structure’s useful life. Skagit PUD is proceeding with recommended corrective measures. One aspect that was not assessed was the earthquake resiliency of the structure, which may be evaluated in a future seismic study.

MT20-1 Sedro Woolley Transmission Line – Phase 2 (Top of Hill)

This project replaces an existing 20-inch and 30-inch transmission pipeline, installed in 1970, from the WTP to the southerly terminus of the 36-inch Emergency Repair pipeline (Phase 1) installed in 2015. There is anecdotal evidence that this transmission pipeline may be leaking near the Chain Lakes area. This potential leak will be investigated further using leak detection equipment and in-pipe hydroponic investigation.

This phase incorporates approximately 6,500 LF of 36-inch welded-steel transmission pipeline.

MT20-2 Sedro Woolley Transmission Line – Phase 4 (N. Side of River)

This project replaces a transmission pipeline from the Skagit River crossing into Sedro-Woolley. This phase incorporates an undetermined length of transmission pipeline. There is no evidence that this pipeline segment needs to be addressed in the 10-year time horizon.

8.2.3 Agency-Driven Relocation

Every year, cities, Skagit County, and WSDOT make roadway improvements that impact the PUD’s water facilities. Often, the PUD must move or replace its water pipelines to accommodate roadway improvements. Fish passage projects have recently instigated several pipeline relocation projects to accommodate the replacement of existing culverts with fish passage structures. Known agency-driven projects are listed in the CIP project tables.

8.2.4 Pipeline Extension Projects

As a policy, Skagit PUD does not pursue projects that expand the retail service area to increase its customer base. Water pipeline extensions are proposed by developers and communities that form a Local Utility District [LUD]. In recent years, however, the Washington State legislature has shown an interest in funding water pipeline extension projects to serve areas with limited or no access to water resulting from the well drilling moratorium in the Skagit River basin. Therefore, the PUD developed several pipeline extension concepts that would serve piped water to rural areas of Skagit County that are impacted by the well moratorium. These new retail service areas are described below.

MP20-1 Little Mountain Road Pipeline

This project addresses limited water availability in an area affected by minimum instream flows on the Skagit River basin. Skagit PUD has requested state capital budget funds to help residents access a legally available water source. Existing groundwater users may also connect to the pipeline, which would reduce impacts to tributary instream flows. The Little Mountain Road Pipeline project is the first opportunity for the PUD to address this problem. The project begins in the southeast corner of

the City of Mount Vernon, and it extends approximately 2.9 miles east through unincorporated Skagit County to the Big Lake service area, connecting to another existing part of the PUD's water system. The project will install a 12-inch water main along Little Mountain Road and Blackburn Road. There are approximately 32 vacant properties adjacent to the proposed waterline, and it is estimated that approximately 68 new homes could be constructed if landowners fully developed their properties.

In 2019, the State legislature funded the project's design and public outreach phases, which are completed. Skagit PUD is currently pursuing state funding for the project's construction phase, which is estimated to cost approximately \$9 million.

MP20-12 Conway to Lake McMurray Extension

Most of Lake McMurray's community is not served by a community water system. The property owners have either shallow wells or direct connections to the lake. A pipeline installed along State Route 534 starting at English Road would provide the Lake McMurray community water from the Judy System. The pipeline length is approximately 17,000 LF. The pipeline could directly serve 27 existing homes and 135 potential new homes along the route, in addition to the homes and businesses in the Lake McMurray community.

MP20-13 South Conway Extension

Skagit PUD has dead-end pipelines on Cedardale Road and Bulson Road on the southern extent of the Judy System. The property owners in this area are currently served through individual wells. Skagit River instream flow regulations severely restrict water availability for new developments. A pipeline installed along Cedardale Road, Starbird Road, and Bulson Road would complete this pipeline loop. One or more pump stations and possibly a storage tank will be necessary to serve water to this higher elevation area. The pipeline length is approximately 27,000 LF. The pipeline could directly serve 78 existing homes, 38 vacant lots, and 74 potential new homes along the route.

MP20-14 Bow Hill to Alger

The Community of Alger is served by the PUD's Alger Water System, which is supplied by a single well. A pipeline extension from the Bow Hill Pump Station could connect this system to the Judy System. The Alger system would be consolidated with the Judy System. The pipeline length is approximately 23,000 LF.

8.2.5 Water Treatment Plant Projects

Skagit PUD owns and operates several water treatment facilities. The largest facility is the Judy Water Treatment Plant [WTP], located adjacent to Judy Reservoir, which provides potable water to the Judy distribution system (PWS ID#79500E). This WTP is a direct filtration plant initially commissioned in 1990 with a significant expansion in 2008.

MO20-2 Emergency Generator Replacement

The existing emergency engine generator is over 30 years old and undersized to the current connected electrical loads at the Judy WTP. Having a backup emergency generator for WTP operations is crucial for ensuring the continuity of water treatment and delivery during power outages. In a windstorm or

other natural disaster, a loss of power can have severe consequences for public safety and health. A backup generator can provide a reliable source of electricity to keep critical systems running.

In addition to providing essential services during emergencies, backup generators can help utilities maintain their operations during planned power outages or maintenance work. This backup can help minimize customer disruptions and reduce the risk of equipment damage or data loss. Overall, having a backup emergency generator for utility operations is an essential investment in resilience and preparedness.

A Project Report for the standby generator was completed on February 15, 2022. A new 1,275 kW engine generator will be installed at the Judy WTP to provide backup electricity for the Judy WTP and associated pump stations. The generator design began in 2024, and construction is anticipated to be completed by the end of 2025.

MO20-3 Potlatch Reverse Osmosis (RO) Replacement

Skagit PUD's Potlatch Beach water system (PWS ID#69034L) utilizes reverse osmosis treatment to remove salt from a brackish water well. The existing RO plant is over 20 years old and near the end of its useful life. A new, smaller RO treatment unit will utilize the latest high-efficiency reverse osmosis technology.

MO20-5 Dedicated Power Feed

The PUD's Skagit River Diversion (SRD) Pump Station's power feed is limited, hindering full capacity utilization and optimal electrical rate structure. The Judy WTP's power supply can be unreliable, particularly during winter storms.

Two solutions are being considered for a dedicated, reliable electrical service to the Judy WTP. The first involves Puget Sound Energy's Norlum substation providing power to the SRD Pump Station and a primary feed to the Judy WTP, requiring about 4 miles of high voltage transmission lines. The second proposes a dedicated substation at the Judy WTP, accessing primary power from the nearby BPA transmission line and extending about 1.1 miles of medium voltage power lines to the SRD Pump Station.

The project is on hold until the Judy WTP or the SRD pump station requires additional power. No expansion is planned for the Judy WTP, and the SRD pump station's limited capacity is adequate for pumping Skagit River water to Judy Reservoir. A new electrical power feed will be considered if facility expansion is planned.

MO20-6 Disinfection Study

The Judy WTP utilizes chlorine gas in its disinfection processes. The Washington State Department of Labor & Industries has requested that all users of chlorine gas evaluate if other options are available and feasible. A potential option is to use sodium hypochlorite as a disinfection chemical. This conversion will require modification at the water treatment plant.

The first phase of this project is a disinfection study that will evaluate the advantages and disadvantages of using chlorine gas or sodium hypochlorite as a disinfectant for the Judy Water

System. This evaluation may recommend disinfection system modifications that will give rise to additional capital projects.

MO20-7 Filtration Conversion and Optimization

Judy WTP uses two filter backwash processes. Filters 1-4 use a surface wash, while Filters 5-8, added in 2008, use an air scour. Filters 1-4 will be converted to the air scour system to standardize operations.

Filter optimization can increase the WTP's firm capacity from 21 MGD to 30 MGD by increasing the loading rate from 4.2 gpm/SF to 6.0 gpm/SF. This optimization requires a filter surveillance and optimization study by Skagit PUD.

The project also includes upgrading the backwash pump system with VFD drives and programmable backwash sequencing.

The project is on hold until increased water system demands necessitate expanding the filter capacity.

MO20-12 WTP Control Building Seismic Improvements

The WTP and RWPS buildings were designed in the 1980s. Seismic design requirements have become more stringent in recent years. These buildings should be assessed for seismic reinforcement to improve facility resiliency and operator safety. Specific examples include anchoring the room trusses to the interior walls. The PUD will contract with a seismic retrofit consultant to evaluate the facilities and design seismic reinforcement.

The PUD is committed to evaluating several critical facilities, including the WTP Control Building, for seismic retrofit. This planning effort will prioritize seismic retrofit projects. It is expected that this facility will be scheduled for proposed resiliency improvements.

MO20-13 Finished Water Flow Meter

The original finished water meter failed, so WTP operators relied on the raw water meter to control all chemical feed systems. This situation is not advantageous for some chemical feed systems, especially those systems that are added late in the treatment train, including Stage 4 chlorination and Stage 5 ammonia addition. Other processes, such as filter backwash operations, alter the finished water flow rate. Installing a new finished water flow meter would allow the operators to use it to control some chemical feed systems more accurately. This finished water flow meter will be necessary for future disinfection process modifications.

MO20-14 Lagoon Solids Handling Improvements – Phase 1

The existing earthen lagoons at the WTP are an inefficient use of space compared to concrete lagoon basins with vertical walls. The project would replace the north lagoon with two concrete lagoons, increasing solids handling capacity within the same footprint. Also, a polymer addition process could be added to improve solids dewatering.

Currently, the lagoon solids handling has been improved through process modifications, and an overhaul of this facility is not warranted. Therefore, this work will be postponed beyond the 10-year time horizon.

MO20-15 WTP Electrical System Upgrade

The existing electrical system at the WTP is near capacity, and additional processes may not be added without electrical modifications and expansion. A new electrical system may need to be installed to consider new or additional processes. A new electrical building will likely be required to keep the WTP in service during construction. The new electrical system may include a new backup generator dedicated to the WTP.

This project is delayed past the 10-year horizon unless new processes require additional electrical demand.

MO20-16 Disinfection System Replacement

The Disinfection Study will provide some direction for the future disinfection strategy for the WTP. Additional studies and pilot testing will be required to define the future disinfection strategy and processes. Once the plan is refined, new disinfection processes will be designed, installed, tested, and commissioned.

MO20-18 Clearwell Seismic Expansion Joints

Clearwell 3 has flexible couplings on the inlet and outlet piping; however, Clearwells 1 and 2 do not. This project involves installing flexible coupling on the inlet and outlet piping for Clearwells 1 and 2.

MO20-19 Lagoon and Solids Handling Expansion – Phase 2

The lagoons at the WTP will eventually be required to handle an expected increase in solids from existing and new treatment processes. The south earthen lagoon will be removed and converted to three concrete lagoons for expanded capacity on the same footprint to accomplish this expected increase. Second, mechanical dewatering processes will be considered to reduce waste disposal volume.

MO24-1 Dam A & B Seismic Upgrade

The Washington State Department of Ecology, Dam Safety Office [DSO] conducted an embankment stability analysis of Dam A and B for the Judy Reservoir for its five-year inspection. The seismic hazard for the Judy Reservoir location has been updated based on the disaggregation results obtained from the USGS Seismic Hazard websites, which recommends a pseudo-static coefficient of 0.26 g's.

Based on this screening evaluation, the PUD will pursue a detailed slope stability assessment of Dam A and B using site-specific Probabilistic Seismic Hazard Analysis to obtain ground motion and determine if corrective action is required.

MO24-2 *WTP Data Center Building*

The PUD has a data center located in the Judy WTP Control Building. This installation does not have the necessary facilities, appurtenances, and infrastructure for a data center. A new data center building will be constructed on the WTP site to house the data center equipment. The new building will have proper security, HVAC, and fire suppression systems. The predesign report was completed in 2023, and design and construction is scheduled for 2025 through 2026.

MO24-3 *Flocculation Basin Stabilization*

During the Judy WTP expansion in 2008, two additional flocculation basins were constructed adjoining the existing two flocculation basins. It was noted in 2022 that the new flocculation basins appear to be undergoing differential settling compared to the original flocculation basins. Operations staff monitor the situation and take survey measurements at 6-month intervals. To date, the hydraulic function of the flocculation basins has not been affected. If the differential settling worsens, corrective action may need to be taken. Corrective action may include subsurface stabilization or complete basin removal and replacement.

8.2.6 *Storage Tank Program*

Adequate storage within the water system reduces pump cycling and treatment system size requirements while providing emergency standby and fire-fighting reserves. Storage components within the water system are ideally designed to provide these reserves while maintaining acceptable water quality. The following are proposed storage tank projects planned throughout the Judy water distribution system to help meet the PUD's storage requirements.

MR13-5 *North Sedro-Woolley Storage Tank (1.0 MG, 430/350-HGL)*

This project is in the north or northeast part of Sedro-Woolley and will serve future demands in this area as the population and water demand increase. A preliminary capacity is estimated to be 1.0 MG. The existing Hoogdal Storage Tank (0.1 MG) also serves this area but does not provide adequate standby storage as the water demand in this pressure zone increases. A site has not yet been selected for this new storage tank, but preliminary discussions with the Upper Skagit Indian Tribe have occurred recently.

MR13-6 *Burlington Tank (2.0 MG, 214-foot HGL)*

This project is in the north part of Burlington to provide standby and fire suppression storage to Burlington and the rural areas north of State Route 20. A preliminary capacity is estimated to be 2.0 MG. Currently, storage in these areas is provided by the 9th & Highland Reservoir (5.0 MG) in Mount Vernon and the Dukes Hill Reservoir (5.0 MG) in Sedro-Woolley. It would be advantageous if there were local storage to respond to domestic demands in Burlington.

The site for this new reservoir has not been selected, but the PUD does own property (Parcel P71298) on the south slope of Burlington Hill that appears to have a suitable elevation and a bedrock foundation. The timing of this reservoir depends on growth and future water demands for this service

area. If there is significant growth in this area, then the construction of this reservoir could be accelerated.

MR13-7 South Mount Vernon / Skagit County Tank (2.0 MG)

This project is in south Mount Vernon or Skagit County to provide additional standby and fire suppression storage for this service area. Currently, storage in this service area is provided by the 9th & Highland Reservoir (5.0 MG), but eventually, the storage volume in this reservoir may be inadequate. A site for this new reservoir has not been selected, and the timing depends on growth and future water demands in this service area.

MR20-1 Panorama Storage Tank (1.6 MG)

The W1 pumping system that delivers potable water to the PUD's Judy WTP and the Panorama service area is a closed system that utilizes control technology developed in the 1980s. The pumping system cannot provide the required 1,500 gpm fire flow at the WTP. Also, no standby storage is provided for the Panorama service area.

The Panorama Storage Tank will provide approximately 1.6 MG of gravity storage to serve the Judy WTP and the Panorama 705 PZ. In addition to equalizing and standby storage, fire suppression storage will be provided to meet current requirements.

MR24-1 Montborne Storage Tank (1.0 MG)

This project is in the 450 PZ near Big Lake, east of Mount Vernon. The residential community surrounding Big Lake is still experiencing growth in hilltop areas that the 356 PZ infrastructure cannot directly serve. A preliminary capacity is estimated to be 1.0 MG. There is a potential for this storage tank to be a developer-driven project, with the PUD contributing to increased storage for existing customers. This project will not be fully defined until the status of potential developments in the Big Lake area is finalized.

MR24-2 Remove the Little Mountain Storage Tank

The Little Mountain Storage Tank is located on an easement that is owned by the City of Mount Vernon. The PUD and City have entered into an agreement that requires the tank to be removed by 2035. The proposed Sky Ridge Pump Station will be constructed to replace the role of the storage tank and create a closed system.

8.2.7 Pump Station Program

The Judy Reservoir water distribution system primarily conveys water through gravity from the treatment plant at Judy Reservoir. However, several service areas require pump stations to convey water to elevated service areas and storage tanks.

MB24-1 W1 Pump System Replacement

In the late 1980s, Skagit PUD initiated a water treatment plant project near Judy Reservoir, requiring a new potable water source. The original W1 Pump System, built in 1990, was a closed system using

constant-speed motors and a pressure relief valve to prevent over-pressurization. This system supplies water to the Judy WTP and Panorama Service area. However, its outdated design leads to excessive pump wear and reliability issues.

The system was designed to provide water for various uses, including operator consumption, filter washing, chemical feed systems, and fire suppression.

Plans are underway to replace the pump system with three variable-speed pumps and motors capable of meeting peak and maximum day demands, plus fire flow. The project report is complete, and the design drawings will be ready by Q2 2024. The project is expected to finish in 2025.

MB24-2 Backwash Pump System Replacement

The WTP's existing backwash pumps, critical for water treatment, are nearing the end of their useful life and becoming unreliable. This project will replace the 30-year-old system to enhance operational control and energy efficiency.

Installed in 1990, the filter backwash pump system uses two constant-speed pumps and motors with flow control valves for a preset backwash sequence. Its outdated design causes excessive pump wear, high electrical demand charges, and reliability issues.

The system will be upgraded with two variable-speed pumps and motors capable of executing the preset backwash sequence. The VFD motors will lower rush-in current and related electrical demand charges. A predesign report was completed in August 2021, with design starting in 2025 and construction expected to finish by end-2026.

MB24-3 Sky Ridge Pump Station Replacement

Skagit PUD is required to remove the Little Mountain Storage Tank by 2035. To accomplish this removal, a new booster pump station will need to be constructed to serve as a closed system in the Sky Ridge development with domestic consumption and fire suppression. This project replaces the existing booster pump station that was installed in 1956. The new booster pump station will have pump and motor redundancy, variable-frequency drives, and a backup power supply.

MB24-4 Tinas Coma Pressure Zone Booster

Several water services near the Tinas Coma storage tank are at an elevation that is too high to provide the minimum 30 psi under MDD conditions. One solution is to install a boosted pressure zone to serve these residential services. The project will include VFD pumps and additional distribution pipelines.

8.2.8 Fiber Optic Program

Fiber optic networks are used for supervisory, control, and data acquisition (SCADA) at the PUD's treatment and distribution facilities. Skagit PUD has been building out its fiber optic network to eventually replace other forms of communication, such as radio and cellular.

FO13-4 9th Street Fiber

This project extends the fiber system and completes gaps in the fiber network. The project will be completed following Skagit PUD guidelines and procedures. This fiber project will tie the 9th and Highland Tank into the future fiber system in the Kulshan Trail.

FO13-6 Kulshan Avenue Fiber

This project extends the fiber system and completes gaps in the fiber network. The project will be completed following Skagit PUD guidelines and procedures. This project will extend along Kulshan Avenue from N. 18th Street to N. 30th Street, where a fiber vault exists.

FO24-1 Alder Lane Fiber

This project extends the fiber system and completes gaps in the fiber network. The project will be completed following Skagit PUD guidelines and procedures. This project will extend along Alder Lane and the Kulshan Trail between junction boxes where a fiber system already exists. This route includes using an existing casing under Interstate 5 and installing a new conduit under Riverside Drive and the BNSF railroad tracks.

FO24-2 Kulshan Trail Fiber

This project extends the fiber system and completes gaps in the fiber network. The project will be completed following Skagit PUD guidelines and procedures. This project will extend from the fiber at 30th Street along the Kulshan Trail to North Waugh Road. A portion of the conduit from 9th Street to 18th Street is completed.

8.2.9 Miscellaneous Capital Projects

Skagit PUD has other capital improvement projects that do not fit conveniently into the above categories. These capital projects are described here and include the following.

MX20-2 PUD Campus Design & Construction

This project is to build a new PUD campus on the existing site. The administrative building, constructed in 1970, is 27,000 square feet and houses the Administration, Finance, IT, Engineering, Operations, Customer Service and Construction Staff. The current building is nearing the end of its life cycle and needs replacement. The administration building's roof, heating, and ventilation systems are currently at or near the end of their useful life. The current building does not meet ADA code, and the main floor is 2.8 feet below flood level. The building is at its capacity with 79 employees. The new building will continue to house the Administration, Finance, IT, Engineering, Operations, Customer Service and Construction Staff. The new building will include meeting spaces, offices, and commissioners' chambers. The other existing five buildings on site used for storage will be updated as needed.

MX20-3 Other Agency Coordination Opportunities

These unspecified projects arise as part of projects pursued by other agencies. These water system projects may be mandated (e.g., relocation of an existing pipeline interfering with another agency's

project) or chosen based on mutual benefit (e.g., replacing a water pipeline before a street paving project). A budget of \$800,000 per year is set aside to address these unspecified projects by other agencies.

MX24-1 Micro-Hydro at the 9th & Highlands Pump Station

Skagit PUD operates several pressure reducing valves throughout the distribution system. These pressure reducing valves can be bypassed by a micro-hydro unit that will provide the same function as the pressure reducing valve while generating clean hydroelectric energy. The Division Street Pump Station was recently equipped with a micro-hydro generator that is currently generating electricity.

The Mount Vernon School District is exploring the installation of a micro-hydro generator at the 9th and Highlands Pump Station, which is adjacent to the Mount Vernon High School. The project is envisioned to generate electricity for high school use and provide educational opportunities for students.

MX24-2 Alger Well Replacement

The well at Alger is 65 years old and cannot produce the desired 100 gpm to meet the Qi of the water right. Therefore, the new well is proposed to be drilled and tested. A new pumphouse and ion exchange treatment system will be included in this project. Other additions may include an electrical service upgrade for the larger well pump and an emergency generator.

Table 8-2: 20-Year Capital Improvement Plan Through 2034 (in 2024 dollars)

WSP No.	Description	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	Distribution Pipeline Replacement Program:											
MP20-4	College Way Pipeline Replacement	1,200,000	1,200,000									
MP20-5	Skagit Country Club Pipeline Replacement	2,740,000										
MP20-6	North Burlington Pipeline Replacement	2,400,000										
MP20-7	Belmont / Clarmont Pipeline Replacement				150,000	1,600,000						
MP20-9	Peterson Road Pipeline Replacement					400,000	1,400,000					
MP20-10	Hillcrest Community Pipeline Replacement			250,000	2,500,000							
MP20-11	Bayview Community Pipeline Replacement					150,000	1,500,000					
MP24-1	Conway Community Pipeline Replacement		250,000	2,500,000								
MP24-2	Alta Vista Pipeline Replacement	50,000	1,300,000									
MP24-3	East Division Street Pipeline Replacement (crew)	60,000	500,000									
MP24-4	Ball Road Pipeline Replacement (crew)	40,000	500,000									
MP24-5	South MV Pressure Zone Realignment			100,000	1,000,000							
MP24-6	Sedro-Woolley Central Area Pipeline Replacement				250,000	2,000,000						
MP24-7	East Victoria Street Pipeline Replacement (crew)	20,000	200,000									
MP24-8	Annual Pipe Replacement Infill							3,000,000	3,200,000	3,400,000	3,700,000	4,000,000
	Distribution Pipeline Replacement Totals:	\$ 6,510,000	\$ 3,950,000	\$ 2,850,000	\$ 3,900,000	\$ 4,150,000	\$ 2,900,000	\$ 3,000,000	\$ 3,200,000	\$ 3,400,000	\$ 3,700,000	\$ 4,000,000
	Transmission Pipeline Replacement Program:											
MT20-1	Judy to SW Transmission Line - Phase 2 (top of hill)	300,000	1,400,000	3,000,000	3,000,000							
	Transmission Pipelines Replacement Total:	\$ 300,000	\$ 1,400,000	\$ 3,000,000	\$ 3,000,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Agency-Driven Pipeline Relocation											
Coordinated Pipeline Replacement	Francis Road Pipe Replacement - Phase 1	450,000										
	Francis Road Pipe Replacement - Phase 3		450,000									
	Burlington East/West Connector (crew)	100,000										
	SR9 - John Liner - McGarigle Roundabout (crew)	150,000										
	John Liner to Jones Road Extension		40,000	400,000								
	LaVenture, Hoag Rd to Sigmar Ln, Pipeline Replacement		600,000									
	Coordinated Pipeline Replacement & Infill (TBD)		200,000	650,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000
WSDOT and County Fish Passage Projects	Pipeline Relocation at Alger Interchange	1,650,000	500,000									
	Grant - Commerce Dept.	(150,000)										
	Grant - EPA Community Grant	(1,500,000)	(500,000)									
	Pipeline Relocation on Henson Rd at Martha Wash. Cr	450,000										
	Pipeline Relocation on Cedardale Rd at Maddox Cr	180,500										
	Infrastructure Assistance Program (District 10)	(630,500)										
	Pipeline Relocation on SR 9 N of Kalloch Road	350,000										
	Pipeline Relocation on SR 20 at Olsen Creek	600,000										
	Infrastructure Assistance Program (District 39)	(582,000)										
	Garden of Eden Pipeline Relocation	75,000										
	Old 99 at Thomas Creek Pipeline Relocation	125,000	400,000									
	Bulson Creek Pipeline Relocation			125,000	400,000							
	Agency-Driven Pipeline Relocation Total:	\$ 1,268,000	\$ 1,690,000	\$ 1,175,000	\$ 1,200,000	\$ 800,000	\$ 800,000	\$ 800,000	\$ 800,000	\$ 800,000	\$ 800,000	\$ 800,000

Table 8-2: 20-Year Capital Improvement Plan Through 2034 (in 2024 dollars)

WSP No.	Description	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	Pipeline Extension Projects											
MP20-1	Little Mountain Road Pipeline Extension TBD Grant Funding			3,000,000 (3,000,000)	5,000,000 (5,000,000)							
	Pipeline Extension Totals:	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Water Treatment Plant Program											
MO20-2	Emergency Generator Replacement	600,000	2,400,000									
MO20-3	Potlatch RO Replacement	400,000										
MO20-6	Disinfection Study	375,000										
MO20-13	Finished Water Flow Meter			450,000								
MO20-16	Disinfection System Replacement		500,000	1,000,000	3,000,000							
MO24-1	Dan A & B Seismic Upgrade											
MO24-2	Data Center		200,000	750,000								
MO24-3	Flocculators Basin Stabilization Study	100,000	400,000									
	Water Treatment Plant Program Totals:	\$ 1,475,000	\$ 3,500,000	\$ 2,200,000	\$ 3,000,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Storage Tank Programs:											
MR13-5	North Sedro Woolley Storage (430/350 HGL)	300,000	1,200,000	8,000,000								
MR20-1	Panorama Storage Tank (1.6 MG, 700 HGL)					1,000,000	6,000,000	5,000,000				
MR24-1	Montborne Storage Tank (1.0 MG, 450 HGL)									1,000,000	2,000,000	6,000,000
MR24-2	Remove the Little Mountain Storage Tank										100,000	100,000
	Storage Tank Program Totals:	\$ 400,000	\$ 1,600,000	\$ 8,000,000	\$ -	\$ 1,000,000	\$ 6,000,000	\$ 5,000,000	\$ -	\$ 1,000,000	\$ 2,100,000	\$ 6,100,000
	Pump Station Programs:											
MB24-1	W1 Pump System Replacement	800,000	400,000									
MB24-2	Backwash Pump System Replacement		200,000	1,000,000								
MB24-3	Sky Ridge Pump Station								700,000	1,000,000		
MB24-4	Tinas Coma Pressure Zone Modifications (506 HGL)							200,000	1,000,000			
	Pump Station Program Totals:	\$ 1,100,000	\$ 1,800,000	\$ 9,000,000	\$ -	\$ 1,000,000	\$ 6,000,000	\$ 5,200,000	\$ 1,700,000	\$ 2,000,000	\$ 2,100,000	\$ 6,100,000
	Miscellaneous Capital Projects:											
MX20-2	PUD Campus Design & Construction	12,000,000	3,000,000									
	2023 State Grant Aqua Room	(199,820)										
	WTP to PUD Campus Fiber Project (4 sections)	875,000										
MX24-1	9th and Highland Micro Hydro	1,000,000										
	Trans Alta Funding	(450,000)										
	Rural Clean Energy Funding	(550,000)										
MX24-2	Alger Well Replacement				500,000	800,000						
	Miscellaneous Capital Project Totals:	\$ 12,675,180	\$ 3,000,000	\$ -	\$ 500,000	\$ 800,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
\$ 100.0 M	Total Capital Projects	\$ 23,328,180	\$ 15,340,000	\$ 18,225,000	\$ 11,600,000	\$ 6,750,000	\$ 9,700,000	\$ 9,000,000	\$ 5,700,000	\$ 6,200,000	\$ 6,600,000	\$ 10,900,000

Table 8-3: 20-Year Capital Improvement Plan 2035 Through 2046 (in 2024 dollars)

WSP No.	Description	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
	Distribution Pipeline Replacement Program:												
MP13-8	North Fork Skagit River Crossing	500,000	2,000,000										
MP20-2	Bored and Cased Crossings	10,000	50,000	100,000	500,000	100,000	500,000	100,000	500,000	100,000	500,000	100,000	500,000
	Pipeline Replacement Program (TBD)	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
	Coordinated Pipeline Replacement & Infill (TBD)	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000
MP20-12	Conway to Lake McMurray Extension	50,000	1,000,000	6,000,000									
MP20-13	South Conway Extension	50,000			2,000,000	6,000,000	6,000,000						
MP20-14	Bow Hill to Alger Extension	50,000						1,000,000	4,000,000	4,000,000			
	Grant Funding (TBD)	(150,000)	(1,000,000)	(6,000,000)	(2,000,000)	(6,000,000)	(6,000,000)	(1,000,000)	(4,000,000)	(4,000,000)			
	Distribution Pipeline Replacement Totals:	\$ 3,160,000	\$ 4,700,000	\$ 2,750,000	\$ 3,150,000	\$ 2,750,000	\$ 3,150,000	\$ 2,750,000	\$ 3,150,000	\$ 2,750,000	\$ 3,150,000	\$ 2,750,000	\$ 3,150,000
	Transmission Pipeline Replacement Program:												
MT13-9	Judy to SW Transmission Line - Phase 3 (river crossing)	200,000	700,000	8,000,000									
MT20-2	Judy to SW Transmission Line - Phase 4 (north of river)						2,000,000	2,000,000	8,000,000	8,000,000			
	Transmission Pipelines Replacement Total:	\$ 200,000	\$ 700,000	\$ 8,000,000	\$ -	\$ -	\$ 2,000,000	\$ 2,000,000	\$ 8,000,000	\$ 8,000,000	\$ -	\$ -	\$ -
	Water Treatment Plant Program												
MO20-7	Dedicated Power Feed	500,000	2,000,000										
MO20-7	Filter Conversion and Optimization		500,000	1,000,000	3,000,000								
MO20-12	WTP Control Building Seismic Improvments		100,000	500,000	500,000								
MO20-14	Lagoon Solids Handling Improvements - Phase 1			1,500,000	3,000,000	2,500,000	2,500,000						
MO20-15	WTP Electrical System Upgrade				1,000,000	3,700,000	2,000,000	8,000,000					
	Ozone Treatment and Disinfection Improvements							1,500,000	3,500,000	9,000,000			
	Ballasted Flocculation									2,000,000	9,000,000	9,000,000	
MO20-19	Lagoon Solids Handling Expansion - Phase 2											1,000,000	4,000,000
	Water Treatment Plant Program Totals:	\$ 500,000	\$ 2,600,000	\$ 3,000,000	\$ 7,500,000	\$ 6,200,000	\$ 4,500,000	\$ 9,500,000	\$ 3,500,000	\$ 11,000,000	\$ 9,000,000	\$ 10,000,000	\$ 4,000,000
	Storage Tank Program:												
MR13-6	Burlington/Sedro-Woolley Tank (2.0 MG, 214 HGL)		1,000,000	2,000,000	6,000,000	6,000,000							
MR13-7	South Mount Vernon Tank (2.0 MG, 214 HGL)						1,000,000	2,000,000	6,000,000	6,000,000			
MR24-1	Montborne Storage Tank (1.0 MG, 450 HGL)	6,000,000											
	Storage Tank Program Totals:	\$ 6,000,000	\$ 1,000,000	\$ 2,000,000	\$ 6,000,000	\$ 6,000,000	\$ 1,000,000	\$ 2,000,000	\$ 6,000,000	\$ 6,000,000	\$ -	\$ -	\$ -
	Miscellaneous Capital Projects:												
	Miscellaneous Capital Project Totals:	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Total Capital Projects	\$ 9,860,000	\$ 9,000,000	\$ 15,750,000	\$ 16,650,000	\$ 14,950,000	\$ 10,650,000	\$ 16,250,000	\$ 20,650,000	\$ 27,750,000	\$ 12,150,000	\$ 12,750,000	\$ 7,150,000

9 FINANCIAL PROGRAM

Skagit PUD's financial forecast considers the historical financial condition, current financial and policy obligations, operation and maintenance needs, and the ability to support the financial impact related to the completion of the capital projects identified in this WSP. Furthermore, this chapter reviews the utility's current rate structure for rate adequacy and examines customer affordability.

9.1 Financial Viability

Skagit PUD maintains a fund structure and implements financial policies that address financially viable and fiscally responsible water systems. The financial viability, or revenue requirement analysis, examines the amount of annual revenue that needs to be generated by user rates. The analysis incorporates operating revenues, O&M expenses, debt service payments, rate-funded capital needs, and any other identified operations-related revenues or expenses. The objective of the financial analysis is to evaluate the sufficiency of the current level of rates. In addition to annual operating costs, the revenue needs include debt covenant requirements and specific fiscal policies and financial goals of the PUD.

The analysis determines the annual revenue needed to meet that year's expected financial obligations. For this analysis, three revenue sufficiency tests have been developed to reflect the financial goals and constraints: (1) fund balance, (2) debt coverage requirements, and (3) net realized liquidity. All three revenue sufficiency tests must be met to operate successfully.

9.1.1 Fund Balance

The fund balance test identifies all known cash requirements for the PUD in each year of the planning period. Typically, these include O&M expenses, debt service payments, depreciation expense, and capital to forecast reserve balances. The total annual cash needs are projected using the current rate structure and the forecasted ending fund balance. Any projected revenue shortfalls are identified, and the rate increases necessary to make up the shortfalls are established. The purpose is to provide a liquidity cushion to accommodate cyclical cash flow fluctuations. The PUD's current policy is to maintain a minimum balance in the Revenue Fund equal to 2½ months of O&M and depreciation.

9.1.2 Debt Service Coverage

The debt service coverage test is based on a commitment made by the PUD when issuing some forms of long-term debt. This analysis assumes new revenue bond debt for any needed debt issuance. As a security condition of issuance, the PUD would be required per covenant to agree that the revenue bond debt would have a higher priority for payment (a senior lien) than most other expenditures; the only outlays with a higher lien are O&M expenses.

Debt service coverage is a multiplier of the annual revenue bond debt service payment. For example, a 1.0 coverage factor would imply that no additional cushion is required. A 1.25 coverage factor means revenue must be sufficient to pay O&M expenses, annual revenue bond debt service payments, plus an additional 25% of annual revenue bond debt service payments. The excess cash flow derived from the added coverage can be used for any purpose, including financing capital projects. Targeting a

higher coverage factor can help achieve a better credit rating and provide lower interest rates for future debt issues. Skagit PUD's existing bond covenants require a minimum 1.25 debt coverage test; however, the target set is 2.0.

9.1.3 Net Liquidity

The third PUD fiscal management target is the net liquidity coverage test. The purpose is to ensure enough cash to meet unforeseen operating or capital needs. It calculates the number of days of operating expenses that can be covered by ending reserves. The PUD's financial policy minimum target for net liquidity coverage is equal to 180 days of O&M expenses.

In determining the annual revenue requirement, all three financial targets need to be met, and the test with the greatest deficiency drives the required rate increase in any given year.

9.1.4 Available Financial Resources

Feasible long-term capital funding strategies help ensure adequate resources are available for the Capital Improvement Plan [CIP] identified in this WSP. In addition to the PUD's resources, such as accumulated cash reserves, capital revenues, and rate revenues designated for capital purposes, capital needs can be met from outside sources such as grants, low-interest loans, and bond financing. The following is a summary of the PUD's internal and external resources.

9.1.4.1 Capital Connection Charges

A connection charge, referred to as a System Development Fee [SDF], is a one-time charge imposed on new customers as a condition of connecting to the water system. The purpose of the connection charge is two-fold: (1) to promote equity between new and existing customers and (2) to provide a source of revenue to fund capacity-related capital projects. Revenue can only be used to fund utility capital projects or to pay debt service incurred to finance those projects. Skagit PUD currently charges an SDF for all new metered water services. The cost is adjusted annually based on the Engineering News Record's Construction Cost Index. The SDF is determined for each meter size based on the capacity weighting factor identified in the AWWA C-700 and C-702 standards.

9.1.4.2 Location Facilities Charges

New customers typically cover general facilities costs through a connection charge, while local facilities funding, often overlooked in rate forecasting, covers the costs of connecting each property to the system's infrastructure. This funding comes from connecting customers, developers, or property assessments, not rates.

Local facilities can be funded through several mechanisms:

1. Charging a connection fee by the utility based on Local Facilities Costs.
2. A developer extending the system to its development and transferring those facilities to the PUD.

3. A local assessment such as a Utility Local Improvement District (ULID) or a Local Utility District (LUD) that collects revenue from benefited properties.

A Local Facilities Charge (LFC) is a variation of the connection charge imposed by the PUD to recover service extension costs to local properties. It's often implemented as a reimbursement mechanism for the cost of a local facility serving a property and can accumulate up to 10 years of interest.

Developer extensions require developers to install improvements as a service extension condition in addition to the required connection charge. An agreement might include a late-comer charge for new connections to the developer extension. Late-comer charges are a variation of developer extensions where new customers connecting to a developer-installed improvement pay the PUD based on their share of the developer's cost, which is then passed on to the developer. The reimbursement agreement cannot exceed 20 years.

Lastly, LUD/ULID is another funding mechanism that assesses benefited properties based on the special benefit received by the construction of specific facilities. However, substantial legal and procedural requirements can make this a relatively expensive process, and a ULID can be rejected.

9.1.4.3 Revenue Bonds

Revenue bonds, secured by the PUD's revenues, are often used for utility capital improvements. These bonds may have higher interest rates due to their limited commitment and require reserves and financial performance security conditions. The utility agrees upon these requirements during the bond sale. In Washington, revenue bonds can be issued without a public vote. The only limit is the utility's ability to generate enough revenue for debt repayment and coverage. Poor credit may pose challenges in issuing bonds.

9.1.4.4 General Obligation Bonds

Under RCW 54.24.020, Skagit PUD can issue General Obligation (GO) bonds secured by all available tax and revenue resources. These bonds offer lower interest rates than revenue bonds due to their high commitment level. However, the issuance of GO bonds is limited by the Washington constitution and statutes, particularly in terms of fund amount and usage, which is tied to assessed valuation. Despite these limitations, GO bonds can benefit project financing due to their lower interest rates, bond costs, and the extension of repayment to all properties via an ad valorem property tax levy.

9.1.4.5 Public Works Trust Fund (PWTF)

Cities, towns, counties, and special purpose districts can receive loans from the PWTF for water, sewer, storm, roads, bridges, and solid waste/recycling construction projects to address critical needs. PWTF loans are available at below-market interest rates depending on the repayment term. All loan terms are subject to negotiation and Board approval.

9.1.4.6 Drinking Water State Revolving Fund (DWSRF) Loan Program

Historically, funding targets public health protection, compliance with drinking water regulations, and assistance for small and disadvantaged communities. Loans have a low interest rate, and no local match is required.

9.1.5 Capital Financing Strategy

An ideal capital financing strategy would include using grants and low-cost loans when debt issuance is required. However, these resources are limited and competitive and do not provide a reliable funding source for planning purposes. The PUD is recommended to pursue these funding avenues but assumes bond financing is needed to meet needs for which the available cash resources are insufficient. The capital financing strategy developed to fund the CIP assumes the following funding resources:

- Accumulated cash reserves.
- Transfers of excess cash (over minimum balance targets) from the Revenue Fund.
- Transfer revenue from rates earmarked for routine capital funding.
- Transfer interest earned on Major Capital Fund balances and other capital resources.
- Apply for Puget Sound Energy power efficiency grants.
- Apply for DWSRF loans.
- Apply for PWTF loans.
- Finance revenue bonds.

9.2 Past Income and Expenses

This section includes a historical summary of the PUD's financial performance, including comparative statements of revenues, expenses, and changes in fund net position, as well as a historical summary of comparative statements of net position, which are useful indicators of the PUD's financial position.

The PUD maintains a Water Utility Fund. **Table 9-1** summarizes the comparative statements of revenues, expenses, and changes in fund net position for the PUD for the 3 years from 2020 through 2022. **Table 9-2** summarizes assets and liabilities, with the difference between the two reported as "net position." Increases or decreases in net position are useful indicators of the financial position. Noteworthy findings and trends are discussed to demonstrate the historical performance and condition of the PUD.

Table 9-1: Summary of Historical Comparative Statements of Revenues, Expenses, and Charges

PUBLIC UTILITY DISTRICT NO. 1 OF SKAGIT COUNTY			
STATEMENT OF REVENUES, EXPENSES, AND CHANGES IN FUND NET POSITION			
FOR YEAR ENDED DECEMBER 31, 2022			
OPERATING REVENUES			
Water sales	2022	2021	2020
Residential and multiple	\$ 21,654,044	\$ 20,423,642	\$ 19,042,573
Commercial, industrial and farms	7,585,274	6,884,708	5,953,560
Resale	181,866	181,650	148,481
Irrigation	813,815	880,058	654,160
Other sales	671,548	367,019	379,917
Total operating revenues	30,906,547	28,737,077	26,178,691
OPERATING EXPENSES			
Supply	775,406	661,645	661,604
Treatment	2,391,782	2,407,576	2,336,591
Transmission and distribution	1,572,310	1,371,906	1,381,510
Broadband	24,025	36,433	25,627
Customer accounts	1,879,633	1,753,584	1,797,789
Administrative and general	7,396,726	5,285,343	7,213,882
Utility taxes	1,449,364	1,377,642	1,236,048
Depreciation and amortization	7,736,185	7,995,344	8,006,784
Total operating expenses	23,225,431	20,889,473	22,659,835
Operating income (loss)	7,681,116	7,847,604	3,518,856
NON-OPERATING REVENUES (EXPENSES)			
Interest income	560,260	26,921	117,279
LUD interest and penalty income	13,762	20,743	19,661
Interest and related charges	(967,955)	(576,548)	(540,053)
Gain (loss) on capital asset disposition	2,343	22,115	(10,804)
Other non-operating revenues	158,938	168,189	251,640
Other non-operating expenses	(22,045)	(27,070)	(74,962)
Total non-operating revenues (expenses)	(254,697)	(363,290)	(220,837)
Income before capital contributions	7,426,419	7,484,314	3,298,019
CAPITAL CONTRIBUTIONS			
Non-donated plant	291,973	325,432	148,326
Donated plant	584,508	886,074	1,103,419
System development fees	1,038,128	1,913,570	1,235,522
Services	456,048	371,544	302,188
Total capital contributions	2,370,657	3,704,405	2,855,063
Change in net position	9,797,076	11,188,719	6,153,082
NET POSITION - beginning of year	192,649,967	181,356,770	175,203,688
NET POSITION - end of year	\$ 202,447,043	\$ 192,649,967	\$ 181,356,770

Table 9-2: Summary of Historical Comparative Statements of Net Position**PUBLIC UTILITY DISTRICT NO. 1 OF SKAGIT COUNTY****STATEMENT OF NET POSITION****AS OF DECEMBER 31, 2022****ASSETS****CURRENT ASSETS**

	2022	2021	2020
Cash and cash equivalents	\$ 2,988,076	\$ 1,225,211	\$ 959,944
Investments	37,773,500	24,816,308	22,018,574
Customer accounts receivable, net	3,982,607	3,414,647	3,263,097
Accounts receivable leases & other	74,760	83,141	130,951
Restricted assets			
Receivables - LUDs	99,265	98,911	97,601
Materials inventory	1,624,826	1,688,089	1,559,939
Prepaid expenses	725,379	450,639	466,816
Other current assets	1,274	5,639	1,350
Total current assets	47,269,687	36,430,918	28,498,272

NON-CURRENT ASSETS

Investment in joint ventures	31,278	53,323	49,479
Assessment receivable	250,493	312,634	384,445
Leases receivable	24,629		
Net Pension Asset	2,167,820	5,768,967	
Capital assets not being depreciated			
Non-operating property	42,794	42,794	10,000
Land and land rights	2,771,197	2,771,197	2,705,739
Earthen impounding reservoir	66,161	66,161	66,161
Construction in progress	17,065,036	27,705,641	9,691,901
Capital assets net of accumulated depreciation			
Water Infrastructure	188,863,686	158,182,254	162,792,770
Equipment & Machinery	5,365,267	5,960,193	5,736,600
Fiber	2,447,163	2,550,139	2,529,292
General	2,882,341	3,478,707	4,219,067
Total non-current assets	221,977,865	206,892,010	188,185,454

Total assets

269,247,552	243,322,928	216,683,726

DEFERRED OUTFLOWS OF RESOURCES

Deferred outflows related to pensions	2,292,693	849,106	964,910
Deferred outflows related to OPEB	342,740	225,034	274,807
Deferred outflows related to ARO	12,358	17,979	23,599
Total deferred outflows of resources	2,647,791	1,092,119	1,263,316

TOTAL ASSETS AND DEFERRED OUTFLOWS OF RESOURCES

\$ 271,895,343	\$ 244,415,047	\$ 217,947,042

PUBLIC UTILITY DISTRICT NO. 1 OF SKAGIT COUNTY
STATEMENT OF NET POSITION
AS OF DECEMBER 31, 2022

LIABILITIES

CURRENT LIABILITIES

	2022	2021	2020
Accounts payable	\$ 3,625,060	\$ 4,719,028	\$ 2,766,255
Taxes payable	157,383	188,384	182,742
Customer deposits	323,854	257,245	182,814
Accrued interest on debt	452,781	278,514	221,172
Bonds and loans payable	2,447,583	2,409,851	2,907,941
OPEB liability	38,333		
Other current liabilities	188,298	176,241	169,338
Total current liabilities	7,233,292	8,029,263	6,430,262

NON-CURRENT LIABILITIES

Compensated absences	774,929	737,208	659,613
Asset retirement obligations	29,220	29,220	29,220
Long-term debt, revenue bonds	21,627,444	22,701,884	10,800,705
Long-term debt, loans	34,713,532	12,144,302	13,674,877
Net pension liability	1,286,489	565,114	2,512,185
OPEB liability	360,351	276,103	288,990
Total non-current liabilities	58,791,965	36,453,831	27,965,590

Total liabilities

66,025,257 44,483,094 34,395,852

DEFERRED INFLOWS OF RESOURCES

Deferred inflows related to pensions	2,314,727	6,120,425	880,200
Deferred inflows related to OPEB	1,059,306	1,161,561	1,314,220
Deferred inflows related to Leases	49,010		
Total deferred inflows of resources	3,423,043	7,281,986	2,194,420

NET POSITION

Net investment in capital assets	159,012,679	164,698,563	160,368,007
Restricted for			
Net pension asset	\$ 2,192,738.00	\$ 964,236.00	
Unrestricted	41,241,626	26,734,700	20,988,763
Total net position	202,447,043	192,649,967	181,356,770

TOTAL LIABILITIES, DEFERRED INFLOWS OF RESOURCES AND NET POSITION

\$ 271,895,343 \$ 244,415,047 \$ 217,947,042

The following is a summary of historical financial performance.

- Water Sales increased by 9.8% from 2020 to 2021 and 7.5% from 2021 to 2022. The lower increases in later years were likely due to cooler-than-normal weather conditions and the depressed economy. Total expenses increased 2.5% from 2020; in 2022, lower depreciation and administrative expenses contributed to the positive net operating income.
- The O&M Coverage Ratio (total operating revenue divided by total operating expenses) began 2020 at 116%, increased to 138% in 2021, and ended 2022 at 133%. A 100% or greater ratio shows that revenue will successfully cover expenses.
- The Net Operating Income as a percentage of Operating Revenue was the highest in 2021 at 27% and decreased to 25% in 2022. Similar to the O&M Coverage Ratio, these trends help show how successfully operating revenue covered operating expenses, with higher positive numbers being the best and negative numbers showing the need for financial improvement.
- The Debt Service Coverage is required by bond covenants to remain above 1.25 during the life of the loans. This ratio is calculated by dividing cash operating income (revenue less expenses before depreciation) by annual revenue bond expenses. This ratio remains above the target, beginning in 2020 at 3.67, increasing to 5.05 in 2021, and decreasing to 4.02 in 2022.
- The Current Ratio is calculated by dividing unrestricted current assets by current liabilities. This ratio ranges from a high of 6.2 in 2022 to a low of 4.1 in 2020, with an average of 4.8. Anything above 2.0 for this ratio is good.
- The Debt to Net Position Ratio compares total debt to total net position, which is the difference between current assets and liabilities. This ratio begins at 15% in 2020, increases to 19% in 2021, and ends at 29% in 2022. For utility districts, a 50 to 60% ratio helps normalize rate impacts, and there is less need to test the total level of debt service to net operating revenues.
- The Debt to Noncurrent Capital Asset Ratio compares total debt to noncurrent assets, also known as property, plant, and equipment. This ratio begins at 15% debt to noncurrent assets in 2020. Noncurrent capital assets increased more than debt throughout the 3 years, and the ratio increased to 18% in 2021 and 26% in 2022. Similar to the debt-to-net position ratio, a 60% debt to 40% equity is a general industry target.

9.3 Operational Budget Forecast

Skagit PUD develops an operating budget each fiscal year (January 1st through December 31st). The annual budget includes a 10-year Capital Improvement Plan, which, along with key factors and assumptions, develops a complete portrayal of the PUD's annual financial obligations. The following is a list of the key revenue and expense factors and assumptions used to develop the financial forecast:

- **Revenue** – Skagit PUD has two general revenue sources: revenue from charges for service (rate revenue) and miscellaneous (non-rate) revenue. In a forecasted annual shortfall, the rate revenue can be increased to meet the annual revenue requirement. Non-rate revenues are forecast to increase with customer growth or not escalate depending on the nature of the revenue.

- **System Development Fee Revenue** – The current SDF charge is expected to increase annually based on construction cost inflation and to generate between \$1,000,000 in 2024 and \$1,300,000 in 2033 collected from new connections. This money is restricted to fund growth-related capital projects and, if needed, associated debt service incurred to finance those projects.
- **Growth** – Rate revenue is escalated based on the growth rates provided in Chapter 2 of this WSP.
- **Expenses** – Operation and maintenance expense projections are based on the 2024 budget and are forecasted to increase with general and labor cost inflation, construction cost inflation, and benefit cost inflation. Budget figures were used to estimate current tax liabilities; future taxes were calculated based on forecasted revenues and prevailing tax rates.
- **Existing Debt** – Skagit PUD has nine outstanding debt issues, including one revenue bond, three PWTF loans, four DWSRF loans, and 1 Ecology loan. Revenue bond annual payments of \$1,676,592 expire in 2039. PWTF annual payments range from \$1,153,000 million, decreasing to \$480,000 and expire in 2042. DWSRF annual payments range from \$1,800,000 to \$824,000 and expire in 2042.
- **Future Debt** – The capital financial strategy developed for this WSP forecasts the need to issue \$10.5 million in new debt and an annual debt service of \$786,000. This analysis assumes all revenue bond financing.
- **Revenue Bond Assumptions** – The forecast assumes a revenue bond interest rate of 4.2%, an issuance cost of .5%, and a term of 20 years.
- **Transfer to Capital** – Any Operating Fund balance above the minimum requirement is assumed to be available to fund capital projects and is projected to be transferred to the Capital Fund in most years. The 2023 Operating Fund balance ended the year at 397 days of O&M expenses plus depreciation, well above the minimum target for that year. The Capital Fund balance is expected to end the year at approximately \$39 million.

Although the financing forecast is completed for the 10-year time horizon of this WSP, the rate strategy focuses on the shorter-term planning period. The PUD must revisit the proposed rates every 2 to 3 years to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the Operating Budget, and future rates should be adjusted as needed.

Table 9-3 summarizes the annual revenue requirements based on the forecast of revenues, expenditures, fund balances, and fiscal policies.

Table 9-3: 10-Year Operating Budget

Revenue Requirement	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Revenues										
Rate Revenues	\$ 33,000,000	\$ 33,990,000	\$ 35,009,700	\$ 36,059,991	\$ 37,141,791	\$ 38,256,044	\$ 39,403,726	\$ 40,585,838	\$ 41,803,413	\$ 43,057,515
Non-Rate Revenues	<u>2,506,000</u>	<u>1,750,000</u>	<u>1,500,000</u>	<u>1,400,000</u>	<u>1,442,000</u>	<u>1,485,260</u>	<u>1,529,818</u>	<u>1,575,712</u>	<u>1,622,984</u>	<u>1,671,673</u>
Total Revenues	\$ 35,506,000	\$ 35,740,000	\$ 36,509,700	\$ 37,459,991	\$ 38,583,791	\$ 39,741,304	\$ 40,933,544	\$ 42,161,550	\$ 43,426,396	\$ 44,729,188
Expenses										
Operating Expenses	\$ 18,278,432	\$ 19,164,936	\$ 20,094,435	\$ 21,069,015	\$ 22,090,863	\$ 23,162,270	\$ 24,285,640	\$ 25,463,493	\$ 26,698,473	\$ 27,993,348
Existing Debt Service	\$ 4,710,416	\$ 4,687,247	\$ 4,687,248	\$ 4,687,249	\$ 4,687,250	\$ 4,687,251	\$ 4,687,252	\$ 4,687,253	\$ 4,687,254	\$ 4,687,255
New Debt Service			786,353	786,353	786,353	786,353	786,353	786,353	786,353	786,353
Taxes	<u>1,815,000</u>	<u>1,869,450</u>	<u>1,925,534</u>	<u>1,983,300</u>	<u>2,042,798</u>	<u>2,104,082</u>	<u>2,167,205</u>	<u>2,232,221</u>	<u>2,299,188</u>	<u>2,368,163</u>
Total Expenses	\$ 24,803,848	\$ 25,721,633	\$ 27,493,570	\$ 28,525,917	\$ 29,607,265	\$ 30,739,956	\$ 31,926,450	\$ 33,169,321	\$ 34,471,268	\$ 35,835,120
Net Surplus (Deficiency)	\$ 10,702,152	\$ 10,018,367	\$ 9,016,130	\$ 8,934,074	\$ 8,976,526	\$ 9,001,348	\$ 9,007,094	\$ 8,992,229	\$ 8,955,129	\$ 8,894,068
Additions to Meet Coverage (Bonds, Loans, & Grants)			10,500,000							
Total Surplus (Deficiency)	\$ 10,702,152	\$ 10,018,367	\$ 19,516,130	\$ 8,934,074	\$ 8,976,526	\$ 9,001,348	\$ 9,007,094	\$ 8,992,229	\$ 8,955,129	\$ 8,894,068
Forecasted Annual Rate Increase	5.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Fund Balance	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Combined										
Beginning Reserve	\$ 39,000,000	\$ 20,028,472	\$ 10,838,839	\$ 10,083,369	\$ 11,830,842	\$ 16,610,768	\$ 21,265,916	\$ 26,107,210	\$ 31,334,039	\$ 35,688,768
Plus Net Cash Flow after Rate Increase	10,702,152	10,018,367	19,516,130	8,934,074	8,976,526	9,001,348	9,007,094	8,992,229	8,955,129	8,894,068
Contingency Capital										
Capital Improvement Plan	<u>(29,673,680)</u>	<u>(19,208,000)</u>	<u>(20,271,600)</u>	<u>(7,186,600)</u>	<u>(4,196,600)</u>	<u>(4,346,200)</u>	<u>(4,165,800)</u>	<u>(3,765,400)</u>	<u>(4,600,400)</u>	<u>(3,765,401)</u>
Ending Reserve	\$ 20,028,472	\$ 10,838,839	\$ 10,083,369	\$ 11,830,842	\$ 16,610,768	\$ 21,265,916	\$ 26,107,210	\$ 31,334,039	\$ 35,688,768	\$ 40,817,435
Estimated Depreciation - Includes CIP	8,735,000	9,000,000	9,300,000	9,300,000	9,300,000	9,300,000	9,300,000	9,300,000	9,300,000	9,300,000
Liquidity Target - Days of O&M Expense Target 180 Days	400 days	206 days	183 days	205 days	274 days	335 days	392 days	449 days	488 days	532 days
Fund Balance	5,627,798	5,867,695	6,123,841	6,326,878	6,539,763	6,762,973	6,997,008	7,242,394	7,499,682	7,769,448
- Minimum 2.5 months x (O&M Expenses + Depreciation)	Meets Target	Meets Target	Meets Target	Meets Target	Meets Target	Meets Target	Meets Target	Meets Target	Meets Target	Meets Target
Debt Service Coverage - Minimum 2	3.27	3.14	5.33	3.07	3.08	3.09	3.09	3.09	3.08	3.07

9.4 Capital Funding Plan

The Capital Funding Plan identifies the total Capital Improvement Program (CIP) obligations of the annual planning period. The plan defines a strategy for funding the CIP, including analyzing available resources from rate revenues, existing reserves, system development charges, debt financing, and any financial resources that may be available (e.g., grants, developer contributions, etc.). The Capital Funding Plan impacts the overall financial plan with debt financing (resulting in annual debt service) and the assumed rate revenue available for capital projects.

The CIP developed for this WSP identifies over \$100 million in projects over the ten-year planning horizon. This CIP consists of various projects, including annual pipe replacement, outside agency mandates, water treatment equipment and systems replacement, water infrastructure expansion, and operating asset replacement.

9.5 Reserves

Below is a summary of the key financial policies employed by the PUD and those recommended and incorporated into the financial program.

9.5.1 Operating Reserves

Operating reserves are designed to provide a liquidity cushion to ensure adequate working capital will be maintained to deal with significant cash balance fluctuations such as seasonal fluctuations in billings and receipts, unanticipated cash expenses, or lower-than-expected revenue collections. The PUD's current policy is to maintain a minimum balance in the Revenue Fund equal to 2½ months of

O&M and depreciation. This target is reasonable for a water system, given the variability in revenue collections due to changing weather patterns that can significantly affect revenue collections during the summer.

9.5.2 Debt Service Coverage

It is necessary to consider policies related to debt management as part of a broader utility financial policy structure. Debt management policies should be evaluated and formalized, including the acceptable outstanding debt, bond coverage, debt repayment, and total debt coverage targets. Skagit PUD's existing bond covenants require a minimum 1.25 debt coverage test; however, the target set by the PUD is 2.0.

9.6 Water Rate Evaluation

Fortunately, there are relatively abundant water resources in the Pacific Northwest. However, collecting, treating, and delivering safe and reliable water creates a valuable and scarce commodity. The PUD must construct, operate, maintain, and finance the infrastructure to deliver this valuable commodity to its customers. Water rates are the only reliable revenue source for the PUD.

The PUD's current rate structure consists of two rate components:

1. A fixed monthly charge based on meter size and
2. A variable monthly charge per hundred cubic feet (ccf).

The variable monthly charge has three blocks: one block for usage up to 3 ccf, a second block for usage between 4 and 100 ccf, and a third block for usage over 100 ccf. **Table 9-4** shows the current rate structure.

Table 9-4: 2024 Rate Structure

Monthly Fixed Charge		Consumption Charge	
Meter Size	Fixed Rate	Single Family and Duplex with Individual Meters	Rate
5/8-inch	\$ 39.36	0 - 3 ccf	\$ 4.11 per ccf
3/4-inch	\$ 39.36	4 - 100 ccf	\$ 6.46 per ccf
1-inch	\$ 65.54	Excess of 100 ccf	\$ 4.43 per ccf
1½-inch	\$ 130.70		
2-inch	\$ 208.74	All Others Classifications	
3-inch	\$ 391.34	0 - 3 ccf	\$ 6.46 per ccf
4-inch	\$ 651.65	4 - 100 ccf	\$ 6.46 per ccf
6-inch	\$ 1,303.35	Excess of 100 ccf	\$ 4.43 per ccf
8-inch	\$ 2,085.04	Agriculture Rate:	\$ 3.90 per ccf

9.6.1 Community Affordability

Community affordability is a metric for water rates' relative financial impact on a community. The EPA considers 2.5% of a community's median household income (MHI) to be the upper threshold for affordable water service. The Department of Health (Drinking Water State Revolving Fund) and the

Department of Commerce (Public Works Trust Fund) use an affordability index to prioritize their grant and low-cost loan programs and establish principal forgiveness eligibility.

The PUD serves multiple cities and towns in Skagit County, with the highest number of customers in Mount Vernon, Sedro-Woolley, and Burlington. **Table 9-5** presents the PUD’s affordability criteria for these three cities and Skagit County. The MHI and percentage of persons in poverty are from 2022. The affordability analysis indicated that the PUD current rates for a typical single-family home are affordable. The average consumption of 145 GPD/ERU is well under the affordability threshold established by the EPA.

Table 9-5: Affordability Test

Jurisdiction	2022 Census Poverty Rate	Median Household Income (in 2022)	EPA Guideline 2.5% of MHI	Allowable Billing per Month	Monthly Equivalent Water Use	Gallons per Day per ERU
Mount Vernon	17.7%	\$ 69,227	\$ 1,730.68	\$ 144.22	18 ccf	457 GPD
Burlington	10.4%	\$ 68,737	\$ 1,718.43	\$ 143.20	17 ccf	428 GPD
Sedro-Woolley	15.1%	\$ 72,281	\$ 1,807.03	\$ 150.59	10 ccf	257 GPD
Skagit County	11.4%	\$ 82,029	\$ 2,050.73	\$ 170.89	30 ccf	759 GPD

Communities with a high level of poverty are sensitive to increases in utility rates. Some have suggested that the threshold level of poverty should be more than 30%¹. Fortunately, Skagit County and the cities served by the PUD are well below this threshold. Regardless, the PUD will consider affordability when considering rate increases.

9.6.2 Customer Affordability

The Department of Health and the EPA recognize the limitations of using a percentage of the Median Household Income as a measure of affordability. Increasing income disparity creates challenges to generating sufficient revenue while maintaining affordable water service. Communities with elevated income disparities and poverty prevalence are most vulnerable to rate increases.

Household affordability can be defined as the ability of an individual customer to pay for essential water services that cover drinking, cooking, cleaning, and sanitation without undue hardship. Various proposals for defining these essential water services have been proposed but seem to center around 50 gallons per person per day. Therefore, essential water services for a two-person household would be approximately 3,000 gallons per month or 4 ccf. However, essential water services for a six-person household could be nearly 9,000 gallons per month or 12 ccf.

One possible metric to estimate the severity of water service affordability is the frequency of water shut-offs. The recent Washington State heat moratorium law, known as HB 1329, aims to protect residents from the dangers of heat waves. One reporting condition within the law requires the PUD to report the number of disconnects for non-payment annually. The first reporting year is 2023. During

¹ Patterson L. & Martin D. 2023, Journal AWWA, How Sensitive Is Household Affordability to Changes in Water Bills, <https://doi.org/10.1002/awwa.2105>

this period, the PUD shut off 951 meters for non-payment, representing 0.62% of all meters. If shut-offs increase over time, it may indicate that rising rates are decreasing affordability for essential water services.

9.6.3 Rate Structure Conclusion

Rate increases are necessary to fund ongoing operating needs and future debt requirements to implement the CIP. Implementing the proposed rate increases should provide continued financial viability while maintaining generally affordable rates.

It is important to remember that the analysis performed in this chapter assumes growth forecasts from **Chapter 2** of this WSP. If the future growth rates change, the proposed annual rate increases may need to be updated and revised. Skagit PUD reviews and updates the key underlying assumptions yearly in its annual budgeting process. Adjustments are made to the financial plan to ensure adequate revenues are collected to meet the PUD's total financial obligations.

9.7 Audits

The Washington State Auditor's Office audits the PUD's financial records yearly. These audits are intended to increase trust in Skagit PUD by providing the public with an independent and transparent examination of the use of public funds. There is also an opportunity to develop strategies that make the PUD more efficient and effective.

The Auditor's findings for the fiscal year ending 2022 provided the following summary of conclusions:

Financial Statements

We issued an unmodified opinion on the fair presentation of the basic financial statements following accounting principles generally accepted in the United States of America (GAAP).

Internal Control over Financial Reporting:

- *Significant Deficiencies:* Identified no deficiencies in the design or operation of internal control over financial reporting that we consider substantial deficiencies.
- *Material Weaknesses:* Identified no deficiencies that we consider to be material weaknesses.

The Auditor noted no instances of noncompliance that were material to the financial statements.

Federal Awards

Internal Control over Major Programs:

A loan from the Drinking Water State Revolving Fund for the Judy Reservoir to Mount Vernon Transmission Pipeline was selected as a major program in this year's audit.

- *Significant Deficiencies:* Reported no deficiencies in the design or operation of internal control over major federal programs that we consider substantial deficiencies.
- *Material Weaknesses:* Identified no deficiencies that we consider to be material weaknesses.

The Auditor issued an unmodified opinion on the PUD's compliance with requirements applicable to its major federal program and reported no findings that are required to be disclosed per 2 CFR 200.516(a).

10 MISCELLANEOUS DOCUMENTS

This chapter provides documentation on compliance with the requirements of the State Environmental Policy Act (Chapter 43.21 RCW), agreements referenced in the Water System Plan, and correspondence and associated comments from state and local government entities and adjacent water systems.

10.1 State Environment Policy Act

Skagit PUD prepared a State Environmental Policy Act [SEPA] Environmental Checklist per Chapter 43.21 RCW and WAC 246-290-100. Based on the checklist assessment, a Determination of Non-Significance [DNS] was issued. A copy of the SEPA Checklist and DNS are provided in **Appendix A**.

10.2 Agreements

Over the years, Skagit PUD has established a water delivery system for its customers, guided partly by a series of agreements focused on water management within Skagit County. This section outlines the key agreements that shape the PUD's water service policies and details the PUD's role and obligations in supplying water.

10.2.1 1996 Memorandum of Agreement

In 1996, representatives from several important stakeholder groups including the PUD, the City of Anacortes, Skagit County, the Upper Skagit Indian Tribe, the Swinomish Indian Tribal Community, the Sauk-Suiattle Indian Tribe, Washington State Department of Ecology (Ecology), and Washington Department of Fish and Wildlife signed the Memorandum of Agreement Regarding Utilization of Skagit River Basin Water Resources for Instream and Out Of Stream Purposes (MOA). The agreement was intended to shape water use policy over the next 50 years. According to the MOA, its purpose was to do the following:

- Ensure instream flows are established to protect fisheries resources and mitigate any interference with such flows.
- Provide a mechanism for the coordinated management of water resources and to meet the out-of-stream needs of the Swinomish Tribal Community, Upper Skagit River Tribe, Sauk-Suiattle Indian tribes, local governments, and public water purveyors in Skagit County.
- Avoid litigation or adjudication between parties to the agreement.
- Help expedite Ecology's water rights decision-making within the CWSP service area.
- Modify the CWSP to conform to the agreement and incorporate the agreement into Anacortes' and Skagit PUD's JOA.

In addition, specific water rights for Anacortes and Skagit PUD were documented as part of the MOA. Chapter 3 of this Water System Plan includes a detailed discussion of the PUD's water rights related to the MOA. This Water System Plan acknowledges the agreements documented in the MOA and is

consistent with the intent and arrangements made in that accord. The MOA expires in 2046 and is on the PUD's website. A link to this document can be found in **Appendix F**.

The six satellite water systems were not discussed in the MOA.

10.2.2 Joint Operating Agreements

The 2000 CWSP identified Skagit PUD and the City of Anacortes as the responsible entities for serving growth in urban areas. Accordingly, the PUD and Anacortes implemented a Joint Operating Agreement (JOA) to develop shared regional water supply facilities. A copy of the JOA is included in **Appendix D**. Under the terms of the JOA, Skagit PUD, and Anacortes agreed to pursue joint-use facilities for their mutual benefit, especially those that would provide a backup supply from one utility to the other during an emergency shutdown or catastrophic failure. Such facilities may include strategically located interties (preferably two-way), distribution storage tanks, and new or improved water treatment facilities. The Riverbend Intertie was the first facility developed under the JOA, and the 1996 MOA was an outgrowth of the JOA. Additional or expanded interties must first consider and plan for in-county consumptive and non-consumptive needs, then consider demands outside the County.

10.2.3 Customer Agreements

Skagit PUD has water service agreements with two wholesale water purchasers and one retail water purchaser. Skagit PUD currently wholesales water to two customers: Samish Farms Water District and North Fir Island Water Association. This section briefly discusses the details of each agreement. The wholesale agreements provided in **Appendix D** list more detailed information regarding the quantity of water, points of delivery, water quality, rates and charges, and other subjects. This section discusses these customer service agreements.

10.2.3.1 Samish Farms Water District

Skagit PUD has a water supply agreement with the Samish Farms Water District. This 25-year agreement took effect April 30, 1996, and may be extended at the option of either party with the consent of the other. This agreement was recently extended in 2022; Skagit PUD agrees to provide no less than 810,000 cubic feet of water per calendar month and no more than 1,100,000 cubic feet of water per calendar month.

10.2.3.2 North Fir Island Water Association

Skagit PUD has a water supply agreement with the North Fir Island Water Association. The original agreement took effect July 5, 1983. The contract is not to exceed 25 years from the date of execution but may be extended at the option of either party with the consent of the other for an additional 3-year period. Skagit PUD agrees to provide no more than 125 gallons per minute at the delivery point. The PUD is working to renew this agreement.

10.3 Correspondence

Satisfies requirements of WAC 246-290-100(4)(k)(iii) and provides DOH and other reviewing agencies with correspondence or comments from entities with an interest in the WSP.

Appendix A: Procedural Documents

Water System Plan Submittal Form 331-149

Pre-Planning Meeting Minutes

Notice Sent to Adjacent Utilities

State Environmental Policy Act (SEPA) Documentation

Consistency Determination from Local Land Use Authorities



Drinking Water

Project Approval Application (PAA) Form

331-149 F • Revised 1/10/2022

Please complete all appropriate sections of this application form and include it with your project.

WATER SYSTEM Information

<u>Judy Reservoir</u>	<u>79500E</u>
Water System Name	PWS ID #
<u>Water System Plan</u>	<u>Skagit</u>
Submittal Description	County
<u>A-Community</u>	<u>10,000 or more</u>
Classification	# of Service Connections

OWNER Information

<u>PUD No. 1 of Skagit County</u>	<u>79500E</u>
Name	Owner ID #
<u>handzlik@skagitpud.org</u>	<u>360 853 6305</u>
E-mail address	Phone
<u>1415 Freeway Drive</u>	<u>Mt. Vernon</u>
Mailing address	City
	State
	Zip

PROJECT CONTACT Information

<u>Mark Semrau, Capital Program Manager</u>	<u>Enter text</u>
Name/Position	
<u>semrau@skagitpud.org</u>	<u>360 853 6545</u>
E-mail address	Phone
<u>1415 Freeway Drive</u>	<u>Mt. Vernon</u>
Mailing address	City
	State
	Zip

CONSULTING/DESIGN ENGINEER Information

<u>Enter text</u>	<u>Enter text</u>
Name/Firm	
<u>Enter text</u>	<u>Enter text</u>
E-mail address	Phone
<u>Enter text</u>	<u>Enter text</u>
Mailing address	City
	State
	Zip

SMA Information

<u>Enter text</u>	<u>Enter text</u>
Name/SMA	SMA #
<u>Enter text</u>	<u>Enter text</u>
E-mail address	Phone
<u>Enter text</u>	<u>Enter text</u>
Mailing address	City
	State
	Zip

BILLING Information*

<u>Mark Semrau, PE</u>	
Name	
<u>semrau@skagitpud.org</u>	<u>360 8536545</u>
E-mail address	Phone
<u>1415 Freeway Drive</u>	<u>Mt. Vernon</u>
Mailing address	City
	State
	Zip

GENERAL Submittal Information

☒ Check here if you need a Box.com folder set up for transferring your project to us electronically. (You will receive an invite by email after we have received the PAA form.)

Do you have projects currently under review by us? ☐ Yes ☒ No

☐ This is a new water system (if so, include a completed Water Facilities Inventory Report Form with your project).

☐ DWSRF Loan

Application # Enter Number

Loan # Enter Number

☒ Water System Plan ([complete Planning Information](#))

☐ Engineering ([complete Engineering Information](#))

☐ Satellite Management Agency Plan ([complete SMA Information](#))

☐ Enforcement

Docket # Enter Number

Type Enter Text

☐ Small Water System Management Program ([complete Planning Information](#))

☐ Group B ([complete Engineering Information](#))

☐ Alternate Technology ([complete Engineering Information](#))

ENGINEERING Information

Choose Project Report

Project Report Type

Choose Predesign Study

Predesign Study

Choose Construction Documents

Construction Documents

Choose Other

Other

Choose Special Report or Plans

Special Report or Plans

Choose Existing System Approval

Existing System Approval

Choose Waiver

Waiver

PLANNING Information

How many connections does system currently have?	32,640
If system is private-for-profit, is it regulated by UTC?	☐ Yes ☒ No
Is system expanding?	☒ Yes ☐ No
Expanding service area?	☒ Yes ☐ No
Increasing number of approved connections?.....	☒ Yes ☐ No
If the number of connections is expected to increase, how many <i>new</i> connections are proposed in the next ten (10) years?	3053
Is your system pursuing additional water rights from Department of Ecology in the next 20 Years?	☒ Yes ☐ No
Is a new intertie proposed?.....	☒ Yes ☐ No
Is the system located in a Critical Water Supply Service Area (is there a Coordinated Water System Plan)?.....	☒ Yes ☐ No
If yes, have you sent a copy of the plan to the county or responsible agency for the CWSP?	☒ Yes ☐ No
Are you requesting distribution main project report and construction document submittal exception?.	☒ Yes ☐ No
If so, does the WSP contain standard construction specifications for distribution mains?	☒ Yes ☐ No
The water system/purveyor is responsible for sending a copy of the plan to:	
♦ Adjacent utilities for review or a letter notifying them that a copy is available for their review and where it is located.	☒ Yes ☐ No
♦ All local governments within the service area.....	☒ Yes ☐ No
♦ County and city planning departments, one or both if applicable, adjacent water systems, etc..	☒ Yes ☐ No
List who have you sent the WSP to for review other than ODW?	Local Tribes
Are you proposing a change in the place of use of your water right?	☐ Yes ☒ No
If "yes," the purveyor must send a copy of the WSP or SWSMP to all local governments within the service area (county and city planning departments) for a local consistency determination. Has this been completed?.....	☐ Yes ☐ No
What are the years of the requested plan approval period (for example 2022 to 2032)?	2024 to 2034
Does your plan follow your preplan checklist?	☒ Yes ☐ No

SMA Information

☐ Ownership only ☐ Management and Operations only ☒ Ownership, Management & Operations

Where can we find the [SMA Notice of Intent 331-590](#), in your plan..... [Enter Text](#)

Please submit all documents electronically. We request one paper copy of planning documents be submitted to the address for your regional office below.

☐ Eastern Regional Office Department of Health eroadmin@doh.wa.gov Phone: 509-329-2100	☒ Northwest Regional Office Department of Health dw.nwro.wsprojects@doh.wa.gov Phone: 253-395-6750	☐ Southwest Regional Office Department of Health swro.admin@doh.wa.gov Phone: 360-236-3030



To request this document in another format, call 1-800-525-0127. Deaf or hard of hearing customers, please call 711 (Washington Relay) or email civil.rights@doh.wa.gov.

Individuals Present:

Mark Handzlik, Skagit PUD
Mark Semrau, Skagit PUD
Bill Trueman, Skagit PUD
Wendy LaRocque, Skagit PUD John Rose, ECY
Rachel Wilkens, Skagit County Health
Britt Pfaff-Duntan, Skagit County Health
PJ Wilkerson, DOH
Krista Chavez, DOH

Successes/Challenges in current planning period:

- Transmission pipeline completion success
- Most objectives have been accomplished in CIP
- Rate plan based on this approved WSP

Goals for this plan:

- Consistency in budgeting and WS planning process has been an issue.
- Modified layout to more closely match our guidance document, streamlined plan.
- Swinomish tribe will receive a copy of draft plan.
- No large CIP projects in the 10-year, horizon - yes in 20 year for Judy WTP.
- Potential intertie additions in the future.
- Expansion of retail service area into future service area in certain parts.
- Upper Skagit tribal property – creating intertie as a backup water source in emergency. Connections outside of tribal property may be included in the retail service area.
- Storage requirement – modifying to 200 gal/ERU where there is a redundant backup source and 300 gal/ERU where there is a single source. Will impact Alger which is going from 600 gal/ERU down to 300 gal/ERU.

Estimated Submittal Date: March 2024

Department of Ecology Items:

Skagit PUD has complex portfolio of water rights.

ECY will be looking at Water Rights Self-Assessment closely, additive, and non-additive quantities for Qa and Qi, make sure totals are correct, limitations on sources, future demand. Will also be ensuring consistency with narrative of water rights in the plan. Procedural changes – will always be sending out a comment letter even if there are no comments. Will be expecting to see replies.

Skagit County Items:

Skagit County Planning Department will be reviewing

DOH Plan Elements & Submittal:

Submittal requirements:

1. Cover Letter
 2. PAA form
 3. WRSA form
 4. Maps – PDF and shape file
 5. Planning document
-
- Submit Plan to DOH and County at the same time. DOH will submit to ECY per MOU
 - Bill 1329 – shutoffs during extreme weather events. Look to see if your policies address this new law.
 - Climate Resiliency requirement June 2025
 - “10 year” planning period – consider planning out 12-13 years to take into account the time it takes to review and approve this document.
 - Address Fidalgo transfer to Anacortes
 - For Judy Reservoir and other system planning on expanding - we need in-depth capacity analysis.
 - For the portions you plan to refer to your website (emergency response program, design specs), you can submit as separate PDF documents.

Attachment: **Water System Plan (WSP) Pre-Plan Agenda**

Water System Pre-Plan Meeting: Skagit PUD No 1, February 2, 2024

Req.	Content Description	WSP Page #
Chapter 1 Description of Water System		
(√)	Ownership and management	1-4
(√)	System history and background	1-4
	Inventory of existing facilities. Will be included in Chapter 3.	
(√)	Related plans: Coordinated Water System Plan (CWSP), Comp./Community	1-7
(√)	Information & Maps: Service area, retail service area, designated land use and zoning, future comprehensive plan request for changes to land use, & agreements for plan approval period - Include change to Fidalgo Island System	1-8
(√)	Policies: Service area, SMA, conditions of service, annexation	1-11
(√)	Duty to serve ☆ requirement: identify process, timeframes, conditions, appeals	1-11
(√)	Consistency from local planning ☆ agency (LGC form to use)	1-15
Chapter 2 Basic Planning Data		
(√)	Current water use: Population, customer classes, & ERUs	2-1
(√)	Demand forecast for plan approval period and a minimum of a 20 year period* for population, service connections & demand forecasts with & w/o expected efficiency savings	2-15
(√)	Monthly and annual production. Totals per source. Water Supply Characteristics & Demand Characteristics (see Chp. 4). Add subtitles with description & discussion on effect of water use	2-18
(√)	Annual usage for water supplied to other systems	2-21
(√)	Annual usage by customer class	2-6
(√)	Historical total water loss (DSL) – percent and volumes	2-11
(√)	>1000, seasonal variations in consumption by customer class – Judy system – PUD would like to analyze seasonal variation of top 10 water users. Include a brief explanation for this option.	2-10
Chapter 3 System Analysis		
(√)	Capacity analysis with water right self assessment (3 forms DOH/ECY per MOU): Existing, approval period* and 20 th year projections	App. C
(√)	System design standards	3-13
(√)	Water quality analysis	3-2
	System inventory, description and analysis	
(√)	Source	2-11
(√)	Treatment	3-20
(√)	Storage	3-22
(√)	Distribution system/hydraulics	3-28
(√)	Summary of system deficiencies	3-30
(√)	Analysis of possible improvement projects	3-30

Water System Pre-Plan Meeting: Skagit PUD No 1, February 2, 2024		
Req.	Content Description	WSP Page #
Chapter 4 Water Use Efficiency Program and Water Resource Analysis		
(√)	Water Use Efficiency Program per WAC 246-290-810 >1,000 Estimate water savings from measures past six years. – Judy System	4-1
(√)	If DSL is > 10%, water loss control action plan required for compliance with a schedule & activities to minimize leakage in budget	4-2
(√)	Source of supply analysis and evaluation of supply alternatives	2-13
(√)	Interties	2-15
(√)	≥1,000 connections explore reclaimed water opportunities	2-15
Chapter 5 Source Water Protection (Check One or Both)		
(√)	Wellhead protection program	5-3
(√)	Watershed control program	5-5
Chapter 6 Operation and Maintenance Program		
(√)	Water system management and personnel – backup operators	6-1
(√)	Operator certification	6-2
(√)	Routine operating procedures and preventive maintenance	6-6
(√)	Water quality sampling procedures & program – Identify WQ PN Requirements CMP plan/map. Add RTCR* and Ground Water Rule (GWR) narrative, actions DBP Monitoring Plan	6-10
(√)	Emergency program, water shortage plan, service reliability per WAC 246-290-420 - WAWARN	6-11
(√)	Address sanitary survey findings	6-13
(√)	Cross-connection control program – Summarize next actions to address	6-13
(√)	Recordkeeping, reporting, and customer complaint program	6-14
(√)	Summary of O&M deficiencies	6-15
Chapter 7 Distribution Facilities Design and Construction Standards		
(√)	Standard construction specification for distribution mains	7-1
Chapter 8 Improvement Program		
(√)	Capital improvement schedule for the identified planning period and within a 20- year planning	8-1

Water System Pre-Plan Meeting: Skagit PUD No 1, February 2, 2024		
<i>Req.</i>	<i>Content Description</i>	<i>WSP Page #</i>
Chapter 9 Financial Program		
(√)	Balanced budget for the planning period* and demonstrating financial viability	9-1
(√)	Revenue and cash flow stability to fund capital and emergency improvements	9-1
(√)	Evaluation of affordable rate structure that encourages water demand efficiency. Budget line item if Water Loss Control Action Plan is required	9-1
Chapter 10 Miscellaneous Documents		
(√)	Meeting of the consumers (documentation). Approval by EGB prior to DOH approval	App. A
(√)	County/Adjacent Utility Correspondence	App. A
(√)	≥1000 connections - State Environmental Policy Act (SEPA) Determination - Judy	App. A
(√)	Agreement (intertie, service area, franchise, etc.)	App. D
Content Description		
(√)	Satellite Management Program	
(√)	Updated WFI forms	App. B
(√)	WUE goal setting	

Appendix B: Department of Health Forms and Reports

Operating Permit

Water Facility Inventory Form

Judy Reservoir Water System (PWS ID#79500E)

Alger Water System (PWS ID#01400K)

Cedargrove Water System (PWS ID#119174)

Marblemount Water System (PWS ID#AA642)

Potlach Beach Water System (PWS ID#69034L)

Rockport Water System (PWS ID#736006)

Skagit View Village Water System (PWS ID#968795)

STATE OF WASHINGTON
Public Water System
Operating Permit

The Department of Health Office of Drinking Water issues a permit to operate:

SKAGIT COUNTY PUD 1 JUDY RES (ID# 79500 E)

to owner: SKAGIT COUNTY PUD 1 County: SKAGIT

SKAGIT COUNTY PUD 1
1415 Freeway Dr
Mount Vernon, WA 98273

This Permit is valid through: 31 May 2024

PERMIT CATEGORY: **** Green ****

The permit category may be modified or the permit revoked subject to water system compliance with applicable State of Washington drinking water rules and regulations and the following statements.

The system operating permit color category is based on information on file with the Department at the time this permit was printed.

System is substantially in compliance with applicable drinking water requirements



Explanation of Permit Categories

1. **Green** - This category means your system is substantially in compliance with applicable drinking water requirements. Placement in this category indicates the system is adequate for growth up to approved number and existing uses.
2. **Yellow** - This category means your system is substantially in compliance except water system notified to submit water system plan, but has not satisfied planning requirement and/or is under a compliance agreement for a state significant non-complier (SSNC) violation. Placement in this category indicates the system is adequate for growth up to approved number unless otherwise limited by compliance agreement and adequate for existing uses.
3. **Blue** - This category means your system is substantially in compliance except water system does not meet design approval or has exceeded number of approved connections. Placement in this category means the system is adequate for existing uses, but not adequate for growth.
4. **Red** - This category means your system is in substantial non-compliance with applicable drinking water requirements. Placement in this category indicates the system is not adequate for growth or existing uses. **This could result in building permits, on-site sewage disposal permits, food service permits, liquor licenses and other permits and licenses being denied for properties connected to or to be connected to the water system. In addition, lending institutions may choose not to finance loans associated with these properties.**

If you have questions about your operating permit or wish to formally appeal the permit category through an adjudicative proceeding, contact the appropriate Drinking Water Regional Office;

Northwest Regional Office
Kent
(253) 395-6750

Southwest Regional Office
Tumwater
(360) 236-3030

Eastern Regional Office
Spokane
(509) 329-2100

WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter: 1
Updated: 12/15/2023

Printed: 3/4/2024
WFI Printed For: On-Demand
Submission Reason: Pop/Connect
Update

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822 or email wfi@doh.wa.gov

1. SYSTEM ID NO. 79500 E	2. SYSTEM NAME SKAGIT COUNTY PUD 1 JUDY RES	3. COUNTY SKAGIT	4. GROUP A	5. TYPE Comm
6. PRIMARY CONTACT NAME & MAILING ADDRESS JAMIE M. LEBLANC [OPERATOR] 1415 FREEWAY DR MOUNT VERNON, WA 98273		7. OWNER NAME & MAILING ADDRESS SKAGIT COUNTY PUD 1 MICHAEL R. FOX 1415 FREEWAY DR MOUNT VERNON, WA 98273 MANAGER		
STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP		STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP		
9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION		
Primary Contact Daytime Phone: (360) 848-2132		Owner Daytime Phone: (360) 848-4457		
Primary Contact Mobile/Cell Phone: (360) 899-8770		Owner Mobile/Cell Phone: (360) 661-4032		
Primary Contact Evening Phone: (xxx)-xxx-xxxx		Owner Evening Phone: (xxx)-xxx-xxxx		
Fax:	E-mail: lxxxxxc@skagitpud.org	Fax:	E-mail: fxx@skagitpud.org	
11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)				
☐ Not applicable (Skip to #12) ☒ Owned and Managed ☐ Managed Only ☐ Owned Only				
SMA NAME: SKAGIT COUNTY PUD 1		SMA Number: 103		
12. WATER SYSTEM CHARACTERISTICS (mark all that apply)				
☒ Agricultural ☒ Commercial / Business ☒ Day Care ☒ Food Service/Food Permit ☒ 1,000 or more person event for 2 or more days per year ☒ Hospital/Clinic ☒ Industrial ☒ Licensed Residential Facility ☒ Lodging ☒ Recreational / RV Park ☒ Residential ☒ School ☒ Temporary Farm Worker ☒ Other (church, fire station, etc.):				
13. WATER SYSTEM OWNERSHIP (mark only one)				14. STORAGE CAPACITY (gallons)
☐ Association ☐ City / Town ☐ County ☐ Federal ☐ Investor ☐ Private ☒ Special District ☐ State				29,520,000

- SEE NEXT PAGE FOR A COMPLETE LIST OF SOURCES -

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO. 79500 E		2. SYSTEM NAME SKAGIT COUNTY PUD 1 JUDY RES										3. COUNTY SKAGIT					4. GROUP A		5. TYPE Comm	

15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY												19 USE	20	21 TREATMENT							22 DEPTH	23	24 SOURCE LOCATION			
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE	
S01	JUDY RESERVOIR									X			X			Y			X			X		18900	NW NE	05	34N	05E	
S02	InAct 11/22/2017 RANNEY WELL										X				X	Y		X				X		2800	NW NE	07	34N	04E	
S03	InAct 11/22/2017 TOWNSHIP STREET		X												X	Y		X				X	55	600	NW NW	30	35N	05E	
S04	02200C/ANACORTES	02200 C												X		Y	X							2000			00N	00E	
S05	InAct 06/03/1991 02200C/ANACORTES	02200 C												X			X							1500	NW SE	03	34N	02E	
S06	InAct 06/03/1991 WHITMARSH 1		X											X			X						190	35	NW SE	03	34N	02E	
S07	InAct 06/03/1991 WHITMARSH 2		X											X			X						18	35	NW SE	03	34N	02E	
S08	02200C/ANACORTES	02200 C												X		Y	X							1000			00N	00E	
S09	02200C/ANACORTES	02200 C												X		Y	X							3250			00N	00E	
S10	02200C/ANACORTES(BEAVER MARSH PORT)	02200 C											X			Y	X							6900			00N	00E	

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
79500 E	SKAGIT COUNTY PUD 1 JUDY RES	SKAGIT	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		29090	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or more per year)	21600		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	1279		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	7490		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	2271	2271	
	28. TOTAL SERVICE CONNECTIONS	31361	

29. FULL-TIME RESIDENTIAL POPULATION													
A. How many residents are served by this system 180 or more days per year? <u>79997</u>													

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	492807	445116	492807	476910	492807	476910	492807	492807	476910	492807	476910	492807
B. How many days per month is water accessible to the public?	31	28	31	30	31	30	31	31	30	31	31	31

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month that are NOT already included in the residential population?	20477	20477	20477	20477	20477	20477	20477	20477	20477	20477	20477	20477
B. How many days per month are they present?	31	28	31	30	31	30	31	31	30	31	31	31

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	100	100	100	100	100	100	100	100	100	100	100	100

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:
☐ Update - Change
 ☐ Update - No Change
 ☐ Inactivate
 ☐ Re-Activate
 ☐ Name Change
 ☐ New System
 ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____	DATE: _____
PRINT NAME: _____	TITLE: _____

STATE OF WASHINGTON
Public Water System
Operating Permit

The Department of Health Office of Drinking Water issues a permit to operate:

SKAGIT CO PUD - ALGER (ID# 01400 K)

to owner: SKAGIT COUNTY PUD 1 County: SKAGIT

SKAGIT COUNTY PUD 1
1415 Freeway Dr
Mount Vernon, WA 98273

This Permit is valid through: 31 May 2024

PERMIT CATEGORY: **** Green ****

The permit category may be modified or the permit revoked subject to water system compliance with applicable State of Washington drinking water rules and regulations and the following statements.

The system operating permit color category is based on information on file with the Department at the time this permit was printed.

System is substantially in compliance with applicable drinking water requirements



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If you have questions about your operating permit or wish to formally appeal the permit category through an adjudicative proceeding, contact the appropriate Drinking Water Regional Office;

Northwest Regional Office
Kent
(253) 395-6750

Southwest Regional Office
Tumwater
(360) 236-3030

Eastern Regional Office
Spokane
(509) 329-2100



WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter: 1
Updated: 01/26/2024

Printed: 4/23/2024
WFI Printed For: On-Demand
Submission Reason: Pop/Connect
Update

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822 or email wfi@doh.wa.gov

1. SYSTEM ID NO. 01400 K	2. SYSTEM NAME SKAGIT CO PUD - ALGER	3. COUNTY SKAGIT	4. GROUP A	5. TYPE Comm					
6. PRIMARY CONTACT NAME & MAILING ADDRESS MICHAEL R. FOX [MANAGER] 1415 FREEWAY DR MOUNT VERNON, WA 98273		7. OWNER NAME & MAILING ADDRESS SKAGIT COUNTY PUD 1 MICHAEL R. FOX 1415 FREEWAY DR MOUNT VERNON, WA 98273							
STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP		STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP							
9. 24 HOUR PRIMARY CONTACT INFORMATION Primary Contact Daytime Phone: (360) 848-4457 Primary Contact Mobile/Cell Phone: (360) 661-4032 Primary Contact Evening Phone: (xxx)-xxx-xxxx Fax: (360) 424-5440 E-mail: fxx@skagitpud.org		10. OWNER CONTACT INFORMATION Owner Daytime Phone: (360) 848-4457 Owner Mobile/Cell Phone: (360) 661-4032 Owner Evening Phone: (xxx)-xxx-xxxx Fax: E-mail: fxx@skagitpud.org							
11. SATELLITE MANAGEMENT AGENCY - SMA (check only one) ☐ Not applicable (Skip to #12) ☒ Owned and Managed SMA NAME: SKAGIT COUNTY PUD 1 SMA Number: 103 ☐ Managed Only ☐ Owned Only									
12. WATER SYSTEM CHARACTERISTICS (mark all that apply) ☐ Agricultural ☐ Hospital/Clinic ☒ Residential ☒ Commercial / Business ☐ Industrial ☐ School ☒ Day Care ☐ Licensed Residential Facility ☐ Temporary Farm Worker ☒ Food Service/Food Permit ☐ Lodging ☒ Other (church, fire station, etc.): ☐ 1,000 or more person event for 2 or more days per year ☐ Recreational / RV Park									
13. WATER SYSTEM OWNERSHIP (mark only one) ☐ Association ☐ County ☐ Investor ☒ Special District ☐ City / Town ☐ Federal ☐ Private ☐ State				14. STORAGE CAPACITY (gallons) 132,000					
15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY	19 USE	20	21 TREATMENT	22 DEPTH	23	24 SOURCE LOCATION
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL WELL IN A WELL FIELD SPRING SPRING IN SPRINGFIELD SEA WATER SURFACE WATER RAINNEY / INF. GALLERY OTHER PERMANENT SEASONAL EMERGENCY SOURCE METERED NONE CHLORINATION FILTRATION FLUORIDATION (UV) IRRADIATION (UV) OTHER				DEPTH TO FIRST OPEN TERTIAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION SECTION NUMBER TOWNSHIP RANGE
S01	Well AER350		X			X	X	35	75 NW SW 08 36N 04E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
01400 K	SKAGIT CO PUD - ALGER	SKAGIT	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		135	219
A. Full Time Single Family Residences (Occupied 180 days or more per year)	129		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	6		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	14	14	0
28. TOTAL SERVICE CONNECTIONS		149	219

29. FULL-TIME RESIDENTIAL POPULATION
A. How many residents are served by this system 180 or more days per year? 315

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	3038	2744	3038	2940	3038	2940	3038	3038	2940	3038	2940	3038
B. How many days per month is water accessible to the public?	30	30	30	30	30	30	30	30	30	30	30	30

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month that are NOT already included in the residential population?	14	14	14	14	14	14	14	14	14	14	14	14
B. How many days per month are they present?	30	30	30	30	30	30	30	30	30	30	30	30

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	1	1	1	1	1	1	1	1	1	1	1	1

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:
☐ Update - Change
 ☐ Update - No Change
 ☐ Inactivate
 ☐ Re-Activate
 ☐ Name Change
 ☐ New System
 ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____	DATE: _____
PRINT NAME: _____	TITLE: _____

STATE OF WASHINGTON
Public Water System
Operating Permit

The Department of Health Office of Drinking Water issues a permit to operate:

SKAGIT CO PUD - CEDARGROVE (ID# 11917 4)

to owner: SKAGIT COUNTY PUD 1 County: SKAGIT

SKAGIT COUNTY PUD 1
1415 Freeway Dr
Mount Vernon, WA 98273

This Permit is valid through: 31 May 2024

PERMIT CATEGORY: **** Green ****

The permit category may be modified or the permit revoked subject to water system compliance with applicable State of Washington drinking water rules and regulations and the following statements.

The system operating permit color category is based on information on file with the Department at the time this permit was printed.

System is substantially in compliance with applicable drinking water requirements



Explanation of Permit Categories

1. **Green** - This category means your system is substantially in compliance with applicable drinking water requirements. Placement in this category indicates the system is adequate for growth up to approved number and existing uses.
2. **Yellow** - This category means your system is substantially in compliance except water system notified to submit water system plan, but has not satisfied planning requirement and/or is under a compliance agreement for a state significant non-complier (SSNC) violation. Placement in this category indicates the system is adequate for growth up to approved number unless otherwise limited by compliance agreement and adequate for existing uses.
3. **Blue** - This category means your system is substantially in compliance except water system does not meet design approval or has exceeded number of approved connections. Placement in this category means the system is adequate for existing uses, but not adequate for growth.
4. **Red** - This category means your system is in substantial non-compliance with applicable drinking water requirements. Placement in this category indicates the system is not adequate for growth or existing uses. **This could result in building permits, on-site sewage disposal permits, food service permits, liquor licenses and other permits and licenses being denied for properties connected to or to be connected to the water system. In addition, lending institutions may choose not to finance loans associated with these properties.**

If you have questions about your operating permit or wish to formally appeal the permit category through an adjudicative proceeding, contact the appropriate Drinking Water Regional Office;

Northwest Regional Office
Kent
(253) 395-6750

Southwest Regional Office
Tumwater
(360) 236-3030

Eastern Regional Office
Spokane
(509) 329-2100

WATER FACILITIES INVENTORY (WFI) FORM

Quarter: 1
Updated: 02/13/2024

ONE FORM PER SYSTEM

Printed: 4/23/2024
WFI Printed For: On-Demand
Submission Reason: Pop/Connect
Update

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822 or email wfi@doh.wa.gov

1. SYSTEM ID NO. 11917 4		2. SYSTEM NAME SKAGIT CO PUD - CEDARGROVE		3. COUNTY SKAGIT		4. GROUP A		5. TYPE Comm									
6. PRIMARY CONTACT NAME & MAILING ADDRESS MICHAEL R. FOX [MANAGER] 1415 FREEWAY DR MOUNT VERNON, WA 98273					7. OWNER NAME & MAILING ADDRESS SKAGIT COUNTY PUD 1 MICHAEL R. FOX 1415 FREEWAY DR MOUNT VERNON, WA 98273												
STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP					STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP												
9. 24 HOUR PRIMARY CONTACT INFORMATION					10. OWNER CONTACT INFORMATION												
Primary Contact Daytime Phone: (360) 848-4457					Owner Daytime Phone: (360) 848-4457												
Primary Contact Mobile/Cell Phone: (360) 661-4032					Owner Mobile/Cell Phone: (360) 661-4032												
Primary Contact Evening Phone: (xxx)-xxx-xxxx					Owner Evening Phone: (xxx)-xxx-xxxx												
Fax: (360) 424-5440 E-mail: fxx@skagitpud.org					Fax: E-mail: fxx@skagitpud.org												
11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)																	
☐ Not applicable (Skip to #12) ☒ Owned and Managed SMA NAME: SKAGIT COUNTY PUD 1 SMA Number: 103 ☐ Managed Only ☐ Owned Only																	
12. WATER SYSTEM CHARACTERISTICS (mark all that apply)																	
☐ Agricultural ☐ Hospital/Clinic ☒ Residential ☐ Commercial / Business ☐ Industrial ☐ School ☐ Day Care ☐ Licensed Residential Facility ☐ Temporary Farm Worker ☐ Food Service/Food Permit ☐ Lodging ☒ Other (church, fire station, etc.): ☐ 1,000 or more person event for 2 or more days per year ☐ Recreational / RV Park																	
13. WATER SYSTEM OWNERSHIP (mark only one)							14. STORAGE CAPACITY (gallons)										
☐ Association ☐ County ☐ Investor ☒ Special District ☐ City / Town ☐ Federal ☐ Private ☐ State							270,000										
15	16	17	18				19	20	21	22	23	24					
	SOURCE NAME	INTERTIE	SOURCE CATEGORY				USE		TREATMENT	DEPTH		SOURCE LOCATION					
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL IN A WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE	
	S01 InAct 08/01/1991 WELL #1		X									102	50	NE SW	14	35N	08E
	S02 WELL # 2 AET033		X									155	262	SW SE	15	35N	08E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
11917 4	SKAGIT CO PUD - CEDARGROVE	SKAGIT	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		175	311
A. Full Time Single Family Residences (Occupied 180 days or more per year)	166		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	9		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	0	0	0
	28. TOTAL SERVICE CONNECTIONS	175	311

29. FULL-TIME RESIDENTIAL POPULATION													
A. How many residents are served by this system 180 or more days per year? 420													

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?												
B. How many days per month is water accessible to the public?												

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month that are NOT already included in the residential population?												
B. How many days per month are they present?												

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	1	1	1	1	1	1	1	1	1	1	1	1

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:
☐ Update - Change
 ☐ Update - No Change
 ☐ Inactivate
 ☐ Re-Activate
 ☐ Name Change
 ☐ New System
 ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____	DATE: _____
PRINT NAME: _____	TITLE: _____

STATE OF WASHINGTON
Public Water System
Operating Permit

The Department of Health Office of Drinking Water issues a permit to operate:

SKAGIT CO PUD - MARBLEMOUNT (ID# AA642 3)

to owner: SKAGIT COUNTY PUD 1 County: SKAGIT

SKAGIT COUNTY PUD 1
1415 Freeway Dr
Mount Vernon, WA 98273

This Permit is valid through: 31 May 2024

PERMIT CATEGORY: **** Green ****

The permit category may be modified or the permit revoked subject to water system compliance with applicable State of Washington drinking water rules and regulations and the following statements.

The system operating permit color category is based on information on file with the Department at the time this permit was printed.

System is substantially in compliance with applicable drinking water requirements



Explanation of Permit Categories

1. **Green** - This category means your system is substantially in compliance with applicable drinking water requirements. Placement in this category indicates the system is adequate for growth up to approved number and existing uses.
2. **Yellow** - This category means your system is substantially in compliance except water system notified to submit water system plan, but has not satisfied planning requirement and/or is under a compliance agreement for a state significant non-complier (SSNC) violation. Placement in this category indicates the system is adequate for growth up to approved number unless otherwise limited by compliance agreement and adequate for existing uses.
3. **Blue** - This category means your system is substantially in compliance except water system does not meet design approval or has exceeded number of approved connections. Placement in this category means the system is adequate for existing uses, but not adequate for growth.
4. **Red** - This category means your system is in substantial non-compliance with applicable drinking water requirements. Placement in this category indicates the system is not adequate for growth or existing uses. **This could result in building permits, on-site sewage disposal permits, food service permits, liquor licenses and other permits and licenses being denied for properties connected to or to be connected to the water system. In addition, lending institutions may choose not to finance loans associated with these properties.**

If you have questions about your operating permit or wish to formally appeal the permit category through an adjudicative proceeding, contact the appropriate Drinking Water Regional Office;

Northwest Regional Office
Kent
(253) 395-6750

Southwest Regional Office
Tumwater
(360) 236-3030

Eastern Regional Office
Spokane
(509) 329-2100

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
AA642 3	SKAGIT CO PUD - MARBLEMOUNT	SKAGIT	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		24	94
A. Full Time Single Family Residences (Occupied 180 days or more per year)	18		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	6		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	10	10	12
28. TOTAL SERVICE CONNECTIONS		34	106

29. FULL-TIME RESIDENTIAL POPULATION													
A. How many residents are served by this system 180 or more days per year? 47													

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	781	952	789	1266	2916	2850	4175	5601	3570	2460	770	783
B. How many days per month is water accessible to the public?	31	28	31	30	31	30	31	31	30	31	30	31

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month that are NOT already included in the residential population?	15	15	15	15	15	15	15	15	15	15	15	15
B. How many days per month are they present?	8	8	8	8	8	8	8	8	8	8	8	8

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	1	1	1	1	1	1	1	1	1	1	1	1

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:
☐ Update - Change
 ☐ Update - No Change
 ☐ Inactivate
 ☐ Re-Activate
 ☐ Name Change
 ☐ New System
 ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____	DATE: _____
PRINT NAME: _____	TITLE: _____

STATE OF WASHINGTON
Public Water System
Operating Permit

The Department of Health Office of Drinking Water issues a permit to operate:

SKAGIT CO PUD - POTLATCH BEACH (ID# 69034 L)

to owner: SKAGIT COUNTY PUD 1 County: SKAGIT

SKAGIT COUNTY PUD 1
1415 Freeway Dr
Mount Vernon, WA 98273

This Permit is valid through: 31 May 2024

PERMIT CATEGORY: **** Green ****

The permit category may be modified or the permit revoked subject to water system compliance with applicable State of Washington drinking water rules and regulations and the following statements.

The system operating permit color category is based on information on file with the Department at the time this permit was printed.

System is substantially in compliance with applicable drinking water requirements



Explanation of Permit Categories

1. **Green** - This category means your system is substantially in compliance with applicable drinking water requirements. Placement in this category indicates the system is adequate for growth up to approved number and existing uses.
2. **Yellow** - This category means your system is substantially in compliance except water system notified to submit water system plan, but has not satisfied planning requirement and/or is under a compliance agreement for a state significant non-complier (SSNC) violation. Placement in this category indicates the system is adequate for growth up to approved number unless otherwise limited by compliance agreement and adequate for existing uses.
3. **Blue** - This category means your system is substantially in compliance except water system does not meet design approval or has exceeded number of approved connections. Placement in this category means the system is adequate for existing uses, but not adequate for growth.
4. **Red** - This category means your system is in substantial non-compliance with applicable drinking water requirements. Placement in this category indicates the system is not adequate for growth or existing uses. **This could result in building permits, on-site sewage disposal permits, food service permits, liquor licenses and other permits and licenses being denied for properties connected to or to be connected to the water system. In addition, lending institutions may choose not to finance loans associated with these properties.**

If you have questions about your operating permit or wish to formally appeal the permit category through an adjudicative proceeding, contact the appropriate Drinking Water Regional Office;

Northwest Regional Office
Kent
(253) 395-6750

Southwest Regional Office
Tumwater
(360) 236-3030

Eastern Regional Office
Spokane
(509) 329-2100

WATER FACILITIES INVENTORY (WFI) FORM

Quarter: 1
Updated: 01/26/2024

ONE FORM PER SYSTEM

Printed: 4/23/2024
WFI Printed For: On-Demand
Submission Reason: No Change

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822 or email wfi@doh.wa.gov

1. SYSTEM ID NO. 69034 L		2. SYSTEM NAME SKAGIT CO PUD - POTLATCH BEACH			3. COUNTY SKAGIT			4. GROUP A		5. TYPE Comm																
6. PRIMARY CONTACT NAME & MAILING ADDRESS MICHAEL R. FOX [MANAGER] 1415 FREEWAY DR MOUNT VERNON, WA 98273					7. OWNER NAME & MAILING ADDRESS SKAGIT COUNTY PUD 1 MICHAEL R. FOX 1415 FREEWAY DR MOUNT VERNON, WA 98273 MANAGER																					
STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP					STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP																					
9. 24 HOUR PRIMARY CONTACT INFORMATION Primary Contact Daytime Phone: (360) 848-4457 Primary Contact Mobile/Cell Phone: (360) 661-4032 Primary Contact Evening Phone: (xxx)-xxx-xxxx Fax: (360) 424-5440 E-mail: fx@skagitpud.org					10. OWNER CONTACT INFORMATION Owner Daytime Phone: (360) 848-4457 Owner Mobile/Cell Phone: (360) 661-4032 Owner Evening Phone: (xxx)-xxx-xxxx Fax: E-mail: fx@skagitpud.org																					
11. SATELLITE MANAGEMENT AGENCY - SMA (check only one) ☐ Not applicable (Skip to #12) ☒ Owned and Managed SMA NAME: SKAGIT COUNTY PUD 1 SMA Number: 103 ☐ Managed Only ☐ Owned Only																										
12. WATER SYSTEM CHARACTERISTICS (mark all that apply) <table><tr><td>☐ Agricultural</td><td>☐ Hospital/Clinic</td><td>☒ Residential</td></tr><tr><td>☐ Commercial / Business</td><td>☐ Industrial</td><td>☐ School</td></tr><tr><td>☐ Day Care</td><td>☐ Licensed Residential Facility</td><td>☐ Temporary Farm Worker</td></tr><tr><td>☐ Food Service/Food Permit</td><td>☐ Lodging</td><td>☐ Other (church, fire station, etc.):</td></tr><tr><td>☐ 1,000 or more person event for 2 or more days per year</td><td>☐ Recreational / RV Park</td><td></td></tr></table>												☐ Agricultural	☐ Hospital/Clinic	☒ Residential	☐ Commercial / Business	☐ Industrial	☐ School	☐ Day Care	☐ Licensed Residential Facility	☐ Temporary Farm Worker	☐ Food Service/Food Permit	☐ Lodging	☐ Other (church, fire station, etc.):	☐ 1,000 or more person event for 2 or more days per year	☐ Recreational / RV Park	
☐ Agricultural	☐ Hospital/Clinic	☒ Residential																								
☐ Commercial / Business	☐ Industrial	☐ School																								
☐ Day Care	☐ Licensed Residential Facility	☐ Temporary Farm Worker																								
☐ Food Service/Food Permit	☐ Lodging	☐ Other (church, fire station, etc.):																								
☐ 1,000 or more person event for 2 or more days per year	☐ Recreational / RV Park																									
13. WATER SYSTEM OWNERSHIP (mark only one) <table><tr><td>☐ Association</td><td>☐ County</td><td>☐ Investor</td><td>☒ Special District</td></tr><tr><td>☐ City / Town</td><td>☐ Federal</td><td>☐ Private</td><td>☐ State</td></tr></table>										☐ Association	☐ County	☐ Investor	☒ Special District	☐ City / Town	☐ Federal	☐ Private	☐ State	14. STORAGE CAPACITY (gallons) 30,000								
☐ Association	☐ County	☐ Investor	☒ Special District																							
☐ City / Town	☐ Federal	☐ Private	☐ State																							
15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY				19 USE	20	21 TREATMENT			22 DEPTH	23	24 SOURCE LOCATION												
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL IN A WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD	WELL FIELD										
S01	InAct 01/19/1993 Well		X																							
S02	Well 1 AAE847		X																							
S03	InAct 01/05/2000 Well 2		X																							
S04	Sea Water																									

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
69034 L	SKAGIT CO PUD - POTLATCH BEACH	SKAGIT	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		33	182
A. Full Time Single Family Residences (Occupied 180 days or more per year)	33		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	0	0	0
28. TOTAL SERVICE CONNECTIONS		33	182

29. FULL-TIME RESIDENTIAL POPULATION													
A. How many residents are served by this system 180 or more days per year? 75													

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?												
B. How many days per month is water accessible to the public?												

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month that are NOT already included in the residential population?												
B. How many days per month are they present?												

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	1	1	1	1	1	1	1	1	1	1	1	1

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:
☐ Update - Change
 ☐ Update - No Change
 ☐ Inactivate
 ☐ Re-Activate
 ☐ Name Change
 ☐ New System
 ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____	DATE: _____
PRINT NAME: _____	TITLE: _____

STATE OF WASHINGTON
Public Water System
Operating Permit

The Department of Health Office of Drinking Water issues a permit to operate:

SKAGIT CO PUD ROCKPORT (ID# 73600 6)

to owner: SKAGIT COUNTY PUD 1 County: SKAGIT

SKAGIT COUNTY PUD 1
1415 Freeway Dr
Mount Vernon, WA 98273

This Permit is valid through: 31 May 2024

PERMIT CATEGORY: **** Green ****

The permit category may be modified or the permit revoked subject to water system compliance with applicable State of Washington drinking water rules and regulations and the following statements.

The system operating permit color category is based on information on file with the Department at the time this permit was printed.

System is substantially in compliance with applicable drinking water requirements



Explanation of Permit Categories

1. **Green** - This category means your system is substantially in compliance with applicable drinking water requirements. Placement in this category indicates the system is adequate for growth up to approved number and existing uses.
2. **Yellow** - This category means your system is substantially in compliance except water system notified to submit water system plan, but has not satisfied planning requirement and/or is under a compliance agreement for a state significant non-complier (SSNC) violation. Placement in this category indicates the system is adequate for growth up to approved number unless otherwise limited by compliance agreement and adequate for existing uses.
3. **Blue** - This category means your system is substantially in compliance except water system does not meet design approval or has exceeded number of approved connections. Placement in this category means the system is adequate for existing uses, but not adequate for growth.
4. **Red** - This category means your system is in substantial non-compliance with applicable drinking water requirements. Placement in this category indicates the system is not adequate for growth or existing uses. **This could result in building permits, on-site sewage disposal permits, food service permits, liquor licenses and other permits and licenses being denied for properties connected to or to be connected to the water system. In addition, lending institutions may choose not to finance loans associated with these properties.**

If you have questions about your operating permit or wish to formally appeal the permit category through an adjudicative proceeding, contact the appropriate Drinking Water Regional Office;

Northwest Regional Office
Kent
(253) 395-6750

Southwest Regional Office
Tumwater
(360) 236-3030

Eastern Regional Office
Spokane
(509) 329-2100

WATER FACILITIES INVENTORY (WFI) FORM

Quarter: 1
Updated: 01/26/2024

ONE FORM PER SYSTEM

Printed: 4/23/2024
WFI Printed For: On-Demand
Submission Reason: Pop/Connect
Update

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822 or email wfi@doh.wa.gov

1. SYSTEM ID NO. 73600 6	2. SYSTEM NAME SKAGIT CO PUD ROCKPORT	3. COUNTY SKAGIT	4. GROUP A	5. TYPE Comm						
6. PRIMARY CONTACT NAME & MAILING ADDRESS MICHAEL R. FOX [MANAGER] 1415 FREEWAY DR MOUNT VERNON, WA 98273		7. OWNER NAME & MAILING ADDRESS SKAGIT COUNTY PUD 1 MICHAEL R. FOX 1415 FREEWAY DR MOUNT VERNON, WA 98273								
STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP		STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP								
9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION								
Primary Contact Daytime Phone: (360) 848-4457		Owner Daytime Phone: (360) 848-4457								
Primary Contact Mobile/Cell Phone: (360) 661-4032		Owner Mobile/Cell Phone: (360) 661-4032								
Primary Contact Evening Phone: (xxx)-xxx-xxxx		Owner Evening Phone: (xxx)-xxx-xxxx								
Fax: (360) 424-5440 E-mail: fxx@skagitpud.org		Fax: E-mail: fxx@skagitpud.org								
11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)										
☐ Not applicable (Skip to #12) ☒ Owned and Managed SMA NAME: SKAGIT COUNTY PUD 1 SMA Number: 103 ☐ Managed Only ☐ Owned Only										
12. WATER SYSTEM CHARACTERISTICS (mark all that apply)										
☐ Agricultural ☒ Commercial / Business ☒ Day Care ☒ Food Service/Food Permit ☐ 1,000 or more person event for 2 or more days per year ☐ Hospital/Clinic ☐ Industrial ☐ Licensed Residential Facility ☐ Lodging ☒ Recreational / RV Park ☒ Residential ☐ School ☐ Temporary Farm Worker ☐ Other (church, fire station, etc.):										
13. WATER SYSTEM OWNERSHIP (mark only one)				14. STORAGE CAPACITY (gallons)						
☐ Association ☐ City / Town ☐ County ☐ Federal ☐ Investor ☐ Private ☒ Special District ☐ State				60,000						
15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY	19 USE	20	21 TREATMENT	22 DEPTH	23	24 SOURCE LOCATION	
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL IN A WELL FIELD WELL FIELD SPRING SPRING IN SPRINGFIELD SEA WATER SURFACE WATER RAINNEY / INF. GALLERY OTHER PERMANENT SEASONAL EMERGENCY SOURCE METERED NONE	CHLORINATION FILTRATION FLUORIDATION (UV) IRRADIATION (UV) OTHER	DEPTH TO FIRST OPEN TERTIAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	InAct 08/25/1991 SURFACE #1		X			X		0		35N 09E
S02	InAct 08/25/1991 SURFACE #2		X			X		0		35N 09E
S03	InAct 08/25/1991 WELL #1		X			X		100	45	NE SE 27 35N 05E
S04	SP740H/WELL @ ROCKPORT SP AET032		X			X	X	334	95	NE SE 27 35N 09E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
73600 6	SKAGIT CO PUD ROCKPORT	SKAGIT	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		61	100
A. Full Time Single Family Residences (Occupied 180 days or more per year)	53		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	8		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	6	6	6
28. TOTAL SERVICE CONNECTIONS		67	106

29. FULL-TIME RESIDENTIAL POPULATION													
A. How many residents are served by this system 180 or more days per year? 135													

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	300	300	400	400	600	1500	1500	1500	1500	400	300	300
B. How many days per month is water accessible to the public?	31	28	31	30	31	30	31	31	30	31	30	31

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month that are NOT already included in the residential population?	3	3	3	3	3	3	3	3	3	3	3	3
B. How many days per month are they present?	31	28	31	30	31	30	31	31	30	31	30	31

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	1	1	1	1	1	1	1	1	1	1	1	1

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:
☐ Update - Change
 ☐ Update - No Change
 ☐ Inactivate
 ☐ Re-Activate
 ☐ Name Change
 ☐ New System
 ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____	DATE: _____
PRINT NAME: _____	TITLE: _____

STATE OF WASHINGTON
Public Water System
Operating Permit

The Department of Health Office of Drinking Water issues a permit to operate:

SKAGIT VIEW VILLAGE WATER SYSTEM (ID# 96879 5)

to owner: **SKAGIT COUNTY PUD 1 County: SKAGIT**

┌ SKAGIT COUNTY PUD 1 1415 Freeway Dr Mount Vernon, WA 98273 └	┐ └

This Permit is valid through: **31 May 2024**

PERMIT CATEGORY: ****** Green ******

The permit category may be modified or the permit revoked subject to water system compliance with applicable State of Washington drinking water rules and regulations and the following statements.

The system operating permit color category is based on information on file with the Department at the time this permit was printed.

System is substantially in compliance with applicable drinking water requirements



Explanation of Permit Categories

1. **Green** - This category means your system is substantially in compliance with applicable drinking water requirements. Placement in this category indicates the system is adequate for growth up to approved number and existing uses.
2. **Yellow** - This category means your system is substantially in compliance except water system notified to submit water system plan, but has not satisfied planning requirement and/or is under a compliance agreement for a state significant non-complier (SSNC) violation. Placement in this category indicates the system is adequate for growth up to approved number unless otherwise limited by compliance agreement and adequate for existing uses.
3. **Blue** - This category means your system is substantially in compliance except water system does not meet design approval or has exceeded number of approved connections. Placement in this category means the system is adequate for existing uses, but not adequate for growth.
4. **Red** - This category means your system is in substantial non-compliance with applicable drinking water requirements. Placement in this category indicates the system is not adequate for growth or existing uses. **This could result in building permits, on-site sewage disposal permits, food service permits, liquor licenses and other permits and licenses being denied for properties connected to or to be connected to the water system. In addition, lending institutions may choose not to finance loans associated with these properties.**

If you have questions about your operating permit or wish to formally appeal the permit category through an adjudicative proceeding, contact the appropriate Drinking Water Regional Office;

Northwest Regional Office
Kent
(253) 395-6750

Southwest Regional Office
Tumwater
(360) 236-3030

Eastern Regional Office
Spokane
(509) 329-2100

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
96879 5	SKAGIT VIEW VILLAGE WATER SYSTEM	SKAGIT	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		95	128
A. Full Time Single Family Residences (Occupied 180 days or more per year)	90		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	5		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	0	0	0
28. TOTAL SERVICE CONNECTIONS		95	128

29. FULL-TIME RESIDENTIAL POPULATION													
A. How many residents are served by this system 180 or more days per year? 220													

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?	25	25	25	25	25	25	25	25	25	25	25	25
B. How many days per month are they present?	8	8	8	8	8	8	8	8	8	8	8	8

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?												
B. How many days per month is water accessible to the public?												

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month that are NOT already included in the residential population?												
B. How many days per month are they present?												

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	1	1	1	1	1	1	1	1	1	1	1	1

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:
☐ Update - Change
 ☐ Update - No Change
 ☐ Inactivate
 ☐ Re-Activate
 ☐ Name Change
 ☐ New System
 ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____	DATE: _____
PRINT NAME: _____	TITLE: _____

Appendix C: Water Rights

Water Rights Self-Assessment (Judy System)

Water Rights (Judy System)

Water Right Self-Assessment Form for Water System Plan

Mouse-over any link for more information. Click on any link for more detailed instructions.

<u>Water Right Permit, Certificate, or Claim #</u> *If water right is interruptible, identify limitation in yellow section below	<u>WFI Source #</u> If a source has multiple water rights, list each water right on separate line	<u>Existing Water Rights</u> Qi= Instantaneous Flow Rate Allowed (GPM or CFS) Qa= Annual Volume Allowed (Acre-Feet/Year) This includes wholesale water sold				<u>Current Source Production – Most Recent Calendar Year</u> Qi = Max Instantaneous Flow Rate Withdrawn (GPM or CFS) Qa = Annual Volume Withdrawn (Acre-Feet/Year) This includes wholesale water sold				<u>10-Year Forecasted Source Production (determined from WSP)</u> This includes wholesale water sold				<u>20-Year Forecasted Source Production (determined from WSP)</u> This includes wholesale water sold			
		<u>Primary Qi</u> Maximum Rate Allowed	<u>Non-Additive Qi</u> Maximum Rate Allowed	<u>Primary Qa</u> Maximum Volume Allowed	<u>Non-Additive Qa</u> Maximum Volume Allowed	<u>Total Qi</u> Maximum Instantaneous Flow Rate Withdrawn	<u>Current Excess or (Deficiency) Qi</u>	<u>Total Qa</u> Maximum Annual Volume Withdrawn	<u>Current Excess or (Deficiency) Qa</u>	<u>Total Qi</u> Maximum Instantaneous Flow Rate in 10 Years	<u>10-Year Forecasted Excess or (Deficiency) Qi</u>	<u>Total Qa</u> Maximum Annual Volume in 10 Years	<u>10-Year Forecasted Excess or (Deficiency) Qa</u>	<u>Total Qi</u> Maximum Instantaneous Flow Rate in 20 Years	<u>20-Year Forecasted Excess or (Deficiency) Qi</u>	<u>Total Qa</u> Maximum Annual Volume in 20 Years	<u>20-Year Forecasted Excess or (Deficiency) Qa</u>
SWC 411	PWSID 79500E Source S01-Judy Res.	1.5 cfs		1,086 afy													
S1-00724C	""	7.39 cfs	1.5 cfs	2,614 afy	1086 afy												
SWC 26	""	2.5 cfs		1,810 afy													
S1-00737C	""	5.5 cfs	2.5 cfs	2,076 afy	1810 afy												
Claim 9333	""	4.3 cfs		2,300 afy													
S1-00739C	""	6.2 cfs		722 afy	2,300 afy												
Claim 9332	""	1.8 cfs		307 afy													
GWP 3350	""	8.91 cfs		6,400 afy													
GWP 2911	""	2 cfs		1,440 afy													
S1-25129P	""	13.15 cfs			3,700 afy												
S1-27862P	""	6.6 cfs			3,022 afy												
S1-18219P	""	4 cfs			307 afy												
S1-27860	""	12.8 cfs		362 afy	5,071 afy												
S1-27861	""	18.56 cfs			3,886 afy												
	TOTALS =	55.39 cfs See Comment 4		19,117.4 afy; 23,417.4 afy with reservoir flushing. See Comment 7		36.54 cfs withdrawn in 2022. See Comment 1	18.85 cfs in 2022. See Comment 1	7,390.93 afy withdrawn in 2022. See Comment 1	11,726.47 afy in 2022. See Comment 1.	55.39 cfs (2035)	0 cfs	8,465.86 afy (2035)	10,651.54 afy (2035)	55.39 cfs (2046)	0 cfs (2046)	11,018.45 afy (2046)	8,098.95 afy (2046)

Column Identifiers for Calculations:

A

B

C

=A-C

D

=B-D

E

= A-E

F

=B-F

G

=A-G

H

=B-H

PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.						
Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa

INTERTIES: Systems receiving wholesale water complete this section. Wholesaling systems must include water sold through intertie in the current and forecasted source production columns above.

[illegible]

Column Identifiers for Calculations:													
A	B	C	=A-C	D	=B-D	E	=A-E	F	=B-F	G	=A-G	H	=B-H
1	2	3		4		5		6		7		8	
9	10	11		12		13		14		15		16	
17	18	19		20		21		22		23		24	
25	26	27		28		29		30		31		32	
33	34	35		36		37		38		39		40	
41	42	43		44		45		46		47		48	
49	50	51		52		53		54		55		56	
57	58	59		60		61		62		63		64	
65	66	67		68		69		70		71		72	
73	74	75		76		77		78		79		80	
81	82	83		84		85		86		87		88	
89	90	91		92		93		94		95		96	
97	98	99		100		101		102		103		104	
105	106	107		108		109		110		111		112	
113	114	115		116		117		118		119		120	
121	122	123		124		125		126		127		128	
129	130	131		132		133		134		135		136	
137	138	139		140		141		142		143		144	
145	146	147		148		149		150		151		152	
153	154	155		156		157		158		159		160	
161	162	163		164		165		166		167		168	
169	170	171		172		173		174		175		176	
177	178	179		180		181		182		183		184	
185	186	187		188		189		190		191		192	
193	194	195		196		197		198		199		200	
201	202	203		204		205		206		207		208	
209	210	211		212		213		214		215		216	
217	218	219		220		221		222		223		224	
225	226	227		228		229		230		231		232	
233	234	235		236		237		238		239		240	
241	242	243		244		245		246		247		248	
249	250	251		252		253		254		255		256	
257	258	259		260		261		262		263		264	
265	266	267		268		269		270		271		272	
273	274	275		276		277		278		279		280	
281	282	283		284		285		286		287		288	
289	290	291		292		293		294		295		296	
297	298	299											

INTERRUPTIBLE WATER RIGHTS: Identify limitations on any water rights listed above that are interruptible.

Water Right #	Conditions of Interruption	Time Period of Interruption
SWC 411	Diversion from Gilligan Creek is subject to the Cultus Mountain Instream Flows.	Chapter 173-503 WAC.
S1-00724C	Diversion from Gilligan Creek is subject to the Cultus Mountain Instream Flows.	Chapter 173-503 WAC.
SWC 26	Diversion from Mundt Creek is subject to the Cultus Mountain Instream Flows.	Chapter 173-503 WAC.
S1-00737C	Diversion from Mundt Creek is subject to the Cultus Mountain Instream Flows.	Chapter 173-503 WAC.
Claim 9333	Diversion from Turner Creek is subject to the Cultus Mountain Instream Flows.	Chapter 173-503 WAC.
S1-00739C	Diversion from Turner Creek is subject to the Cultus Mountain Instream Flows.	Chapter 173-503 WAC.
Claim 9332	Diversion from Salmon Creek is subject to the Cultus Mountain Instream Flows.	Chapter 173-503 WAC.
S1-25129P	Diversion from Gilligan Creek is subject to the Cultus Mountain Instream Flows. Diversion from the Skagit River is subject to the Skagit River Instream Flows.	Chapter 173-503 WAC.
S1-27862P	Diversion from Turner Creek is subject to the Cultus Mountain Instream Flows. Diversion from the Skagit River is subject to the Skagit River Instream Flows.	Chapter 173-503 WAC.
S1-18219P	Diversion from Salmon Creek is subject to the Cultus Mountain Instream Flows. Diversion from the Skagit River is subject to the Skagit River Instream Flows.	Chapter 173-503 WAC.
S1-27861	Diversion from Mundt Creek is subject to the Cultus Mountain Instream Flows. Diversion from the Skagit River is subject to the Skagit River Instream Flows.	Chapter 173-503 WAC.
S1-27860	Diversion is subject to the Skagit River Instream Flows.	Chapter 173-503 WAC.

ADDITIONAL COMMENTS:

1. Judy Reservoir Group A water system. Existing production is 2022 calendar year, but in previous years Qa has reached 10,748 afy and Qi has reached 55.1 cfs. The pumping capacity of the Skagit River pump station is sufficient to divert the full Qi of 55.39 cfs. Forecasted years are 2035 for the updated 10-year and 2046 for the updated 20-year forecasts.
2. Storage and standby/reserve water rights are listed and described in the 2024 WSP.
3. Interties with the City of Anacortes water system are available to the District on an “as-needed” basis:
 - a. Four interties (Avon, Riverbend, Lefebber, Fredonia) are connected to the Judy Reservoir Group A water system for unanticipated operational needs, such as transmission line breaks.
 - b. Two interties (Twin Bridges and Bayview Industries) provide continuous supply to six connections on isolated distribution systems in the Judy System retail service area.
 - c. Seven interties were connected to the Fidalgo Island satellite system (PWSID 03774Y), but this water system was transferred to the City of Anacortes in October 2023.
 - d. The existing agreement with the City of Anacortes specifies a contractual water volume for the District’s cumulative use of the interties of 175 million gallons per year (537.06 acre-ft). The agreement does not specify an instantaneous limit.
 - e. 2022 cumulative use of all interties was 64.79 (198.82 acre-ft), 9.77 MG (29.99 acre-ft) was used by Judy interties, leaving a balance of 100.44 MG (338.24 acre-ft) available for that year.
4. Listed water rights are included in the 1996 Memorandum of Agreement Regarding Utilization of Skagit River Basin Water Resources for Instream and Out of Stream Purposes (1996 MOA). Total combined instantaneous water right available from the river, streams, or a combination of both is 55.39 cfs. As a result of the cumulative nature of these water rights, existing and forecasted water use and water rights status is detailed on a cumulative basis.
5. The Skagit River has been added as an additional source for water rights associated with the Cultus Mountain Streams.
6. Skagit groundwater rights cited herein changed to surface water diversions pursuant to 1996 MOA and reverted to permit status per water right changes approved in 2001.
7. Total production/additive water right Qa of 19,117.4 afy excluding additive storage rights of 5,750 afy. The total authorized Qa of 23,417.4 afy includes 4,300 afy of water designated for Judy Reservoir flushing flow.
8. See water rights tables in 2024 WSP for additional information. Seven additional water right certificates and claims are listed in those table as standby/reserve (claims 009334, 009335, 009336, 009337, 009338; and certificates G1-00128C and G1-25755C).

Water Right Self-Assessment Form for Water System Plan

Mouse-over any link for more information. Click on any link for more detailed instructions

[illegible]

Column Identifiers for Calculations:

A

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PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.						
Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa

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Column Identifiers for Calculations:

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INTERRUPTIBLE WATER RIGHTS: Identify limitations on any water rights listed above that are interruptible.		
Water Right #	Conditions of Interruption	Time Period of Interruption
1		
2		
3		

ADDITIONAL COMMENTS:

Alger satellite water system (PWSID 01400K)

2022 source production data. Existing well pump capacity of 50 gpm.

Water Right Self-Assessment Form for Water System Plan

Mouse-over any link for more information. Click on any link for more detailed instructions

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Column Identifiers for Calculations:

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PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.						
Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa

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Column Identifiers for Calculations:

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INTERRUPTIBLE WATER RIGHTS: Identify limitations on any water rights listed above that are interruptible.		
Water Right #	Conditions of Interruption	Time Period of Interruption
1		
2		
3		

ADDITIONAL COMMENTS:

Cedargrove satellite water system (PWSID 11917 4).

2022 source production data. Existing well pump capacity of 105 gpm.

Water Right Self-Assessment Form for Water System Plan

Mouse-over any link for more information. Click on any link for more detailed instructions

Water Right Permit, Certificate, or Claim # *If water right is interruptible, identify limitation in yellow section below	WFI Source # If a source has multiple water rights, list each water right on separate line	<u>Existing Water Rights</u> Qi= Instantaneous Flow Rate Allowed (GPM or CFS) Qa= Annual Volume Allowed (Acre-Feet/Year) This includes wholesale water sold				<u>Current Source Production – Most Recent Calendar Year</u> Qi = Max Instantaneous Flow Rate Withdrawn (GPM or CFS) Qa = Annual Volume Withdrawn (Acre-Feet/Year) This includes wholesale water sold				<u>10-Year Forecasted Source Production (determined from WSP)</u> This includes wholesale water sold				<u>20-Year Forecasted Source Production (determined from WSP)</u> This includes wholesale water sold				
		<u>Primary Qi</u> Maximum Rate Allowed	<u>Non-Additive Qi</u> Maximum Rate Allowed	<u>Primary Qa</u> Maximum Volume Allowed	<u>Non-Additive Qa</u> Maximum Volume Allowed	<u>Total Qi</u> Maximum Instantaneous Flow Rate Withdrawn	<u>Current Excess or (Deficiency) Qi</u>	<u>Total Qa</u> Maximum Annual Volume Withdrawn	<u>Current Excess or (Deficiency) Qa</u>	<u>Total Qi</u> Maximum Instantaneous Flow Rate in 10 Years	<u>10-Year Forecasted Excess or (Deficiency) Qi</u>	<u>Total Qa</u> Maximum Annual Volume in 10 Years	<u>10-Year Forecasted Excess or (Deficiency) Qa</u>	<u>Total Qi</u> Maximum Instantaneous Flow Rate in 20 Years	<u>20-Year Forecasted Excess or (Deficiency) Qi</u>	<u>Total Qa</u> Maximum Annual Volume in 20 Years	<u>20-Year Forecasted Excess or (Deficiency) Qa</u>	
		G1-28137P	S01 Well AHB745	150 gpm		19.4 afy		143 gpm	7 gpm	13.34 afy	6.06 afy							
								</										

Column Identifiers for Calculations:

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PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.						
Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa

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Column Identifiers for Calculations:

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$$= A - C$$

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<u>INTERRUPTIBLE WATER RIGHTS:</u> Identify limitations on any water rights listed above that are interruptible.		
Water Right #	Conditions of Interruption	Time Period of Interruption
G1-28137P	See comments.	See comments.

ADDITIONAL COMMENTS:

Marblemount satellite water system (PWSID AA6423).

2022 source production data. Existing well pump capacity of 143 gpm.

9.4 acre feet per year is subject to the instream flow set for the Skagit River, according to Chapter 173-503 WAC Instream Resources Protection Program-Lower and Upper Skagit Water Resources Inventory Area; however, continuous use of the 9.4 afy can be realized when mitigated under an Ecology approved mitigation plan. An additional 10.0 afy is made available for mitigation purposes only as needed for the growth of municipal water use.

Water Right Self-Assessment Form for Water System Plan

Mouse-over any link for more information. Click on any link for more detailed instructions.

Water Right Permit, Certificate, or Claim # *If water right is interruptible, identify limitation in yellow section below	WFI Source # If a source has multiple water rights, list each water right on separate line	Existing Water Rights Qi= Instantaneous Flow Rate Allowed (GPM or CFS) Qa= Annual Volume Allowed (Acre-Feet/Year) This includes wholesale water sold				Current Source Production – Most Recent Calendar Year Qi = Max Instantaneous Flow Rate Withdrawn (GPM or CFS) Qa = Annual Volume Withdrawn (Acre-Feet/Year) This includes wholesale water sold				10-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold				20-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold			
		Primary Qi Maximum Rate Allowed	Non-Additive Qi Maximum Rate Allowed	Primary Qa Maximum Volume Allowed	Non-Additive Qa Maximum Volume Allowed	Total Qi Maximum Instantaneous Flow Rate Withdrawn	Current Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume Withdrawn	Current Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 10 Years	10-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 10 Years	10-Year Forecasted Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 20 Years	20-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 20 Years	20-Year Forecasted Excess or (Deficiency) Qa
G1-25509C	S04 SP740H AET032	95 gpm		19.0 afy		40 gpm	55 gpm	12.08 afy	6.92 afy								
	TOTALS =	95 gpm		19.0 afy		40 gpm	55 gpm	12.08 afy	6.92 afy								

Column Identifiers for Calculations:

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PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.						
Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa

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Column Identifiers for Calculations:

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$$= A - C$$

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INTERRUPTIBLE WATER RIGHTS: Identify limitations on any water rights listed above that are interruptible.		
Water Right #	Conditions of Interruption	Time Period of Interruption
1		
2		
3		

ADDITIONAL COMMENTS:

Rockport satellite water system (PWSID 736006).

2022 source production data. Existing well pump capacity of 40 gpm.

Total withdrawal under G1-25509C and G1-22623C shall not exceed 100 gpm and 38.6 afy. G1-22623 is owned by Washington State Parks & Recreation (Qi: 60 gpm; Qa: 19.6 afy).

Water Right Self-Assessment Form for Water System Plan

Mouse-over any link for more information. Click on any link for more detailed instructions

<u>Water Right Permit, Certificate, or Claim #</u> *If water right is interruptible, identify limitation in yellow section below	<u>WFI Source #</u> If a source has multiple water rights, list each water right on separate line	<u>Existing Water Rights</u> Qi= Instantaneous Flow Rate Allowed (GPM or CFS) Qa= Annual Volume Allowed (Acre-Feet/Year) This includes wholesale water sold				<u>Current Source Production – Most Recent Calendar Year</u> Qi = Max Instantaneous Flow Rate Withdrawn (GPM or CFS) Qa = Annual Volume Withdrawn (Acre-Feet/Year) This includes wholesale water sold				<u>10-Year Forecasted Source Production (determined from WSP)</u> This includes wholesale water sold				<u>20-Year Forecasted Source Production (determined from WSP)</u> This includes wholesale water sold			
		<u>Primary Qi</u> Maximum Rate Allowed	<u>Non-Additive Qi</u> Maximum Rate Allowed	<u>Primary Qa</u> Maximum Volume Allowed	<u>Non-Additive Qa</u> Maximum Volume Allowed	<u>Total Qi</u> Maximum Instantaneous Flow Rate Withdrawn	<u>Current Excess or (Deficiency) Qi</u>	<u>Total Qa</u> Maximum Annual Volume Withdrawn	<u>Current Excess or (Deficiency) Qa</u>	<u>Total Qi</u> Maximum Instantaneous Flow Rate in 10 Years	<u>10-Year Forecasted Excess or (Deficiency) Qi</u>	<u>Total Qa</u> Maximum Annual Volume in 10 Years	<u>10-Year Forecasted Excess or (Deficiency) Qa</u>	<u>Total Qi</u> Maximum Instantaneous Flow Rate in 20 Years	<u>20-Year Forecasted Excess or (Deficiency) Qi</u>	<u>Total Qa</u> Maximum Annual Volume in 20 Years	<u>20-Year Forecasted Excess or (Deficiency) Qa</u>
G1-20763P	S01 Well 1 AET015	200 gpm		38.4 afy		62 gpm	138 gpm	13.99 afy	24.41 afy								
	TOTALS =	200 gpm		38.4 afy		62 gpm	138 gpm	13.99 afy	24.41 afy								

Column Identifiers for Calculations:

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PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.						
Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa

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Column Identifiers for Calculations:

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$$= A - C$$

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<u>INTERRUPTIBLE WATER RIGHTS:</u> Identify limitations on any water rights listed above that are interruptible.		
Water Right #	Conditions of Interruption	Time Period of Interruption
G1-20763P	80 gpm subject to Chapter 173-503 WAC	When flows are below minimum flows
2		
3		

ADDITIONAL COMMENTS:

Skagit View Village satellite water system (PWSID 968795)

2022 source production data. Existing well pump capacity of 62 gpm.

Appendix D: Water Service Agreements

Skagit County Service Area Agreement for the CWSP

Skagit County Franchise Agreement

City of Anacortes Joint Operating Agreement

Water Supply Agreement with Samish Farms Water Association

Water Supply Agreement with the North Fir Island Water Association (expired)

Water Supply Agreement with Sierra Pacific

WATER SERVICE CONTRACT

This water service contract is entered into between Public Utility District No. 1 of Skagit County, Washington, a Municipal Corporation, (hereinafter referred to as the "District") and Samish Farms Water Association, a voluntary non-profit association organized and existing under the laws of the State of Washington, whose address is P.O. Box 102, Bow, Washington, 98232, (hereinafter called the "Association") (each a "Party" and collectively the "Parties" to this contract).

WITNESSETH: That the Parties hereto do mutually agree as follows:

1. SCOPE AND TERM OF CONTRACT

Subject to the terms and conditions hereinafter set forth, the District agrees to provide the Association water for rural, domestic, commercial, and industrial purposes for a period not to exceed five years. The Association is permitted to re-sell the water to its members with their own water meters. The first five-year period will run from January 1, 2022 through December 31, 2027. The contract will automatically be extended for an additional five year period unless either Party provides written notice to this effect at least ninety (90) days prior to the expiration of the Contract period. This contract may be extended a maximum of four (4) additional five-year periods.

2. AMOUNT OF WATER

The District agrees to furnish the Association with water to fulfill their current maximum demand and their future demand; provided, however, that such demands are not in excess of the capacity of facilities and available water supply of the District to render such water service; and in any event not to exceed 300 gallons per minute (gpm) at the delivery point during peak usage hours, defined as between 8:00 a.m. and 11:00 a.m. and between 4:00 p.m. and 6:00 p.m., AND 350 gpm at the delivery point during periods other than peak hours. The total withdrawal per calendar month shall not exceed 1,100,000 cubic feet. Notwithstanding the foregoing, it is understood and agreed by the Parties that the District must furnish a minimum of 810,000 cubic feet of water per calendar month, if demanded by the Association, subject to the District's water conservation program and curtailment requirements established in the District's current Water System Plan.

The Association agrees to continue to pay a System Development Fee (SDF) to the District for each new service connection added to the Association's water system after the effective date of this Contract (there are currently 531 service connections on the Association's water system per the Association's records as of the effective date of this Contract); the District shall compute the cost of the Association's SDF at eighty percent (80%) of the regular District SDF per its current rate schedule on the date the service is requested and shall be paid by the Association to the District within thirty (30) days of the date the service connection is requested.

WATER SERVICE CONTRACT

Should the water demand of the Association exceed the amounts indicated in this Section of the Contract, the District reserves the right to determine what, if any, additional facilities it will elect to install to satisfy the excess requirements. The terms and conditions for water supply beyond the maximum amount indicated above will be the subject of further negotiations between the parties.

3. RATES AND CHARGES

For all water furnished under this Contract, the Association agrees to pay the District as follows:

1. The District shall compute the cost of water at ninety percent (90%) of the Commercial/Industrial/Municipal water rate as per its current rate schedule.

The parties of this Contract mutually agree that during the period of this Contract the District may review its rate structure and make annual changes to its rates and charges.

Payment for said charges shall be due within ten (10) days of the billing date. If payment is not made after thirty (30) days, the District may elect to charge interest on the unpaid account and, if payment is not made after ninety (90) days, the District may, upon written notice to the Association, discontinue service until payment is received in full.

Should the Association, in the conduct of its business, require additional service from the District such as reading of meters, billing, and collecting, and other services in connection with the management and operation of the Association's water facilities, such services may, if the Association elects, be negotiated by the Parties and shall be reduced to writing as a supplement contract between the Parties. It is specifically understood by and between the Parties hereto that the Association may contract for these services with any other entity other than the District if the Association so elects.

4. POINT OF DELIVERY AND METERING

The District agrees to make delivery of water at a point known as Jack Smith's corner, located in Section 16, Township 35 North, Range 3, East of the Willamette Meridian, Skagit County, Washington. Water shall be measured by District approved water metering equipment, to be paid for and installed by the Association and maintained, calibrated, and read by the District at its expense. If additional points of delivery, or additional metering facilities are required by mutual agreement of the Parties, such additional facilities will be the subject of further negotiations between the Parties and implemented only upon supplemental written agreement.

5. FACILITIES OF THE ASSOCIATION AND THE DISTRICT

The District shall use reasonable diligence to provide a regular and uninterrupted

WATER SERVICE CONTRACT

supply of water to the Association at a minimum pressure of 40 pounds per square inch (psi), but shall not be liable for damages, breach of contract or otherwise for failure, suspension, diminution, or other variations of service, unless such damages or breach of contract are due to the intentional act or omission of the District. The Association agrees that it will provide the maximum utilization of its existing water facilities. The Association further agrees that, should the pressure at the point of delivery become less than 40 psi due to actions or demands of the Association, it will provide and maintain at its own expense additional storage facilities, regulating valves and other facilities required to protect the system pressures of the District.

The District agrees that should the pressure at the point of delivery become less than 40 psi due to actions or demands other than of the Association, the District will provide and maintain such facilities as are required to provide at least the minimum pressure stated herein. To assure continuity of service to its other customers, and to enable the District to intelligently plan for meeting future water requirements, the District reserves the right to review and approve the plans and specifications of such facilities, or project plans if construction is by force account, which the Association may install, and such major additions and extensions thereof as may be undertaken by the Association. For the District to plan for its own facilities, the Association agrees to furnish to the District one copy of the Association's detailed plans and specifications for the Association's water system.

The Association agrees to install a Double Check Valve Assembly (DCVA) at, or near, the District's point of delivery to enhance protection of the water system. The District will work cooperatively with the Association on the DCVA specifications to be installed and the location of the valve. The Association agrees that the DCVA will be installed by December 31, 2022 and that the District will need to inspect and approve the Association's completed project.

6. CHANGE IN VOLUME OR CHARACTER OF LOAD

Reasonable notice shall be given to the District by the Association respecting any material change proposed in volume of water required or characteristics of utility service.

7. LIABILITY OF THE PARTIES

Title to all facilities beyond the discharge side of the water meter at the point of delivery shall be vested in and remain with the Association, which shall be responsible for loss or damage to such facilities, unless such damage is caused by the intentional act or omission of the District, in which case damages shall be apportioned accordingly.

The District, a municipal corporation organized under Title 54, Revised Code of Washington, is bound by the rights, powers and duties contained in that statute, and the Association, as a water customer, agrees to be bound by such rules and regulations as may be

WATER SERVICE CONTRACT

promulgated by the District pursuant to such authority.

In case suit or any other action, including arbitration or mediation, is commenced to enforce any one or more of the provisions in this Contract, whether said provisions be expressed or implied, the prevailing party shall be awarded its reasonable attorney's fees and costs. Venue for all court action shall be vested in Superior Court for Skagit County.

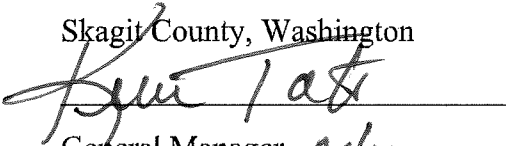
8. ASSIGNABILITY OF CONTRACT

The Parties acknowledge that the Association has borrowed construction funds from the Farm Home Administration of the United States Department of Agriculture and has given, or will give, a first mortgage securing said loan upon the proposed water system and all assets. In the event of the Association's default upon said loan, this contract is and shall be assignable to said Mortgagee or its assigns and the District shall and will continue to perform hereunder so long as the Purchaser shall abide by the terms hereof.

9. This Contract supersedes the previous Contract between the District and the Association, dated April 30, 1996, and its amendments.

PUBLIC UTILITY DISTRICT No. 1

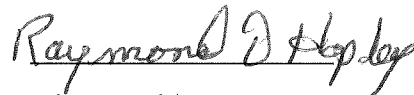
Skagit County, Washington


General Manager, acting

SAMISH FARMS

Water Association


President


Vice-President

WATER CONTRACT

NORTH FIR ISLAND WATER ASSOCIATION

Expired
7/5/08

THIS CONTRACT, entered into as of the 5TH day of July, 1983,
by and between Public Utility District No. 1 of Skagit County, Washington,
a Municipal Corporation, (hereinafter referred to as the District), and
North Fir Island Water Association, a voluntary non-profit association
organized and existing under the laws of the State of Washington, whose
address is 1544 Skagit City Road, Mount Vernon, Washington, (hereinafter
called the Association).

WITNESSETH: That the parties hereto do mutually agree as follows:

1. SCOPE AND TERM OF CONTRACT

Subject to the terms and conditions hereinafter set forth, the District
agrees to sell at wholesale and deliver to the Association for resale, and
the Association agrees to buy water for rural, domestic, commercial, and
industrial purposes for a period not to exceed twenty-five years at the
option of either party with the consent of the other for additional three-
year periods upon written notice to this effect received ninety (90) days
prior to the expiration of the Contract period.

2. AMOUNT OF WATER

The District agrees to furnish the Association with its full requirements
for water which exist now or which may exist in the future; provided,
however, that such water requirements shall not be in excess of the capacity
of present facilities and available water supply of the District to render
such water service; and in any event not to exceed 125 gallons per minute
at the delivery point. Should the water requirements of the Association
exceed this amount, the District reserves the right to determine what, if
any, additional facilities it will elect to install to satisfy the excess
requirements. The terms and conditions for water supply beyond the maximum
amount indicated above will be the subject of further negotiations between
the parties.

3. RATES AND CHARGES

For all water furnished under this Contract, the Association agrees
to pay the District as follows:

1. The Association's minimum quantity shall be 26,000 cubic feet per month.
2. The District shall compute the cost of 26,000 cubic feet per month using the regular water rate as per its current rate schedule. That dollar amount shall be the minimum monthly rate.
3. All water furnished in excess of 26,000 cubic feet per month shall carry a charge per 100 cubic feet equivalent to the last step in the District's regular rate schedule.

The parties of this Contract mutually agree that during the period of this Contract, the District may review its rate structure and make such changes in its rates and charges as follows:

1. As may be required by State Laws.
2. May be necessary to carry out the obligations of its bond resolutions.
3. May be necessary to make the business of District profitable, or
4. To conform to the resolutions of its Board of Commissioners.
5. When there is a rate increase in general for District customers.

Ninety days written notice to the Association will be required if the District elects to exercise this option.

Payment for said charges shall be made within ten days of the billing date thereof, which billing date is fixed as of the 1st of the month; and, if payment is not made, the District may elect to terminate this Contract and discontinue service upon written notice to the Association, whereupon all charges become due and payable at once.

Should the Association, in the conduct of its business, require additional service from the District such as reading of meters, billing and collecting, and other services in connection with the management and operation of the Association's water facilities, such services shall be negotiated by the parties and shall be reduced to writing as a supplement contract between the parties.

4. POINT OF DELIVERY AND METERING

The District agrees to make delivery of water at a point approximately 2,213 feet north and 15 feet west of centerline of Fir Island Road as measured along centerline of Skagit City Road on Fir Island, Skagit County, Washington. Water shall be measured by suitable metering equipment of standard manufacture to be installed by the Association and approved by the District and maintained, calibrated, and read by the District at its expense. If additional points of delivery or additional metering facilities are required in the discretion

of the District, such additional facilities will be the subject of further negotiations between the parties and agreed to in writing.

5. FACILITIES OF THE ASSOCIATION AND THE DISTRICT

The District shall use reasonable diligence to provide a regular and uninterrupted supply of water to the Association, but shall not be liable for damages, breach of contract or otherwise for failure, suspension, diminution or other variations of service occasioned by any causes beyond the control of the District. The Association agrees that it will provide the maximum utilization of its water facilities. The Association further agrees that, should the pressure at the point of delivery become less than 40 pounds per square inch, it will provide and maintain at its own expense additional storage facilities, regulating valves and other facilities required to protect the system pressures of the District. To assure continuity of service to its other customers, and to enable the District to intelligently plan for meeting future water requirements, the District reserves the right to review and approve the plans and specifications of such facilities, or project plans, if construction is by force account, which the Association may install, and such major additions and extensions thereof as may be undertaken by the Association. In order for the District to plan for its own facilities, the Association agrees to furnish to the District one copy of the Association's detailed plans and specifications for the Association's water system.

6. CHANGE IN VOLUME OR CHARACTER OF LOAD

Reasonable notice shall be given to the District by the Association respecting any material change proposed in volume water required or characteristics of utility service.

7. LIABILITY OF THE PARTIES

Title to all facilities beyond (but not including) the water meter shall be vested and remain in the Association, which shall be responsible for loss or damage to such facilities.

The District, a Municipal Corporation, organized under Remington's Revised Statutes, Sec. 11605, is bound by the rights, powers, and duties contained in that statute; and the Association, as a water customer, agrees to be bound by such rules and regulations as may be promulgated by the District pursuant to such authority.

IN WITNESS WHEREOF the parties have hereunto affixed their signatures
this day and date just above written.

PUBLIC UTILITY DISTRICT No. 1 of
Skagit County, Washington

By H. W. Beckman
Commissioner

By H. C. Vanderhyde
Commissioner

By James A. Stetson
Commissioner

NORTH FIR ISLAND WATER ASSOCIATION

By J. A. Pierson
President

By Gay T. Stewart
Secretary

ADDENDUM NO. 1 TO THE AGREEMENT
BETWEEN THE SKAGIT PUBLIC UTILITY DISTRICT
AND NORTH FIR ISLAND WATER ASSOCIATION

At the request of Skagit Public Utility District, an addendum is made to the agreement between Skagit Public Utility District and North Fir Island Water Association. The purpose of the addendum is to facilitate the District's newly adopted rate design and allow North Fir Island Water Association relief from existing contract language pertaining to rates. The addendum is a rewrite of Item Three, Subsection Two in the current agreement. The rewritten section is as follows:

3. RATES AND CHARGES

For all water furnished under this Contract, the Association agrees to pay the District as follows:

1. The Association's minimum quantity shall be 26,000 cubic feet per month.
2. The District shall compute the cost of water using 90% of the Commercial/Industrial/Municipal water rate as per its current rate schedule.

This addendum supersedes Item Three, Subsection Items 1, 2 and 3 of the existing agreement.

The changes made by this addendum to Item Three Rates and Charges, does not change or invalidate any other conditions, covenants, or other addendums of this agreement.

Dated this 27th day of January, 1997 3

NORTH FIR ISLAND WATER ASSOCIATION

BY: [Signature]
President
[Signature]
Secretary

SKAGIT PUBLIC UTILITY DISTRICT

BY: [Signature]
Commissioner
[Signature]
Commissioner
[Signature]
Commissioner

Appendix E: Satellite System Capacity Analyses

Alger Water System

Cedargrove Water System

Marblemount Water System

Potlach Beach Water System

Rockport Water System

Skagit View Village Water System

ALGER WATER SYSTEM

Water System Physical Capacity Analysis

April 22, 2024



OVERVIEW

1. Physical Capacity Analysis Objectives

Every water system should be designed and operated to provide safe and reliable water service to its customers. For existing systems, physical and legal limitations should periodically be evaluated and understood. As new customers request water service, the PUD must know if there is adequate capacity for new connections and the impact of each new connection. This capacity analysis evaluates the physical and legal limitations to determine the system's capacity. This analysis follows procedures outlined in the Water System Design Manual¹.

2. Water System Background and Description

The Alger water system (PWS ID#01400K) is in northern Skagit County, straddling Interstate 5, in and around the Alger community. The water system was constructed through LUD Nos. 22 and 24. Properties within the service area include both residential and commercial customers.

Each existing customer has a meter, which is read every two months for billing purposes.

3. Water System Facilities

The Alger water facility inventory and design parameters are presented in **Table 1**. The single well provides an estimated 60 gallons per minute [gpm]. No problems are observed with the treatment systems at this flow rate.

A cylindrical concrete tank has a nominal volume of 137,000 gallons, providing operating, equalizing, standby, and fire suppression storage. The well and storage tank are located in the primary service area, which has a hydraulic grade line [HGL] of 520 feet. The majority of the residential services (77%) and all commercial and governmental services are located in this pressure zone.

Two additional service areas are served through booster pump stations. The Cantershire development has 15 residential services and is supplied with a booster pump at an estimated 80 gpm. The HGL is 585 feet.

The second is the Cimarron development with ten (10) residential services and is supplied with a booster pump at an estimated 29 gpm. The HGL is 710 feet.

The water distribution system in the 520 HGL consists of 6-inch, 8-inch, 12-inch, and 16-inch ductile iron pipes. There are 19 fire hydrants distributed throughout the 520 HGL service area to provide a minimum of 500 gpm fire flow.

¹ *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

FACILITY ANALYSIS

1. Meter Classification and Evaluation

Services within this water system are classified as either residential, commercial, or governmental customers. There are 127 existing residential services, 12 commercial services, and two governmental services. For this analysis, an equivalent residential unit [ERU] is defined as one full-time residential unit.

Metered water consumption was collected and evaluated for three years from 2018 through 2020. This evaluation revealed several part-time or vacant homes and vacant commercial establishments. Part-time residential services may represent families that spend a portion of the year in a second home in a different local (e.g., snowbirds). Vacant homes may have minimal or no water usage throughout the year due to no residency at all. These homes may be abandoned or changing ownership. Only full-time residential units were considered when determining average day demand [ADD].

During this period, it was noted that growth was approximately two services per year. A summary of the services and their classification is presented in **Table 2**. Three (3) meter boxes were installed during the initial water system installation but have not yet been activated by the property owners. These potential future services could be activated and need to have sufficient capacity available.

2. Water Consumption

For the water consumption analysis, the services were divided into their respective pressure zones. The ADD was determined for all full-time residential units for each of the three evaluation years. Also, the maximum month average day demand [MMADD] was determined, equating to the July-August billing period. The MMADD was used to estimate the maximum day demand [MDD] based on the DOH recommended peaking factor of 1.65 for systems serving fewer than 1,000 people².

a. Residential Consumption

Table 3A summarizes the ADD, MMADD, and MDD for the total full-time residential meters in the 520 HGL service area for the three evaluation years. The year with the maximum consumption and maximum MMADD was 2020. The estimated MDD of 401 gpd/ERU is higher than the DOH minimum of 350 gpd/ERU. Therefore, the estimated MDD of 401 gpd/ERU was used for the facility evaluation.

Table 3B summarizes the ADD, MMADD, and MDD for the 15 total full-time residential meters in the 585 HGL service area for the three evaluation years. The year with the maximum consumption and maximum MMADD was 2018. The estimated MDD of 333 gpd/ERU is lower than the DOH minimum of 350 gpd/ERU.

Table 3C summarizes the ADD, MMADD, and MDD for the ten (10) total full-time residential meters in the 710 HGL service area for the three evaluation years. The year with the maximum consumption was 2018, but the maximum MMADD was 2020. The estimated MDD of 1,637 gpd/ERU is higher than the DOH minimum of 350 gpd/ERU and considerably higher than other full-time residences in the remainder of the Alger service area. This discrepancy is due to the characteristics of the Cimarron

² Section 3.4.1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

development, which consists of large lots with extensive landscaping irrigation. This combination results in higher ADD, MMADD, MDD, and associated ratios.

b. Commercial and Governmental Consumption

Table 3D summarizes the ADD, MMADD, and MDD for the active commercial meters for the three evaluation years. The year with the maximum consumption and maximum MMADD was 2018. The estimated MDD of 728 gpd was used for estimates ERUs for the commercial services. Therefore, an average commercial service is equal to 1.8 ERUs.

The two existing governmental services are currently inactive.

c. Consumption Analysis Philosophy

The Alger water system's well, storage tank, and most services are in the 520 pressure zone. Therefore, this water consumption was used to analyze the equalizing storage within the storage tank. The booster pumps for the Cantershire and Cimarron developments were included as additional demand to the PHD for the 520 pressure zone.

The PHD calculation is based on the number of ERUs and the MDD³ in the 520 pressure zone. For the existing services, the PHD is calculated to be 111 gpm.

The consumption data indicated an estimated six part-time, five vacant, and eleven new or future residential services within the two LUDs. The MDD of 401 gpd/ERU was used to estimate the potential consumption by assuming the part-time, vacant, and new services could all potentially become full-time residential users. The potential water consumption for all residential services is summarized in **Table 4A**.

In addition, the ten active commercial services, two vacant commercial services, and two vacant governmental services could reflect consumption equal to 25 ERUs. The potential water consumption for all commercial services is summarized in **Table 4B**.

3. Source Capacity

In conjunction with any storage designed to accommodate daily or longer peak use periods, total daily source capacity shall be sufficient to provide a reliable water supply equal to or exceeding the MDD⁴.

a. Water Rights

The Alger well has a certificated water right (Certificate 3885). The instantaneous withdrawal [Qi] limit is 100 gpm, and the annual withdrawal [Qa] limit is 100.0 acre-feet.

b. Well Pump Capacity

The Alger water system is supplied by a single well [AER350]. The existing well pump has a capacity of 60 gpm and is controlled by floats within the storage tank.

³ Equation 3-1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁴ WAC 264-290-222(4)

c. Treatment Capacity

The source water is treated to remove iron and manganese using an ion-exchange treatment system manufactured by ATEC Systems Associates. The treatment system is designed to accommodate the installed well pump capacity or 60 gpm.

The water system is also disinfected using sodium hypochlorite, which is injected through a metering pump.

4. Storage Capacity

The storage elements, including operating, equalizing, standby, and fire suppression storage, shall have sufficient volumes to provide a reliable water supply and minimum pressure to meet normal and abnormal demand and operating conditions⁵. The storage volume calculations for existing conditions are presented in **Table 5**.

a. Operating Storage

The PUD's Operations Department sets operating storage [OS] volume to operate the well pump efficiently. The setpoints have a span of 3.0 feet and an approximate OS volume of 15,900 gallons. The minimum well pump runtime is around 353 minutes. This runtime is more than is necessary to protect the well pump.

b. Equalizing Storage

Equalizing storage [ES] volume is based on the difference between the peak hourly demand [PHD] and the well pump capacity. The PHD is calculated to be 111 gpm for the 520 HGL pressure zone, based on Equation 3-1⁶. The well pump capacity for the Alger water system is less than the PHD; therefore, equalizing storage is required. In addition, the ES must provide a minimum of 30 psi at all services.

Existing ES can also be estimated using the PUD's SCADA database. Under normal operating conditions, the bottom of the ES will be the lowest level reached in the storage tank. A review of SCADA records indicates that the water level in the tank drops to 16.1 feet, or an elevation of 511.1 feet. This observation supports the conclusion that actual PHD is more than the calculated PHD of 111 gpm. For this analysis, the more conservative (observed) equalizing storage was used.

c. Standby Storage

Standby storage [SB] volume allows the water system to maintain adequate pressure in an adverse operating condition, such as a firefighting situation or a mechanical, electrical, or water quality issue. Skagit PUD's goal is to provide 300 gallons per ERU as standby storage. However, DOH recommends SB volume equal the MDD⁷, which is 401 gpd/ERU for the Alger water system. Therefore, the more stringent requirement is used in this capacity analysis, specifically 401 gpd/ERU.

⁵ WAC 246-290-235

⁶ Equation 3-1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁷ Section 7.1.1.3, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

d. Fire Suppression Storage

The local Fire Marshal establishes fire suppression storage [FSS] volume. Minimum recommended FSS is listed in the Coordinated Water System Plan and equates to 15,000 gallons (500 gpm for 30 minutes)⁸.

The Skagit County Fire Marshal allows the FS to be nested with the SB storage within the storage tank.

e. Dead Storage

All storage must be capable of providing a minimum of 20 psi to all services and fire hydrants at the bottom of the fire suppression storage. The Alger water system's minimum elevation to be served is a meter at 466 feet and a hydrant at 448 feet. This meter elevation requires a water level in the storage tank of 492 feet, which is below the tank's base elevation of 495 feet. Therefore, there is no dead storage in the tank.

5. Booster Pump Capacity

The Cantershire (585 pressure zone) and Cimarron (710 pressure zone) service areas have existing booster pumps that can be optimized. The 80 gpm pump capacity in the Cantershire service area exceeds what is required to meet the expected PHD to this 15-lot pressure zone. The optimum pump capacity can be sized from the estimated PHD for this pressure zone.

$$\text{PHD} = (350 \text{ gpd/ERU} \div 1440) \times (3.0 \times 15 + 0) + 18 \quad \text{Equation 3-1}$$

$$\text{PHD} = 23 \text{ gpm (minimum booster pump capacity)}$$

The 29 gpm pump capacity in the Cimarron area is not sufficient to meet the expected PHD to this 10-lot pressure zone. The optimum pump capacity can be sized from the estimated PHD for this pressure zone.

$$\text{PHD} = (1,637 \text{ gpd/ERU} \div 1440) \times (3.0 \times 10 + 0) + 18 \quad \text{Equation 3-1}$$

$$\text{PHD} = 52 \text{ gpm (minimum booster pump capacity)}$$

6. Distribution System Capacity

The distribution system consists of 6-inch, 8-inch, 12-inch, and 16-inch ductile iron pipelines transporting water to the Alger community. Several dead-end pipelines characterize the distribution system. The fire hydrants are connected to the 8-in distribution pipelines, providing adequate flow to meet the 500 gpm fire flow requirement stated in the Coordinated Water System Plan⁹.

7. Distribution System Leakage

The distribution system leakage [DSL] for the Alger water system was determined to be 818 gpd in 2020. This leakage rate equals approximately 2 ERUs, as shown in **Table 6**.

⁸ Table 4-3, *Skagit County Coordinated Water System Plan*, Economic and Engineering Services, Inc., July 2000.

⁹ Table 4-3, *Skagit County Coordinated Water System Plan*, Economic and Engineering Services, Inc., July 2000.

WATER SYSTEM CAPACITY CONCLUSIONS

The purpose of a Water System Physical Capacity Analysis is to inform managers when and which water system facilities need to be addressed to maintain capacity and support community growth. The water system operating data and physical capacity analysis are presented in **Table 6**.

As mentioned previously, the Alger water system is comprised of residential and commercial development. The Alger water system is currently approved for 219 connections. The total number of existing connections is 144, which equates to 183 ERUs. This accounting of existing connections includes a small number (approximately 11) of services that are physically connected to the water system but have yet to be activated by the property owners. If all existing connections are active, the estimated MDD is 74,480 gpd. When the DSL is added, the total existing water system represents 185 ERUs.

1. Maximum Service Capacity

The following assessment of the maximum service capacity is based on the water system's physical and legal limitations. This information is summarized in **Table 6**.

- The existing well pump at 60 gpm can supply 79,200 gallons during a 22 hour per day pumping cycle. This volume is sufficient to provide the MDD for 198 ERUs, 13 ERUs more than what the existing water system is currently serving.

Ideally, the well pump should provide the MDD of 74,185 gpd. The system has an excess capacity of approximately 5,015 gpd of well pump capacity. Currently, the well capacity is the limiting facility in the Alger water system.

- The treatment system for removing iron and manganese from the groundwater is reported to be sized to treat the existing well capacity of 60 gpm. Therefore, it is only rated to provide the MDD for 198 ERUs, 13 ERUs more than the existing water system is currently serving. Any increase in well capacity will require an increase in treatment system capacity.
- The OS span is 1 foot, which is equivalent to 5,300 gallons.
- The observed ES based on the SCADA recordings is more than what is calculated using an estimated PHD. Therefore, the observed ES of 31,200 gallons was used in the analysis. Based on this observed ES, it is estimated that the lowest elevation of the ES will provide a minimum of 29 psi to the highest service within the distribution system, which is below the minimum pressure of 30 psi.
- The SB storage volumes of 95,700 gallons can serve 238 ERUs at 401 gallons per ERU. This is more than the PUD's goal 300 gpd/ERU. This SB storage provides 53 ERUs more than what the existing water system is currently serving.
- The lowest elevation of the standby storage will provide a minimum of 20 psi at the highest fire hydrant and service within the distribution system.
- The PUD has determined that the existing distribution pipeline network is sufficient to provide a firefighting flow of 500 gpm under MDD conditions.
- The instantaneous water right limitation of 100 gpm is sufficient to supply 359 ERUs, 174 ERUs more than what the existing water system is currently serving.

- The annual water right limitation of 100.0 acre-feet is sufficient to supply 465 ERUs, 280 ERUs more than what the existing water system is currently serving.

Based on operating conditions, physical water system components, and water rights limitations, the Alger water system is currently limited by the well pump capacity. In the short-term, this limitation can be addressed using excess SB storage.

2. Water System Improvements

The PUD can make several structural and operational modifications to help ensure a continuity of service in the Alger water system as it continues add connections. The following are some suggested modifications to consider for further evaluation.

1. Reduce the booster pump capacity to the Cantershire development. The 80 gpm pump capacity exceeds what is required to meet the expected PHD to this 15-lot pressure zone. The pump capacity can be reduced from 80 gpm to a minimum capacity of 23 gpm from the estimated PHD for this pressure zone.
2. Increase the booster pump capacity to the Cimarron development. The 29 gpm pump capacity is not sufficient to meet the expected PHD to this 10-lot pressure zone. The pump capacity can be increased from 29 gpm to a minimum capacity of 52 gpm from the estimated PHD for this pressure zone.

The reduction in the Cantershire pump more than offsets the increase in the Cimarron pump. These two pump modifications would theoretically reduce the estimated ES storage in the 520 pressure zone by 5,100 gallons.

$$\text{ES Reduction} = [(80+29) - (23+52)] \times 150$$

$$\text{ES Reduction} = 5,100 \text{ gallons}$$

3. Measure and record the well drawdown to ensure the well pump has adequate submergence during the summer and fall. The current 60 gpm capacity is below the water right Qi of 100 gpm. Consequently, increasing the well capacity will reduce the ES and increase the minimum service pressure to the highest meters.
4. The well is 64 years old, near the end of its useful life, and should be replaced. A hydrogeologist should be utilized in any drilling operation to determine the well's safe yield. Any plan to increase the well capacity will also necessitate evaluating and potentially upsizing the existing treatment and electrical systems. Also, the wellhead protection area may need to be reexamined and updated.
5. Finally, additional storage may be needed to meet the growing needs within the service area. If suitable sites are available, this extra storage could be placed in the 520 pressure zone or possibly installed in the 585 or 710 pressure zones. Another option may be to install a pipeline from Bow Hill Road to the Alger community and consolidate this water system with the Judy Reservoir water system.

Alger Water System Capacity Analysis

Table 1: Alger Facility Inventory		
Storage Tank	Data	
Base Elevation	495.0 feet	
Spill Elevation	521.0 feet	
Water Elevation in Tank	26.0 feet	
Side Wall Depth	27 feet	
Tank Diameter	30 feet	
Tank Radius	15 feet	
Tank Unit Volume	5,300 gal/ft	
Nominal Tank Volume	137,000 gal	
Well Pump		
Well Pump Capacity	60 gpm	
"Pump On" Setpoint	24.0 feet	
"Pump Off" Setpoint	25.0 feet	
Booster Pump Station Pump	585 HGL	710 HGL
Booster Pump Capacity	80 gpm	29 gpm
Hydraulic Constraints		
Highest Meter Elevation	446 feet	
Highest Fire Hydrant Elevation	448 feet	
Tank Hydraulic Grade Line	520 feet	
Demand Constraints (DOH Water System Design Manual Table 3-1)		
Number of ERUs [N]	101 - 250	
C factor	2.0	
F factor	75 gpm	

Table 2: Alger Meter Service Summary			
Meter Classification	FY2018	FY2019	FY2020
Full-Time Residential	109	107	108
Part-Time Residential	3	6	6
Vacant Residential	4	4	5
New Residential	8	10	8
Commercial / Governmental	14	14	14
Total Meters	138	141	141
Well Production	1,272,300 CF	1,148,100 CF	1,184,400 CF

Alger Water System Capacity Analysis

Table 3A: Alger 510 HGL Residential Water Consumption Analysis						
Description	Total Meters	ADD _{ERU} ¹	MMADD:ADD Ratio	MMADD _{ERU} ²	MDD:MMADD Ratio ³	MDD _{ERU} ³
2018 Full-Time Residential Usage	84	158 GPD	1.21	191 GPD	1.65	315 GPD
2019 Full-Time Residential Usage	82	152 GPD	1.36	207 GPD	1.65	342 GPD
2020 Full-Time Residential Usage	83	169 GPD	1.44	243 GPD	1.65	401 GPD
Maximum Values	84	169 GPD	1.44	243 GPD	1.65	401 GPD
Notes: 1. ADD_{ERU} - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage. 2. MMADD_{ERU} - Maximum Month's Average Day Demand per ERU based on the peak bi-monthly period, which includes July and August. 3. MDD:MMADD Ratio - Recommended ratio by the Department of Health for water systems serving fewer the 1,000 people.						

Table 3B: Alger 585 HGL Residential Water Consumption Analysis						
Description	Total Meters	ADD	MMADD:ADD Ratio	MMADD	MDD:MMADD Ratio	MDD
2018 Full-Time Residential Usage	15	143 GPD	1.41	202 GPD	1.65	333 GPD
2019 Full-Time Residential Usage	15	127 GPD	1.52	193 GPD	1.65	318 GPD
2020 Full-Time Residential Usage	15	138 GPD	1.37	189 GPD	1.65	312 GPD
Maximum Values	15	143 GPD	1.41	202 GPD	1.65	333 GPD

Alger Water System Capacity Analysis

Table 3C: Alger 710 HGL Residential Water Consumption Analysis						
Description	Total Meters	ADD	MMADD:ADD Ratio	MMADD	MDD:MMADD Ratio	MDD
2018 Full-Time Residential Usage	10	387 GPD	2.27	878 GPD	1.65	1,449 GPD
2019 Full-Time Residential Usage	10	343 GPD	2.13	731 GPD	1.65	1,206 GPD
2020 Full-Time Residential Usage	10	307 GPD	3.23	992 GPD	1.65	1,637 GPD
Maximum Values	10	387 GPD	2.56	992 GPD	1.65	1,637 GPD

Table 3D: Alger Commercial Water Consumption Analysis						
Description	Total Meters	ADD	MMADD:ADD Ratio	MMADD	MDD:MMADD Ratio	MDD
2018 Commercial Usage	10	252 GPD	1.75	441 GPD	1.65	728 GPD
2019 Commercial Usage	10	247 GPD	1.46	361 GPD	1.65	596 GPD
2020 Commercial Usage	10	230 GPD	1.53	352 GPD	1.65	581 GPD
Maximum Values	10	252 GPD	1.75	441 GPD	1.65	728 GPD

Alger Water System Capacity Analysis

Table 4A: Alger Residential Water Consumption					
Description	ERUs	ADD _{ERU} ¹	ADD	MDD _{ERU} ²	MDD
Full-Time Residential Usage	83	169 GPD	14,027 GPD	401 GPD	33,283 GPD
Part-Time Residential Usage	6	169 GPD	1,014 GPD	401 GPD	2,406 GPD
Vacant Residential	5	169 GPD	845 GPD	401 GPD	2,005 GPD
New and Future Residential Usage	11	169 GPD	1,859 GPD	401 GPD	4,411 GPD
Summary Values	105		17,745 GPD		42,105 GPD
Notes: 1. ADD_{ERU} - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage. 2. MDD_{ERU} - Calculated Maximum Day Demand per ERU.					

Table 4B: Alger Commercial / Governmental Water Consumption					
Description	ERUs	ADD _{ERU} ¹	ADD	MDD _{ERU} ²	MDD
Full-Time Commercial Usage	10	252 GPD	2,520 GPD	728 GPD	7,280 GPD
Part-Time Commercial & Government Usage	4	252 GPD	1,008 GPD	728 GPD	2,912 GPD
Summary Values	14		3,528 GPD		10,192 GPD

Calculations	
PHD = (MDD _{ERU} ÷ 1440) × (C × N + F) + 18	(Equation 3-1)
PHD = (401 ÷ 1440) × (2.0 × 130 + 75) + 18	PHD 520 HGL = 111 gpm
ES = (PHD + Q ₅₈₅ + Q ₇₁₀ - Q _{well}) × 150 minutes	(Equation 7-1) Modified
ES = (111 + 80 + 29 - 52) × 150	Calculated ES = 24,000 gal
The level in the storage tank has dropped to 16.1 ft under normal operating conditions.	Observed ES = 31,200 gal

Alger Water System Capacity Analysis

Table 5: Alger Storage Tank Volumes				
Description	Volume	Water Depth	Elevation	Minimum Pressure
Overflow			521.0 feet	
Freeboard		1.0 feet	520.0 feet	
Operating Storage	5,300 gal	1.0 feet	519.0 feet	
Equalizing Storage ¹	31,200 gal	5.9 feet	513.1 feet	29 psi
Standby Storage ²	95,700 gal	18.1 feet	495.0 feet	20 psi
Fire Suppression Storage ³	30,000 gal	Nested	495.0 feet	
Dead Storage	0 gal	0.0 feet	495.0 feet	
Summary Values	132,200 gal	26.0 feet		
Notes: 1. Provide 30 psi minimum residual hydraulic head throughout the distribution system during PHD. 2. Provide 20 psi of residual hydraulic head throughout the distribution system during FF + MDD. 3. Consolidated (i.e., nested) in the Standby Storage component.				

Alger Water System Capacity Analysis

Table 7: Alger ERU Capacity Summary			
Water System Specific Operating Basis			
Average Day Demand [ADD]	169 GPD/ERU		
Maximum Day Demand [MDD]	401 GPD/ERU		
Peak Hour Demand [PHD]	111 gpm		
Service Classification	Maximum Day Demand	Number of Connections	ERUs
Single-Family Residential 520 HGL	42,105 GPD	105 Connections	105 ERUs
Single-Family Residential 585 HGL	4,995 GPD	15 Connections	12 ERUs
Single-Family Residential 710 HGL	16,370 GPD	10 Connections	41 ERUs
Multi-Family Residential			
Non-Residential			
Industrial			
Commercial	10,192 GPD	14 Connections	25 ERUs
Governmental			
Agricultural			
Recreational			
Other			
Distribution System Leakage [DSL]	818 GPD	N/A	2 ERUs
Other (identify)			
Totals	74,480 GPD	144 Connections	185 ERUs
Maximum Service Capacity as ERUs and Volumes			
Water System Components	Capacity for Each Component	Total ERU Capacity for Each Component	Excess ERU Capacity for Each Component
Source (Well AET032) @ 22 hr/day	79,200 GPD	198 ERUs	13 ERUs
Treatment	79,200 GPD	198 ERUs	13 ERUs
Equalizing Storage	31,200 gal	216 ERUs	31 ERUs
Standby Storage (401 gal per ERU)	95,700 gal	238 ERUs	53 ERUs
Transmission (FF + Max MDD)	> 552 gpm	Determined to be Adequate	
Water Rights Instantaneous	100 gpm	359 ERUs	174 ERUs
Water Rights Annual	100.0 acre-feet	465 ERUs	280 ERUs
Water System Capacity for Alger		198 ERUs	13 ERUs

CEDARGROVE WATER SYSTEM

Water System Physical Capacity Analysis

April 22, 2024



OVERVIEW

1. Physical Capacity Analysis Objectives

Every water system should be designed and operated to provide safe and reliable water service to its customers. For existing systems, physical and legal limitations should periodically be evaluated and understood. As new customers request water service, the Skagit Public Utility District must know if there is adequate capacity for new connections and the impact of each new connection. This capacity analysis evaluates the physical and legal limitations to determine the system's capacity. This analysis follows procedures outlined in the Water System Design Manual¹.

2. Water System Background and Description

The Cedargrove water system (PWS ID#119174) is in central Skagit County, south of the Skagit River, near the town of Concrete. The water system was constructed through LUD #10 as part of the Cedargrove plat development². The development consists of 220 residential lots.

Each existing customer has a meter, which is read every two months for billing purposes.

3. Water System Facilities

The Cedargrove water facility inventory and design parameters are presented in **Table 1**. The single well provides an estimated 105 gallons per minute [gpm]. A bolted steel tank has a nominal volume of 267,000 gallons, providing operating, equalizing, standby, and fire suppression storage.

The water distribution system consists of 6-inch, 8-inch, and 10-inch ductile iron pipe. There are 12 fire hydrants distributed throughout the service area to provide a minimum of 500 gpm fire flow.

FACILITY ANALYSIS

1. Meter Classification and Evaluation

All services within the Cedargrove development are classified as residential customers. Therefore, an equivalent residential unit [ERU] is defined as one full-time residential unit.

Metered water consumption was collected and evaluated for three years from 2018 through 2020. This evaluation revealed several part-time or vacant homes. Part-time services may represent families that spend a portion of the year in a second home in a different local (e.g., snowbirds). Vacant homes may have minimal or no water usage throughout the year due to no residency at all. These homes may be abandoned

¹ *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

² Cedargrove on the Skagit, Plat No. 3877, AF#715090, 1968.

or changing ownership. Only full-time residential units were considered when determining average day demand [ADD].

During this period, it was noted that growth was approximately two services per year. A summary of the services and their classification is presented in **Table 2**. Twenty-five (25) meter boxes were installed during the initial water system installation but have not yet been activated by the property owners. These potential future services could be activated and need to have sufficient capacity available.

2. Water Consumption

The ADD was determined for all full-time residential units for each of the three evaluation years. Also, the maximum month average day demand [MMADD] was determined, equating to the July-August billing period. The MMADD was used to estimate the maximum day demand [MDD] based on the DOH recommended peaking factor of 1.65 for systems serving fewer than 1,000 people³.

Table 3 summarizes the total full-time meters, ADD, MMADD, and MDD for the three evaluation years. The year with the maximum consumption appears to be 2019; therefore, these values were used for the facility evaluation. The estimated MDD of 363 GPD/ERU is slightly higher than the DOH minimum of 350 GPD/ERU.

The consumption data indicated an estimated six part-time, eight vacant, and two new residential services within the Cedargrove water system. The MDD of 363 GPD/ERU was used to estimate the potential consumption by assuming the part-time, vacant, and new services could all potentially become full-time residential users. The residential water consumption is summarized in **Table 4**.

3. Source Capacity

In conjunction with any storage designed to accommodate peak use periods on a daily or longer basis, total daily source capacity shall be sufficient to provide a reliable supply of water equal to or exceeding the MDD⁴.

a. Water Rights

The Cedargrove well has a certificated water right (G1-25994C). The instantaneous withdrawal [Qi] limit is 262 gpm, and the annual withdrawal [Qa] limit is 53.8 acre-feet.

b. Well Pump Capacity

The Cedargrove water system is supplied by a single well [AET033]. The existing well pump has a capacity of 105 gpm and is controlled by floats within the storage tank.

c. Treatment Capacity

The source water is treated to remove iron and manganese using an ion-exchange treatment system manufactured by ATEC Systems Associates. The treatment system is designed to accommodate the installed well pump capacity.

³ Section 3.4.1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁴ WAC 264-290-222(4)

4. Storage Capacity

The storage elements, including operating, equalizing, standby, and fire suppression storage, shall have sufficient volumes to provide a reliable water supply and minimum pressure to meet normal and abnormal demand and operating conditions⁵. The storage volume calculations for existing and full buildout conditions are presented in **Table 5** and **Table 6**.

a. Operating Storage

Operating storage [OS] volume is set by the PUD's operations personnel to efficiently operate the well pump. The setpoints have a span of 6 feet and an approximate operating storage volume of 20,300 gallons. The minimum well pump runtime is around 193 minutes.

b. Equalizing Storage

Equalizing storage [ES] volume is based on the peak hourly demand [PHD], which itself is calculated based on the MDD⁶. The PHD will increase as new connections are added to the water system. Therefore, the ES requirement will also increase as the development moves toward full buildout. The ES must provide a minimum of 30 psi at all services.

Existing ES can also be estimated using the PUD's SCADA database. Under normal operating conditions, the bottom of the ES will be the lowest level reached in the storage tank.

By rearranging the equation for calculating the PHD, we can calculate the required ES at any point in time based on the number of ERUs, well pump flow rate, and MDD. This calculation is provided in Equation 4-5⁷.

c. Standby Storage

Standby storage [SB] volume allows the water system to maintain adequate pressure in an adverse operating condition, such as a firefighting situation or a mechanical, electrical, or water quality issue. Skagit PUD policy is to provide 300 gallons per ERU as standby storage. However, DOH recommends SB volume equal the MDD⁸, which is 363 gpd/ERU for the Cedargrove water system. Therefore, the more stringent requirement is used in this capacity analysis, specifically 363 gpd/ERU.

d. Fire Suppression Storage

The local Fire Marshal establishes fire suppression storage [FSS] volume. Minimum recommended FSS is listed in the Coordinated Water System Plan and equates to 15,000 gallons (500 gpm for 30 minutes)⁹.

The Skagit County Fire Marshal allows the FS to be nested with the SB storage within the storage tank.

e. Dead Storage

All storage must be capable of providing a minimum of 20 psi to all services and fire hydrants at the bottom of the fire suppression storage. The Cedargrove water system's minimum elevation to be served is a meter at an elevation of 239 feet. This meter elevation requires a water level in the storage tank of 302 feet, 3 feet above the tank's base elevation of 299 feet. Therefore, the bottom 3 feet of storage is

⁵ WAC 246-290-235

⁶ Equation 3-1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁷ Equation 4-5, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁸ Section 7.1.1.3, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁹ Table 4-3, *Skagit County Coordinated Water System Plan*, Economic and Engineering Services, Inc., July 2000.

considered dead storage and is not available for calculating necessary storage volumes. This dead storage equates to approximately 10,200 gallons.

5. Distribution System Capacity

The distribution system consists of 8-in and 10-in ductile iron pipelines that transport water to the Cedargrove development. Within the development is looped 6-in pipelines that distribute the water to the services. The fire hydrants are primarily connected to the 6-in distribution pipelines, but the looping characteristics of the network provide adequate flow to meet the 500 gpm fire flow requirement stated in the Coordinated Water System Plan¹⁰.

6. Distribution System Leakage

The distribution system leakage [DSL] for the Cedargrove water system was determined to be 2,065 GPD in 2020. This leakage rate equals approximately 6 ERUs, as shown in **Table 7**.

WATER SYSTEM CAPACITY CONCLUSIONS

The purpose of a Water System Physical Capacity Analysis is to inform managers when and which water system facilities need to be addressed to maintain capacity and support community growth. The water system operating data and physical capacity analysis are presented in **Table 7**.

As mentioned previously, the Cedargrove water system is comprised exclusively of single-family residential units. The total number of existing connections is 168, which equates to 168 ERUs. If all existing connections are active, the estimated MDD is 60,984 GPD. When the DSL is added, the total existing water system represents 174 ERUs.

1. Maximum Service Capacity

The following assessment of the maximum service capacity is based on the water system's physical and legal limitations. This information is summarized in **Table 7**.

- The existing well pump can supply 126,000 gallons during a 20 hour per day pumping cycle. This volume is sufficient to supply 347 ERUs, 173 ERUs more than what the existing water system is currently serving.
- The ATEC treatment system is sized to treat the water supplied by the well pump. Therefore, the existing treatment system has sufficient capacity to accommodate 347 ERUs, 173 ERUs more than what the existing water system is currently serving.
- The ES storage volume meets the requirements for the maximum number of services. The ES can serve 360 ERUs, which is 186 ERUs more than what the existing water system is currently serving.
- The SB storage volume meets the requirements for the maximum number of services. The SB can serve 596 ERUs, which is 422 ERUs more than what the existing water system is currently serving.

¹⁰ Table 4-3, *Skagit County Coordinated Water System Plan*, Economic and Engineering Services, Inc., July 2000.

- It is estimated that the lowest elevation of the equalizing storage will provide a minimum of 55 psi to the highest service within the distribution system. Furthermore, the lowest elevation of the standby storage will provide a minimum of 20 psi at the highest fire hydrant and service within the distribution system.
- The PUD has determined that the existing distribution pipeline network is sufficient to provide a firefighting flow of 500 gpm under MDD conditions.
- The instantaneous water right limitation of 262 gpm is sufficient to supply 1,039 ERUs, 865 ERUs more than what the existing water system is currently serving.
- The annual water right limitation of 53.8 acre-feet is sufficient to supply 311 ERUs, 137 ERUs more than what the existing water system is currently serving.

Based on the operating conditions, physical water system components, and water rights limitations, the Cedargrove water system has sufficient capacity to serve 311 ERUs. The limiting component is the annual water right withdrawal. Considering the water system is currently serving 174 ERUs, the excess capacity is 137 ERUs.

Cedargrove Water System Capacity Analysis

Table 1: Cedargrove Facility Inventory	
Storage Tank	Data
Base Elevation	299.0 feet
Spill Elevation	378.0 feet
Water Elevation in Tank	79.0 feet
Side Wall Depth	80 feet
Tank Diameter	24 feet
Tank Radius	12 feet
Tank Unit Volume	3,400 gal/ft
Nominal Tank Volume	267,000 gal
Well Pump	
Pump Discharge	105 gpm
"Pump On" Setpoint	74.0 feet
"Pump Off" Setpoint	80.0 feet
Hydraulic Constraints	
Highest Meter Elevation	239 feet
Highest Fire Hydrant Elevation	256 feet
Tank Hydraulic Grade Line	378 feet
Demand Constraints (DOH Water System Design Manual Table 3-1)	
Number of ERUs [N]	101 - 250
C factor	2.0
F factor	75 gpm

Table 2: Cedargrove Residential Meter Services			
Meter Classification	2018	2019	2020
Full-Time Residential	142	145	149
Part-Time Residential	16	10	9
Vacant Residential	6	8	8
New Residential	0	3	2
Total Meters	164	166	168
Well Production	1,302,000 CF	1,312,900 CF	1,294,000 CF

Cedargrove Water System Capacity Analysis

Description	Total Meters	ADD_{ERU}¹	MMADD:ADD Ratio	MMADD_{ERU}²	MDD:MMADD Ratio³	MDD_{ERU}³
2018 Full-Time Residential Units	142	162 GPD	1.26	204 GPD	1.65	337 GPD
2019 Full-Time Residential Units	145	169 GPD	1.30	220 GPD	1.65	363 GPD
2020 Full-Time Residential Units	149	153 GPD	1.19	182 GPD	1.65	300 GPD
Maximum Values	149	169 GPD	1.30	220 GPD	1.65	363 GPD

Notes:

- ADD_{ERU}** - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage.
- MMADD_{ERU}** - Maximum Month's Average Day Demand per ERU based on the peak bi-monthly period, which includes July and August.
- MDD:MMADD Ratio** - Recommended ratio by the Department of Health for water systems serving fewer the 1,000 people.

Cedargrove Water System Capacity Analysis

Table 4: Cedargrove Residential Water Consumption					
Description	ERUs	ADD _{ERU} ¹	ADD	MDD _{ERU} ²	MDD
Full-Time Residential Units	149	169 GPD	25,181 GPD	363 GPD	54,087 GPD
Part-Time Residential Units	9	169 GPD	1,521 GPD	363 GPD	3,267 GPD
Vacant Residential Units	8	169 GPD	1,352 GPD	363 GPD	2,904 GPD
New Residential Units	2	169 GPD	338 GPD	363 GPD	726 GPD
Summary Values	168		28,392 GPD		60,984 GPD
Notes: 1. ADD_{ERU} - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage. 2. MDD_{ERU} - Calculated Maximum Day Demand per ERU.					

Calculations	
$PHD = (MDD_{ERU} \div 1440) \times (C \times N + F) + 18$	(Equation 3-1)
$PHD = (373 \div 1440) \times (2.0 \times 168 + 75) + 18$	PHD = 122 gpm
$N = (1/C) \times [1440/MDD_{ERU} \times (ES/150 + Q_s - 18) - F]$	(Equation 4-6)
$N = (1/2.0) \times [1440/363 \times (2,500/150 + 105 - 18) - 75]$	N = 168 ERUs

Cedargrove Water System Capacity Analysis

Table 5: Cedargrove Storage Tank Volumes

Description	Volume	Depth	Elevation	Minimum Pressure
Overflow			378.0 feet	
Freeboard		1.0 feet	377.0 feet	
Operating Storage	20,300 gal	6.0 feet	371.0 feet	
Equalizing Storage ¹	2,500 gal	0.7 feet	370.3 feet	57 psi
Standby Storage ²	231,100 gal	68.3 feet	302.0 feet	20 psi
Fire Suppression Storage ³	15,000 gal	Nested	302.0 feet	
Dead Storage	10,200 gal	3.0 feet	299.0 feet	
Summary Values	264,100 gal	79.0 feet		

Notes:

1. Provide 30 psi minimum residual hydraulic head throughout the distribution system during PHD.
2. Provide 20 psi of residual hydraulic head throughout the distribution system during FF + MDD.
3. Consolidated (i.e., nested) in the Standby Storage component.

Table 6: Maximum Buildout Cedargrove Storage Tank Volumes

Description	Volume	Depth	Elevation	Minimum Pressure
Overflow			378.0 feet	
Freeboard		1.0 feet	377.0 feet	
Operating Storage	20,300 gal	6.0 feet	371.0 feet	
Equalizing Storage ¹	17,000 gal	5.0 feet	366.0 feet	55 psi
Standby Storage ²	216,600 gal	64.0 feet	302.0 feet	20 psi
Fire Suppression Storage ³	15,000 gal	Nested	302.0 feet	
Dead Storage	10,200 gal	3.0 feet	299.0 feet	
Summary Values	264,100 gal	79.0 feet		

Notes:

1. Expanded to accommodate potential future connections.
2. Reduced to accommodate increased ES.
3. Consolidated (i.e., nested) in the Standby Storage component.

Cedargrove Water System Capacity Analysis

Table 7: Cedargrove ERU Capacity Summary			
Water System Specific Operating Basis			
Average Day Demand [ADD]	169 GPD/ERU		
Maximum Day Demand [MDD]	363 GPD/ERU		
Peak Hour Demand [PHD]	122 gpm		
Service Classification	Maximum Day Demand	Number of Connections	ERUs
Single-Family Residential	60,984 GPD	168 Connections	168 ERUs
Multi-Family Residential			
Non-Residential			
Industrial			
Commercial			
Governmental			
Agricultural			
Recreational			
Other			
Distribution System Leakage [DSL]	2,065 GPD	N/A	6 ERUs
Other (identify)			
Total Existing ERUs (Residential + Non-Residential + DSL + Other)			174 ERUs
Maximum Service Capacity as ERUs and Gallons per Day			
Water System Components	Capacity for Each Component	Total ERU Capacity for Each Component	Excess ERU Capacity for Each Component
Source (Well AET033) @ 20 hr/day	126,000 GPD	347 ERUs	173 ERUs
Treatment	126,000 GPD	347 ERUs	173 ERUs
Equalizing Storage	17,000 gal	360 ERUs	186 ERUs
Standby Storage (363 gal per ERU)	216,600 gal	596 ERUs	422 ERUs
Transmission (FF + Max MDD)	> 578 gpm	Determined to be Adequate	
Water Rights Instantaneous	262 gpm	1039 ERUs	865 ERUs
Water Rights Annual	53.8 acre-feet	311 ERUs	137 ERUs
Water System Capacity for Cedargrove		311 ERUs	137 ERUs

MARBLEMOUNT WATER SYSTEM

Water System Physical Capacity Analysis

April 22, 2024



OVERVIEW

1. Physical Capacity Analysis Objectives

Every water system should be designed and operated to provide safe and reliable water service to its customers. For existing systems, physical and legal limitations should periodically be evaluated and understood. As new customers request water service, the Skagit Public Utility District must know if there is adequate capacity for new connections and the impact of each new connection. This capacity analysis evaluates the physical and legal limitations to determine the system's capacity. This analysis follows procedures outlined in the Water System Design Manual¹.

2. Water System Background and Description

The Marblemount water system (PWS ID#AA642) is in eastern Skagit County, along State Route 20, in the Marblemount community. The water system was constructed through LUD #28. Properties within the LUD include both residential and commercial customers and land uses.

Each existing customer has a meter, which is read every two months for billing purposes.

3. Water System Facilities

The Marblemount water facility inventory and design parameters are presented in **Table 1**. The single well provides an estimated 143 gallons per minute [gpm]. A cylindrical concrete tank has a nominal volume of 63,000 gallons, providing operating, equalizing, standby, and fire suppression storage.

The water distribution system consists of 8-inch C-900 PVC pipes. There are six (6) fire hydrants distributed throughout the service area to provide a minimum of 500 gpm fire flow.

FACILITY ANALYSIS

1. Meter Classification and Evaluation

Services within this water system are classified as either residential or commercial customers. There are 46 residential services and 14 commercial services. For the purposes of this analysis, an equivalent residential unit [ERU] is defined as one full-time residential unit.

Metered water consumption was collected and evaluated for three years from 2018 through 2020. This evaluation revealed several part-time or vacant homes and vacant commercial establishments. Part-time residential services may represent families that spend a portion of the year in a second home in a different

¹ *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

local (e.g., snowbirds). Vacant homes may have minimal or no water usage throughout the year due to no residency at all. These homes may be abandoned or changing ownership. Only full-time residential units were considered when determining average day demand [ADD]. Vacant commercial establishments are indicative of the seasonal economy of this rural community.

During this period, it was noted that growth was approximately one service per year. A summary of the services and their classification is presented in **Table 2**. Twenty-five (25) meter boxes were installed during the initial water system installation but have not yet been activated by the property owners. These potential future services could be activated and need to have sufficient capacity available.

2. Water Consumption

The ADD was determined for all full-time residential units for each of the three evaluation years. Also, the maximum month average day demand [MMADD] was determined, equating to the July-August billing period. The MMADD was used to estimate the maximum day demand [MDD] based on the DOH recommended peaking factor of 1.65 for systems serving fewer than 1,000 people².

Table 3A summarizes the total full-time residential meters, ADD, MMADD, and MDD for the three evaluation years. The year with the maximum consumption and maximum MMADD was 2020. The estimated MDD of 254 gpd/ERU is lower than the DOH minimum of 350 gpd/ERU. Therefore, the DOH minimum of 350 gpd/ERU was used for the facility evaluation.

Table 3B summarizes the ADD, MMADD, and MDD for the active commercial meters for the three evaluation years. The year with the maximum consumption was 2019, but the maximum MMADD was 2018. The estimated MDD of 1,216 gpd was used for estimates ERUs for the commercial services. Therefore, an average commercial service is equal to 3.5 ERUs.

The PHD is a calculation based on the number of ERUs and the MDD³. For the existing services, the PHD is calculated to be 82 gpm.

The consumption data indicated an estimated two part-time, four vacant, 25 future residential, and six vacant commercial services within the water system. The MDD of 350 gpd/ERU was used to estimate the potential consumption by assuming the part-time, vacant, and new services could all potentially become full-time residential users. The potential water consumption for all residential services is summarized in **Table 4A**.

In addition, the six vacant commercial services could reflect consumption equal to 21 ERUs. The potential water consumption for all commercial services is summarized in **Table 4B**.

² Section 3.4.1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

³ Equation 3-1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

3. Source Capacity

In conjunction with any storage designed to accommodate daily or longer peak use periods, total daily source capacity shall be sufficient to provide a reliable water supply equal to or exceeding the MDD⁴.

a. Water Rights

The Marblemount well has a ground water permit (G1-28137P). The instantaneous withdrawal [Qi] limit is 150 gpm; however, 11 gpm is reserved for augmentation of the Skagit River during periods of low flow. The remaining 139 gpm is available for municipal uses.

Likewise, the ground water permit has an annual withdrawal [Qa] limit is 19.4 acre-feet; however, 10 acre-feet are reserved for augmentation of the Skagit River. The remaining 9.4 acre-feet are available for municipal uses.

b. Well Pump Capacity

The Marblemount water system is supplied by a single well [AET032]. The existing well pump has a capacity of 143 gpm and is controlled by floats within the storage tank. This well provides water for both municipal purposes and augmentation to the Skagit River during periods of low flow.

c. Treatment Capacity

The source water is not treated. However, the pump station design included room for installing an ion-exchange treatment system and a sodium hypochlorite disinfection system. These treatment systems shall be designed to accommodate the well pump capacity or instantaneous water right withdrawal if needed.

4. Storage Capacity

The storage elements, including operating, equalizing, standby, and fire suppression storage, shall have sufficient volumes to provide a reliable water supply and minimum pressure to meet normal and abnormal demand and operating conditions⁵. The storage volume calculations for existing conditions is presented in Table 5.

a. Operating Storage

The PUD's Operations Department sets operating storage [OS] volume to operate the well pump efficiently. The setpoints have a span of 2.0 feet and an approximate operating storage volume of 10,600 gallons. The minimum well pump runtime is around 74 minutes.

b. Equalizing Storage

Equalizing storage [ES] volume is based on the difference between the peak hourly demand [PHD] and the well pump capacity. The PHD is calculated to be 82 gpm at full buildout, based on Equation 3-1⁶. For the Marblemount water system, the well pump capacity is greater than the PDH; therefore, there is no requirement for equalizing storage under either existing conditions or full buildout. In addition, the ES must provide a minimum of 30 psi at all services.

⁴ WAC 264-290-222(4)

⁵ WAC 246-290-235

⁶ Equation 3-1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

Existing ES can also be estimated using the PUD's SCADA database. Under normal operating conditions, the bottom of the ES will be the lowest level reached in the storage tank. A review of SCADA records indicates that the water level in the tank does not drop below the bottom of the operating storage. This observation supports the conclusion that actual PHD is less than the well pump capacity of 143 gpm.

c. Standby Storage

Standby storage [SB] volume allows the water system to maintain adequate pressure in an adverse operating condition, such as a firefighting situation or a mechanical, electrical, or water quality issue. Skagit PUD policy provides 300 gallons per ERU as standby storage. However, DOH recommends SB volume equal the MDD⁷, which is 350 gpd/ERU for the Marblemount water system. Therefore, the more stringent requirement is used in this capacity analysis, specifically 350 gpd/ERU.

d. Fire Suppression Storage

The local Fire Marshal establishes fire suppression storage [FSS] volume. Minimum recommended FSS is listed in the Coordinated Water System Plan and equates to 15,000 gallons (500 gpm for 30 minutes)⁸.

The Skagit County Fire Marshal allows the FS to be nested with the SB storage within the storage tank.

e. Dead Storage

All storage must be capable of providing a minimum of 20 psi to all services and fire hydrants at the bottom of the fire suppression storage. The Marblemount water system's minimum elevation to be served is a meter and hydrant at 325 feet. This meter elevation requires a water level in the storage tank of 371 feet, which is below the tank's base elevation of 516 feet. Therefore, there is no dead storage in the tank.

5. Distribution System Capacity

The distribution system consists of 8-in C-900 PVC pipelines transporting water to the Marblemount community. Dead-end pipelines characterize the distribution system. The fire hydrants are connected to the 8-in distribution pipelines, providing adequate flow to meet the 500 gpm fire flow requirement stated in the Coordinated Water System Plan⁹.

6. Distribution System Leakage

The distribution system leakage [DSL] for the Marblemount water system was determined to be 420 gpd in 2020. This leakage rate equals approximately 1 ERU, as shown in **Table 6**.

⁷ Section 7.1.1.3, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁸ Table 4-3, *Skagit County Coordinated Water System Plan*, Economic and Engineering Services, Inc., July 2000.

⁹ Table 4-3, *Skagit County Coordinated Water System Plan*, Economic and Engineering Services, Inc., July 2000.

WATER SYSTEM CAPACITY CONCLUSIONS

The purpose of a Water System Physical Capacity Analysis is to inform managers when and which water system facilities need to be addressed to maintain capacity and support community growth. The water system operating data and physical capacity analysis are presented in **Table 6**.

As mentioned previously, the Marblemount water system is comprised of residential and commercial development. The total number of existing connections is 60, which equates to 95 ERUs. If all existing connections are active, the estimated MDD is 33,544 gpd. When the DSL is added, the total existing water system represents 96 ERUs.

1. Maximum Service Capacity

The following assessment of the maximum service capacity is based on the water system's physical and legal limitations. This information is summarized in **Table 6**.

- The existing well pump can supply 171,600 gallons during a 20 hour per day pumping cycle. This volume is sufficient to supply 490 ERUs, 394 ERUs more than the existing water system currently serving.
- There is no treatment currently provided in the Marblemount water system.
- No ES is required in the storage tank since the well pump capacity under both existing and full buildout conditions exceeds the calculated PHD.
- The SB storage volumes of 47,600 gallons can serve 136 ERUs, which is 40 ERUs more than required to serve the full buildout. The Marblemount water system design included the installation of a second storage tank. This analysis does not currently support the installation of the second tank at this time. The PUD should continue monitoring water usage within the water system and plan to install the second storage tank when SB storage is needed.
- It is estimated that the lowest elevation of the equalizing/operating storage will provide a minimum of 87 psi to the highest service within the distribution system. Furthermore, the lowest elevation of the standby storage will provide a minimum of 83 psi at the highest fire hydrant and service within the distribution system.
- The PUD has determined that the existing distribution pipeline network is sufficient to provide a firefighting flow of 500 gpm under MDD conditions.
- The instantaneous water right limitation of 139 gpm for municipal uses is sufficient to supply 572 ERUs, 476 ERUs more than what the existing water system is currently serving.
- The annual water right limitation of 9.4 acre-feet for municipal uses is sufficient to supply 158 ERUs, 62 ERUs more than what the existing water system is currently serving.

Based on the operating conditions, physical water system components, and water rights limitations, the Marblemount water system may have insufficient SB storage capacity to serve full buildout. Installation of the planned second storage tank will alleviate this apparent shortfall. This delinquency is not an immediate concern since 67 percent of residential and 43 percent of commercial customers are part-time or completely

inactive. The PUD shall monitor customer activity in the Marblemount community. If water use increases of inactive customers become active again, then the second storage tank may need to be constructed.

Marblemount Water System Capacity Analysis

Table 1: Marblemount Facility Inventory	
Storage Tank	Data
Base Elevation	516.0 feet
Spill Elevation	528.0 feet
Water Elevation in Tank	12.0 feet
Side Wall Depth	13 feet
Tank Diameter	30 feet
Tank Radius	15 feet
Tank Unit Volume	5,300 gal/ft
Nominal Tank Volume	63,000 gal
Well Pump	
Pump Discharge	143 gpm
"Pump On" Setpoint	9.0 feet
"Pump Off" Setpoint	11.0 feet
Hydraulic Constraints	
Highest Meter Elevation	325 feet
Highest Fire Hydrant Elevation	325 feet
Tank Hydraulic Grade Line	527 feet
Demand Constraints (DOH Water System Design Manual Table 3-1)	
Number of ERUs [N]	51 - 100
C factor	2.5
F factor	25 gpm

Table 2: Marblemount Residential Meter Services			
Meter Classification	2018	2019	2020
Full-Time Residential	11	14	15
Part-Time Residential	4	1	2
Vacant Residential	3	5	4
New Residential	1	1	0
Total Meters	19	21	21
Well Production	374,500 CF	592,200 CF	375,900 CF
Discharge to the Skagit River	150,450 CF	343,700 CF	375,900 CF
Municipal Production	224,050 CF	248,500 CF	118,900 CF

Marblemount Water System Capacity Analysis

Table 3A: Marblemount Residential Water Consumption Analysis						
Description	Total Meters	ADD_{ERU}¹	MMADD:ADD Ratio	MMADD_{ERU}²	MDD:MMADD Ratio³	MDD_{ERU}³
2018 Full-Time Residential Usage	11	90 GPD	1.37	123 GPD	1.65	203 GPD
2019 Full-Time Residential Usage	14	85 GPD	1.15	98 GPD	1.65	162 GPD
2020 Full-Time Residential Usage	15	128 GPD	1.20	154 GPD	1.65	254 GPD
Maximum Values	15	128 GPD	1.20	154 GPD	1.65	254 GPD
Minimum MDD allowed by DOH						350 GPD
Notes: ADD_{ERU} - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage. MMADD_{ERU} - Maximum Month's Average Day Demand per ERU based on the peak bi-monthly period, which includes July and August. MDD:MMADD Ratio - Recommended ratio by the Department of Health for water systems serving fewer the 1,000 people.						

Table 3B: Marblemount Commercial Water Consumption Analysis						
Description	Total Meters	ADD	MMADD:ADD Ratio	MMADD	MDD:MMADD Ratio	MDD
2018 Commercial Usage	8	356 GPD	2.07	737 GPD	1.65	1,216 GPD
2019 Commercial Usage	8	359 GPD	1.95	700 GPD	1.65	1,155 GPD
2020 Commercial Usage	8	329 GPD	1.81	595 GPD	1.65	982 GPD
Maximum Values	8	359 GPD	2.05	737 GPD	1.65	1,216 GPD

Marblemount Water System Capacity Analysis

Table 4A: Marblemount Residential Water Consumption

Description	ERUs	ADD _{ERU} ¹	ADD	MDD _{ERU} ²	MDD
Full-Time Residential Usage	15	128 GPD	1,920 GPD	350 GPD	5,250 GPD
Part-Time Residential Usage in 2021	2	128 GPD	256 GPD	350 GPD	700 GPD
Vacant Residential	4	128 GPD	512 GPD	350 GPD	1,400 GPD
Future Residential	25	128 GPD	3,200 GPD	350 GPD	8,750 GPD
Summary Values	46		5,888 GPD		16,100 GPD

Notes:

1. **ADD_{ERU}** - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage.
2. **MDD_{ERU}** - Calculated Maximum Day Demand per ERU.

Table 4B: Marblemount Commercial Water Consumption

Description	ERUs	ADD _{ERU} ¹	ADD	MDD _{ERU} ²	MDD
Active Commercial	8	737 GPD	5,896 GPD	1,216 GPD	9,728 GPD
Vacant Commercial	6	737 GPD	4,422 GPD	1,216 GPD	7,296 GPD
Summary Values	14		10,318 GPD		17,024 GPD

Notes:

1. **ADD_{ERU}** - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage.
2. **MDD_{ERU}** - Calculated Maximum Day Demand per ERU.

Peak Hour Demand Calculations

$$\text{PHD} = (\text{MDD}_{\text{ERU}} \div 1440) \times (C \times N + F) + 18 \quad (\text{Equation 3-1})$$

$$\text{PHD} = (350 \div 1440) \times (2.5 \times 95 + 25) + 18 \quad \text{PHD} = 82 \text{ gpm}$$

Marblemount Water System Capacity Analysis

Table 5: Marblemount Storage Tank Volumes				
Description	Volume	Water Depth	Elevation	Minimum Pressure
Overflow			528.0 feet	
Freeboard		1.0 feet	527.0 feet	
Operating Storage	10,600 gal	2.0 feet	525.0 feet	
Equalizing Storage ¹	0 gal	0.0 feet	525.0 feet	87 psi
Standby Storage ²	47,600 gal	9.0 feet	516.0 feet	83 psi
Fire Suppression Storage ³	30,000 gal	Nested	516.0 feet	
Dead Storage	0 gal	0.0 feet	516.0 feet	
Summary Values	58,200 gal	12.0 feet		
Notes: 1. Provide 30 psi minimum residual hydraulic head throughout the distribution system during PHD. 2. Provide 20 psi of residual hydraulic head throughout the distribution system during FF + MDD. 3. Consolidated (i.e., nested) in the Standby Storage component.				

Marblemount Water System Capacity Analysis

Table 6: Marblemount ERU Capacity Summary			
Water System Specific Operating Basis			
Average Day Demand [ADD]	128 GPD/ERU		
Maximum Day Demand [MDD]	350 GPD/ERU		
Peak Hour Demand [PHD]	82 gpm		
Service Classification	Maximum Day Demand	Number of Connections	ERUs
Single-Family Residential	16,100 GPD	46 Connections	46 ERUs
Multi-Family Residential			
Non-Residential			
Industrial			
Commercial	17,024 GPD	14 Connections	49 ERUs
Governmental			
Agricultural			
Recreational			
Other			
Distribution System Leakage [DSL]	420 GPD	N/A	1 ERUs
Other (identify)			
Totals	33,544 GPD	60 Connections	96 ERUs
Maximum Service Capacity as ERUs and Gallons per Day			
Water System Components	Capacity for Each Component	Total ERU Capacity for Each Component	Excess ERU Capacity for Each Component
Source (Well AET032) @ 20 hr/day	171,600 GPD	490 ERUs	394 ERUs
Treatment	There is no treatment provided at this time.		
Equalizing Storage	0 gal	196 ERUs	100 ERUs
Standby Storage (350 gal per ERU)	47,600 gal	136 ERUs	40 ERUs
Transmission (FF + Max MDD)	> 523 gpm	Determined to be Adequate	
Water Rights Instantaneous	139 gpm	572 ERUs	476 ERUs
Water Rights Annual	9.4 acre-feet	158 ERUs	62 ERUs
Water System Capacity for Marblemount		136 ERUs	40 ERUs

POTLATCH BEACH WATER SYSTEM

Water System Physical Capacity Analysis

April 22, 2024



OVERVIEW

1. Physical Capacity Analysis Objectives

Every water system should be designed and operated to provide safe and reliable water service to its customers. For existing systems, physical and legal limitations should periodically be evaluated and understood. As new customers request water service, the Skagit Public Utility District must know if there is adequate capacity for new connections and the impact of each new connection. This capacity analysis evaluates the physical and legal limitations to determine the system's capacity. This analysis follows procedures outlined in the Water System Design Manual¹.

2. Water System Background and Description

The Potlatch Beach water system (PWS ID#69034L) is on the west shore of Guemes Island. The water system was upgraded through LUD #23. The service area consists of 36 residential lots.

Each existing customer has a meter, which is read every month for billing purposes.

3. Water System Facilities

The Potlatch Beach water facility inventory and design parameters are presented in **Table 1**. The single saltwater intake provides an estimated 15 gallons per minute [gpm]. The saltwater is treated through a reverse osmosis system and potable water is disinfected and collected in a clearwell in the treatment building. The supernatant from the RO system is returned to the saltwater.

A booster pump with a capacity of 15 gpm transfers the potable water from the clearwell into the distribution systems and the storage tank.

A concrete storage tank has a nominal volume of 31,000 gallons, providing operating, equalizing, and standby storage. The water system is not designed for fire suppression.

The water distribution system consists of 2-inch and 4-inch PVC pipe.

FACILITY ANALYSIS

1. Meter Classification and Evaluation

All services within the Potlatch Beach service area are classified as residential customers. Therefore, an equivalent residential unit [ERU] is defined as one full-time residential unit.

¹ *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

Metered water consumption was collected and evaluated for three years from 2021 through 2023. This evaluation revealed several part-time or vacant homes. Part-time services may represent families that spend a portion of the year in a primary home in a different local. Vacant homes may have minimal or no water usage throughout the year due to no residency at all. These homes may be changing ownership. Only full-time residential units were considered when determining average day demand [ADD].

A summary of the services and their classification is presented in **Table 2**. A Total of 34 meters are installed on the water system. There are 20 full-time residences, 12 part-time residences, and one vacant residence. There is one meter box that is reserved for a future connection but has not yet been activated by the property owners. This potential future service could be activated and need to have sufficient capacity available.

2. Water Consumption

The ADD was determined for all full-time residential units for each of the three evaluation years. Also, the maximum month average day demand [MMADD] was determined, equating to the July or August billing period. The MMADD was used to estimate the maximum day demand [MDD] based on the DOH recommended peaking factor of 1.65 for systems serving fewer than 1,000 people².

Table 3 summarizes the total full-time meters, ADD, MMADD, and MDD for the three evaluation years. The year with the maximum consumption appears to be 2021; therefore, these values were used for the facility evaluation. The estimated MDD of 228 gpd/ERU, which is lower than the DOH minimum of 350 gpd/ERU. The higher value of 350 gpd/ERU will be used for the MDD in this analysis.

The MDD of 350 gpd/ERU was used to estimate the potential consumption by assuming the part-time, vacant, and new services could all potentially become full-time residential users. The residential water consumption is summarized in **Table 4**.

3. Source Capacity

In conjunction with any storage designed to accommodate peak use periods on a daily or longer basis, total daily source capacity shall be sufficient to provide a reliable supply of water equal to or exceeding the MDD³.

a. Water Rights

The Potlatch Beach utilizes saltwater as its source and, therefore, does not need a water right.

b. Pump Capacity

The Potlatch Beach water system utilizes single well [AET033] to pump saltwater to the RO treatment system. A booster pump transfers potable water to the distribution system and storage tank. Both pumps have a capacity of 15 gpm and is controlled by floats within the clearwell and storage tank, respectfully.

c. Treatment Capacity

The saltwater is treated using a reverse osmosis treatment system. The treatment system is designed to accommodate the installed pump capacity of 15 gpm.

² Section 3.4.1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

³ WAC 264-290-222(4)

4. Storage Capacity

The storage elements, including operating, equalizing, standby, and fire suppression storage, shall have sufficient volumes to provide a reliable water supply and minimum pressure to meet normal and abnormal demand and operating conditions⁴. The storage volume calculations for existing conditions are presented in **Table 5**.

a. Operating Storage

Operating storage [OS] volume is set by the PUD's operations personnel to efficiently operate the well pump. The setpoints have a span of 0.6 feet and an approximate operating storage volume of 1,400 gallons. The minimum well pump runtime is around 93 minutes.

b. Equalizing Storage

Equalizing storage [ES] volume is based on the peak hourly demand [PHD], which itself is calculated based on the MDD⁵. The PHD will increase as new connections are added to the water system. Therefore, the ES requirement will also increase as the development moves toward full buildout. The ES must provide a minimum of 30 psi at all services.

Existing ES can also be estimated using the PUD's SCADA database. Under normal operating conditions, the bottom of the ES will be the lowest level reached in the storage tank.

By rearranging the equation for calculating the PHD, we can calculate the required ES at any point in time based on the number of ERUs, well pump flow rate, and MDD. This calculation is provided in Equation 4-5⁶.

c. Standby Storage

Standby storage [SB] volume allows the water system to maintain adequate pressure in an adverse operating condition, such as a firefighting situation or a mechanical, electrical, or water quality issue. Skagit PUD policy is to provide 300 gallons per ERU as standby storage. However, DOH recommends SB volume equal the MDD⁷, which is 350 gpd/ERU for the Potlatch Beach water system. Therefore, the more stringent requirement is used in this capacity analysis, specifically 350 gpd/ERU.

d. Fire Suppression Storage

The local Fire Marshal establishes fire suppression storage [FSS] volume. The Skagit County Fire Marshal did not require FS to be provided for the Potlatch Beach water system. Therefore, not FS is provided in the storage tank and no fire hydrants are installed on the distribution system.

e. Dead Storage

All storage must be capable of providing a minimum of 20 psi to all services at the bottom of the standby storage. The Potlatch Beach water system's minimum elevation to be served is a meter at an elevation of 108 feet. This meter elevation requires a water level in the storage tank of 154 feet, 3 feet below the tank's base elevation of 157 feet. Therefore, there is no dead storage in the tank.

⁴ WAC 246-290-235

⁵ Equation 3-1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁶ Equation 4-5, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁷ Section 7.1.1.3, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

5. Distribution System Capacity

The distribution system consists of 2-in and 4-in PVC pipelines that transport water throughout the Potlatch Beach water system. Not fire hydrants are installed in the distribution system.

There are two pressure zones to serve the residences at different elevations. The lower pressure zone, at a 165 ft HGL, is controlled by the water surface elevation in the storage tank. The higher pressure zone, at a 273 ft HGL, is maintained by a booster pump station with a capacity of 35 gpm to meet the PHD. The pipeline sizes are sufficient to accommodate the PHD flow rate.

6. Distribution System Leakage

The distribution system leakage [DSL] for the Potlatch Beach water system was determined to be 198 gpd in 2023. This leakage rate equals approximately 1 ERU, as shown in **Table 6**.

WATER SYSTEM CAPACITY CONCLUSIONS

The purpose of a Water System Physical Capacity Analysis is to inform managers when and which water system facilities need to be addressed to maintain capacity and support community growth. The water system operating data and physical capacity analysis are presented in **Table 6**.

As mentioned previously, the Potlatch Beach water system is comprised exclusively of single-family residential units. The total number of existing connections is 34, which equates to 34 ERUs. If all existing connections are active, the estimated MDD is 4,069 gpd. When the DSL is added, the total existing water system represents 35 ERUs.

1. Maximum Service Capacity

The following assessment of the maximum service capacity is based on the water system's physical and legal limitations. This information is summarized in **Table 6**.

- The existing well pump can supply 16,200 gallons during an 18 hour per day pumping cycle. This volume is sufficient to supply 46 ERUs, 11 ERUs more than what the existing water system is currently serving.
- The RO treatment system is sized to treat the water supplied by the well pump. Therefore, the existing treatment system has sufficient capacity to accommodate 46 ERUs, 11 ERUs more than what the existing water system is currently serving.
- The ES storage volume meets the requirements for the maximum number of services. The ES can serve 90 ERUs, which is 55 ERUs more than what the existing water system is currently serving.
- The SB storage volume meets the requirements for the maximum number of services. The SB can serve 53 ERUs, which is 18 ERUs more than what the existing water system is currently serving.
- It is estimated that the lowest elevation of the equalizing storage will provide 25 psi to the highest service within the distribution system. This is less than the desire pressure of 30 psi.
- The PUD has determined that the existing distribution pipeline network is sufficient to provide a sufficient hydraulic capacity to meet the PHD conditions.

- The saltwater source does not require a water right.

2. Summary

Based on the operating conditions and physical water system components, the Potlatch Beach water system has sufficient capacity to serve 46 ERUs. The limiting component is the saltwater well pump and RO treatment system. Considering the water system is currently serving 34 ERUs, the excess capacity is 12 ERUs. The only limiting factor is that storage tank is not at a sufficient elevation to provide a minimum of 30 psi to the highest service in the 165 PZ.

Potlatch Beach Water System Capacity Analysis

Table 1: Potlatch Beach Facility Inventory		
Storage Tank	Data	
Base Elevation	157.2 feet	
Spill Elevation	170.4 feet	
Tank Overflow Level	13.2 feet	
Side Wall Depth	15 feet	
Tank Diameter	20 feet	
Tank Radius	10 feet	
Tank Unit Volume	2,300 gal/ft	
Nominal Tank Volume	31,000 gal	
Well Pump		
RO Pump Discharge	15 gpm	
"Pump On" Setpoint	12.4 feet	
"Pump Off" Setpoint	13.0 feet	
Booster Pump Station Pump		
Booster Pump Capacity	35 gpm	
Hydraulic Constraints	165 PZ	273 PZ
Highest Meter Elevation	108 feet	164 feet
Highest Fire Hydrant Elevation	N/A	N/A
Demand Constraints (DOH Water System Design Manual Table 3-1)		
Number of ERUs [N]	15 - 50	
C factor	3.0	
F factor	0 gpm	

Table 2: Potlatch Beach Residential Meter Services			
Meter Classification	2021	2022	2023
Full-Time Residential	17	17	20
Part-Time Residential	14	14	12
Vacant Residential	0	1	1
Future Residential	1	1	1
Total Meters	32	33	34
Municipal Production	86,620 CF	82,930 CF	92,850 CF

Potlatch Beach Water System Capacity Analysis

Table 3A: Potlatch 165 PZ Residential Water Consumption Analysis						
Description	Total Meters	ADD_{ERU}¹	MMADD:ADD Ratio	MMADD_{ERU}²	MDD:MMADD Ratio³	MDD_{ERU}³
2021 Full-Time Residential Usage	3	76 GPD	1.82	138 GPD	1.65	228 GPD
2022 Full-Time Residential Usage	3	69 GPD	1.59	110 GPD	1.65	182 GPD
2023 Full-Time Residential Usage	4	72 GPD	1.54	111 GPD	1.65	183 GPD
Maximum Values	4	76 GPD	1.82	138 GPD	1.65	228 GPD
Minimum MDD allowed by DOH						350 GPD
Notes: ADD_{ERU} - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water MMADD_{ERU} - Maximum Month's Average Day Demand per ERU based on the peak monthly MDD:MMADD Ratio - Recommended ratio by the Department of Health for water systems serving fewer the 1,000 people.						

Table 3B: Potlatch 260 PZ Residential Water Consumption Analysis						
Description	Total Meters	ADD	MMADD:ADD Ratio	MMADD	MDD:MMADD Ratio	MDD
2021 Full-Time Residential Usage	14	76 GPD	1.82	138 GPD	1.65	228 GPD
2022 Full-Time Residential Usage	14	69 GPD	1.59	110 GPD	1.65	182 GPD
2023 Full-Time Residential Usage	16	72 GPD	1.54	111 GPD	1.65	183 GPD
Maximum Values	16	76 GPD	1.82	138 GPD	1.65	228 GPD

Potlatch Beach Water System Capacity Analysis

Table 4A: Potlatch 165 PZ Residential Water Consumption					
Description	ERUs	ADD_{ERU}¹	ADD	MDD_{ERU}²	MDD
Full-Time Residential Usage in 2023	4	76 GPD	304 GPD	350 GPD	1,400 GPD
Part-Time Residential Usage in 2023	6	76 GPD	456 GPD	350 GPD	2,100 GPD
Vacant Residential	1	76 GPD	76 GPD	350 GPD	350 GPD
Summary Values	11		836 GPD		3,850 GPD
Notes: 1. ADD_{ERU} - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water 2. MDD_{ERU} - Calculated Maximum Day Demand per ERU.					

Table 4B: Peak Hour Demand Calculations for 165 PZ	
$PHD = (MDD_{ERU} \div 1440) \times (C \times N + F) + 18$	(Equation 3-1)
$PHD = (350 \div 1440) \times (3.0 \times 11 + 0) + 18$	PHD = 26 gpm
$ES = (PHD + Q_{BP} - Q_{RO}) \times 150 \text{ minutes}$	(Equation 7-1) Modified
$ES = (26 + 35 - 15) \times 150$	Calculated ES = 6,900 gal
The level in the storage tank has dropped to 8.0 ft under normal operating conditions.	Observed ES = 10,300 gal

Potlatch Beach Water System Capacity Analysis

Table 4C: Potlatch 260 PZ Residential Water Consumption					
Description	ERUs	ADD_{ERU}¹	ADD	MDD_{ERU}²	MDD
Full-Time Residential Usage in 2023	16	76 GPD	1,216 GPD	350 GPD	5,600 GPD
Part-Time Residential Usage in 2023	6	76 GPD	456 GPD	350 GPD	2,100 GPD
Future Residential	1	76 GPD	76 GPD	350 GPD	350 GPD
Summary Values	23		1,748 GPD		8,050 GPD
Notes: 1. ADD_{ERU} - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water 2. MDD_{ERU} - Calculated Maximum Day Demand per ERU.					

Table 4D: Peak Hour Demand Calculations for 260 PZ	
$\text{PHD} = (\text{MDD}_{\text{ERU}} \div 1440) \times (C \times N + F) + 18$	(Equation 3-1)
$\text{PHD} = (350 \div 1440) \times (3.0 \times 23 + 0) + 18$	PHD = 35 gpm

Potlatch Beach Water System Capacity Analysis

Table 5: Potlatch Beach Storage Tank Volumes				
Description	Volume	Water Depth	Elevation	Minimum Pressure
Overflow			170.4 feet	
Freeboard		0.2 feet	170.2 feet	
Operating Storage	1,400 gal	0.6 feet	169.6 feet	
Equalizing Storage ¹	10,300 gal	4.4 feet	165.2 feet	25 psi
Standby Storage ²	18,800 gal	8.0 feet	157.2 feet	
Fire Suppression Storage ³	N/A			
Dead Storage	0 gal	0.0 feet	157.2 feet	
Summary Values	30,500 gal	13.2 feet		
Notes: 1. Provide 30 psi minimum residual hydraulic head throughout the distribution system during PHD. 2. Provide 20 psi of residual hydraulic head throughout the distribution system during FF + MDD. 3. Water system is not capable of providing fire suppression.				

Potlatch Beach Water System Capacity Analysis

Table 6: Potlatch Beach ERU Capacity Summary			
Water System Specific Operating Basis			
Average Day Demand [ADD]	76 GPD/ERU		
Maximum Day Demand [MDD]	350 GPD/ERU		
Peak Hour Demand [PHD]	26 gpm		
Service Classification	Maximum Day Demand	Number of Connections	ERUs
Single-Family Residential	3,850 GPD	34 Connections	34 ERUs
Multi-Family Residential			
Non-Residential			
Industrial			
Commercial			
Governmental			
Agricultural			
Recreational			
Other			
Distribution System Leakage [DSL]	198 GPD	N/A	1 ERUs
Other (identify)			
Totals	4,048 GPD	34 Connections	35 ERUs
Maximum Service Capacity as ERUs			
Water System Components	Capacity for Each Component	Total ERU Capacity for Each Component	Excess ERU Capacity for Each Component
RO Treatment @ 18 hrs/day	16,200 GPD	46 ERUs	11 ERUs
Equalizing Storage	10,300 gal	90 ERUs	55 ERUs
Standby Storage (350 gal per ERU)	18,800 gal	53 ERUs	18 ERUs
Booster Pump MDD @ 18 hrs/day	37,800 GPD	108 ERUs	85 ERUs
Booster Pump PHD (273 PZ)	35 gpm	31 ERUs	8 ERUs
Transmission (Max MDD)	> 35 gpm	Determined to be Adequate	
Water System Capacity for Potlatch Beach		46 ERUs	11 ERUs

ROCKPORT WATER SYSTEM

Water System Physical Capacity Analysis

April 23, 2024



OVERVIEW

1. Physical Capacity Analysis Objectives

Every water system should be designed and operated to provide safe and reliable water service to its customers. For existing systems, physical and legal limitations should periodically be evaluated and understood. As new customers request water service, the Skagit Public Utility District must know if there is adequate capacity for new connections and the impact of each new connection. This capacity analysis evaluates the physical and legal limitations to determine the system's capacity. This analysis follows procedures outlined in the Water System Design Manual¹.

2. Water System Background and Description

Rockport State Park (PWS ID#SP740H) is a Group A, Transient, Non-Community water system. Washington State Parks (WSP) acquired the property from the DNR in 1961 and developed a campground. The campground was closed in May 2007 due to tree-fall danger. Activity at the park is limited to weekend day use. The water system consists of a single well, concrete storage tank, and distribution system. The PUD manages the Rockport State Park water system as the Satellite Management Agency.

The PUD-owned Rockport water system (PWS ID#736006) is in eastern Skagit County, along State Route 20, in the Rockport community. The water system was constructed through LUD #11. Properties within the LUD include residential, commercial, governmental, and recreational customers and land uses.

Each existing customer has a meter, which is read every two months for billing purposes.

3. Water System Facilities

The PUD's Rockport water system shares the well (AET032) and WSP storage tank. The Rockport water facility inventory and design parameters are presented in **Table 1**. The single well provides an estimated 40 gallons per minute [gpm]. Two tanks provide storage for the water system. The WSP tank is rectangular with a nominal volume of 20,000 gallons, and the PUD-owned tank is a cylindrical concrete tank with a nominal volume of 60,000 gallons. Both tanks provide operating, equalizing, standby, and fire suppression storage.

The water distribution system consists of 6-inch and 8-inch C-900 PVC pipes. There are six fire hydrants distributed throughout the service area to provide a minimum of 500 gpm fire flow.

¹ *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

FACILITY ANALYSIS

1. Meter Classification and Evaluation

Services within this water system are classified as either residential, commercial, governmental, and recreational customers. There are 63 residential services two commercial services, three governmental services and one recreational service. For this analysis, an equivalent residential unit [ERU] is defined as one full-time residential unit.

Metered water consumption was collected and evaluated for three years from 2018 through 2020. This evaluation revealed several part-time or vacant homes and vacant commercial establishments. Part-time residential services may represent families that spend a portion of the year in a second home in a different local (e.g., snowbirds). Vacant homes may have minimal or no water usage throughout the year due to no residency at all. These homes may be abandoned or changing ownership. Only full-time residential units were considered when determining average day demand [ADD]. Vacant commercial establishments are indicative of the seasonal economy of this rural community.

During this analysis period, growth was approximately one service per year. A summary of the services and their classification is presented in **Table 2**. Three (3) meter boxes were installed during the initial water system installation but have not yet been activated by the property owners. These potential future services could be activated and need to have sufficient capacity available.

2. Water Consumption

The ADD was determined for all full-time residential units for each of the three evaluation years. Also, the maximum month average day demand [MMADD] was determined, equating to the July-August billing period. The MMADD was used to estimate the maximum day demand [MDD] based on the DOH recommended peaking factor of 1.65 for systems serving fewer than 1,000 people².

Table 3A summarizes the total full-time residential meters, ADD, MMADD, and MDD for the three evaluation years. The year with the maximum consumption and maximum MMADD was 2018. The estimated MDD of 271 GPD/ERU is lower than the DOH minimum of 350 GPD/ERU. Therefore, the DOH minimum of 350 GPD/ERU was used for the facility evaluation.

Table 3B summarizes the ADD, MMADD, and MDD for the active commercial meters for the three evaluation years. The year with the maximum consumption and maximum MMADD was 2018. The estimated MDD of 4,665 GPD was used for estimates ERUs for the commercial services. Therefore, an average commercial service is equal to 13.3 ERUs.

Table 3C summarizes the ADD, MMADD, and MDD for the active government meters for the three evaluation years. The year with the maximum consumption and maximum MMADD was 2018. The estimated MDD of 884 GPD was used for estimates ERUs for the commercial services. Therefore, an average commercial service is equal to 2.5 ERUs.

² Section 3.4.1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

Table 3D summarizes the ADD, MMADD, and MDD for the active recreational meters for the three evaluation years. The year with the maximum consumption and maximum MMADD was 2020. The estimated MDD of 9,522 GPD was used for estimates ERUs for the commercial services. Therefore, an average commercial service is equal to 27.2 ERUs.

The PHD calculation is based on the number of ERUs and the MDD³. For the existing services, the PHD is calculated to be 89 gpm.

The consumption data indicated an estimated eight part-time, 15 vacant, two new residential, and three future residential services within the water system. The MDD of 350 GPD/ERU was used to estimate the potential consumption by assuming the part-time, vacant, and new services could all potentially become full-time residential users. The potential water consumption for all residential services is summarized in **Table 4A**.

3. Source Capacity

In conjunction with any storage designed to accommodate daily or more extended peak use periods, total daily source capacity shall be sufficient to provide a reliable water supply equal to or exceeding the MDD⁴.

a. Water Rights

The Rockport well has a certificated water right (G1-25509C). The instantaneous withdrawal [Qi] limit is 95 gpm, and the annual withdrawal [Qa] limit is 19.0 acre-feet.

b. Well Pump Capacity

The Rockport water system is supplied by a single well [AET032]. The existing well pump has a capacity of 40 gpm and is controlled by floats within the storage tank.

c. Treatment Capacity

The source water is treated to remove iron and manganese using an ion-exchange treatment system manufactured by ATEC Systems Associates. The treatment system is designed to accommodate the installed well pump capacity.

The water system is also disinfected using sodium hypochlorite, which is injected through a metering pump.

4. Storage Capacity

The storage elements, including operating, equalizing, standby, and fire suppression storage, shall have sufficient volumes to provide a reliable water supply and minimum pressure to meet normal and abnormal demand and operating conditions⁵. The storage volume calculations for existing and full buildout conditions are presented in **Table 5** and **Table 6**.

a. Operating Storage

The PUD's Engineering and Operations Department sets operating storage [OS] volume to use the well pump efficiently. The setpoints have a span of 1.0 feet and an approximate operating storage volume

³ Equation 3-1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁴ WAC 264-290-222(4)

⁵ WAC 246-290-235

of 2,000 gallons in the WSP Tank and 4,000 gallons in the PUD tank. The minimum well pump runtime is around 50 minutes but is typically longer due to the operation of the electronic valve, which operates for a minimum of 100 minutes.

b. Equalizing Storage

Equalizing storage [ES] volume is based on the difference between the peak hourly demand [PHD] and the well pump capacity, but for the Rockport water system, it is the difference between the PHD and the electronic valve flow rate. The PHD is calculated to be 89 gpm at full buildout. For the Rockport water system, the electronic valve flow rate is set to the well pump capacity. Therefore, there is no need for ES in the WSP tank. The ES in the PUD tank is calculated from the difference between the electronic valve flow rate and the PHD, based on Equation 7-1⁶, which is determined to be 7,400 gallons. In addition, the ES must provide a minimum of 30 psi at all services.

Existing ES can also be estimated using the PUD's SCADA database. Under normal operating conditions, the bottom of the ES will be the lowest level reached in the storage tank. A review of SCADA records indicates that the water level in the tank does not drop below the bottom of the operating storage. This observation supports the belief that actual PHD is less than the electronic valve flow rate of 40 gpm.

c. Standby Storage

Standby storage [SB] volume allows the water system to maintain adequate pressure in an adverse operating condition, such as a firefighting situation or a mechanical, electrical, or water quality issue. Skagit PUD policy provides 300 gallons per ERU as standby storage. However, DOH recommends SB volume equal the MDD⁷, which is 350 gpd/ERU for the Marblemount water system. Therefore, the more stringent requirement is used in this capacity analysis, specifically 350 gpd/ERU.

d. Fire Suppression Storage

The local Fire Marshal establishes fire suppression storage [FSS] volume. Minimum recommended FSS is listed in the Coordinated Water System Plan and equates to 15,000 gallons (500 gpm for 30 minutes)⁸.

The Skagit County Fire Marshal allows the FS to be nested with the SB storage within the storage tank.

e. Dead Storage

All storage must be capable of providing a minimum of 20 psi to all services and fire hydrants at the bottom of the fire suppression storage. The Rockport water system's minimum elevation to be served is a meter at an elevation of 353 feet. This meter elevation requires a water level in the storage tank of 399 feet, which is below the tank's base elevation of 453 feet. Therefore, there is no dead storage in the tank.

5. Distribution System Capacity

The distribution system consists of 6-in and 8-in C-900 PVC pipelines transporting water to the Rockport community. The distribution system is characterized by looped pipelines. The six fire hydrants are

⁶ Equation 7-1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁷ Section 7.1.1.3, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁸ Table 4-3, *Skagit County Coordinated Water System Plan*, Economic and Engineering Services, Inc., July 2000.

connected to the looped 6-in distribution pipelines, providing adequate flow to meet the 500 gpm fire flow requirement stated in the Coordinated Water System Plan⁹.

6. Distribution System Leakage

The distribution system leakage [DSL] for the Rockport water system was determined to have a 3-year average (2021-2023) of 1,094 GPD. This leakage rate equals approximately 3 ERUs, as shown in **Table 7**.

WATER SYSTEM CAPACITY CONCLUSIONS

The purpose of a Water System Physical Capacity Analysis is to inform managers when and which water system facilities need to be addressed to maintain capacity and support community growth. The water system operating data and physical capacity analysis are presented in **Table 7**.

As mentioned previously, the Rockport water system is comprised of residential, commercial, governmental, and recreational development. The total number of existing connections is 72, which equates to 109 ERUs. If all existing connections are active, the estimated MDD is 38,171 GPD. When the DSL is added, the total existing water system represents 112 ERUs.

1. Maximum Service Capacity

The following assessment of the maximum service capacity is based on the water system's physical and legal limitations. This information is summarized in **Table 7**.

- The existing well pump can supply 48,000 gallons during a 20 hour per day pumping cycle. This volume is sufficient to supply 137 ERUs, 25 ERUs more than the existing water system currently serving.
- The ATEC treatment system is sized to treat the water supplied by the well pump. Therefore, the existing treatment system has sufficient capacity to accommodate 137 ERUs, 25 ERUs more than what the existing water system is currently serving. Furthermore, the sodium hypochlorite metering pump capacity exceeds the well pump capacity.
- No ES is required in the WSP tank since the electronic valve flow rate is set to the well pump capacity. The minimum ES in the PUD tank is 7,400 gallons to serve the existing full buildout conditions.
- The ES and SB storage volumes were balanced to meet the requirements for the maximum number of services. Both the ES and SB can serve 158 ERUs, which is 46 ERUs more than what the existing water system is currently serving.
- It is estimated that the lowest elevation of the equalizing/operating storage will provide a minimum of 48 psi to the highest service within the distribution system. Furthermore, the lowest elevation of the standby storage will provide a minimum of 43 psi at the highest service and service within the distribution system.

⁹ Table 4-3, *Skagit County Coordinated Water System Plan*, Economic and Engineering Services, Inc., July 2000.

- The PUD has determined that the existing distribution pipeline network is sufficient to provide a firefighting flow of 500 gpm under MDD conditions.
- The instantaneous water right limitation of 95 gpm is sufficient to supply 391 ERUs, 279 ERUs more than what the existing water system is currently serving.
- The annual water right limitation of 19.0 acre-feet is sufficient to supply 122 ERUs, 10 ERUs more than what the existing water system is currently serving.

Based on the operating conditions, physical water system components, and water rights limitations, the Rockport water system has sufficient capacity to serve 122 ERUs. The limiting component is water rights annual withdrawal. Considering the water system is currently serving 112 ERUs, the excess capacity is 10 ERUs.

Rockport Water System Capacity Analysis

Table 1: Rockport Facility Inventory		
Storage Tank	State Tank	District Tank
Base Elevation	624.0 feet	453.0 feet
Spill Elevation	634.0 feet	467.0 feet
Water Elevation in Tank	9.5 feet	13.5 feet
Side Wall Depth	10 feet	15 feet
Tank Diameter		26 feet
Tank Radius		13 feet
Tank Unit Volume	2,000 gal/ft	4,000 gal/ft
Nominal Tank Volume	20,000 gal	53,600 gal
Well Pump		
Pump Discharge	40 gpm	40 gpm
"Pump On" Setpoint	8.5 feet	12.5 feet
"Pump Off" Setpoint	9.5 feet	13.5 feet
Hydraulic Constraints		
Highest Meter Elevation		353 feet
Highest Fire Hydrant Elevation		315 feet
Tank Hydraulic Grade Line		468 feet
Demand Constraints (DOH Water System Design Manual Table 3-1)		
Number of ERUs [N]		101 - 250
C factor		2.0
F factor		75 gpm

Table 2: Rockport Meter Services			
Meter Classification	2018	2019	2020
Full-Time Residential	37	34	38
Part-Time Residential	9	12	8
Vacant Residential	14	14	15
New Residential	0	1	2
Total Meters	60	61	63
Well Production	454,100 CF	406,200 CF	565,200 CF

Rockport Water System Capacity Analysis

Table 3A: Rockport Residential Water Consumption Analysis						
Description	Total Meters	ADD _{ERU} ¹	MMADD:ADD Ratio	MMADD _{ERU} ²	MDD:MMADD Ratio ³	MDD _{ERU} ³
2018 Full-Time Residential Usage	37	139 GPD	1.18	164 GPD	1.65	271 GPD
2019 Full-Time Residential Usage	34	124 GPD	1.24	154 GPD	1.65	254 GPD
2020 Full-Time Residential Usage	38	113 GPD	1.37	155 GPD	1.65	256 GPD
Maximum Values	38	139 GPD	1.18	164 GPD	1.65	271 GPD
Minimum MDD allowed by DOH						350 GPD
Notes: 1. ADD_{ERU} - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage. 2. MMADD_{ERU} - Maximum Month's Average Day Demand per ERU based on the peak bi-monthly period, which includes July and August. 3. MDD:MMADD Ratio - Recommended ratio by the Department of Health for water systems serving fewer the 1,000 people.						

Table 3B: Rockport Commercial Water Consumption Analysis						
Description	Total Meters	ADD	MMADD:ADD Ratio	MMADD	MDD:MMADD Ratio	MDD
2018 Commercial Usage	2	912 GPD	3.10	2,827 GPD	1.65	4,665 GPD
2019 Commercial Usage	2	428 GPD	2.58	1,104 GPD	1.65	1,822 GPD
2020 Commercial Usage	2	344 GPD	1.46	502 GPD	1.65	828 GPD
Maximum Values	2	912 GPD	3.10	2,827 GPD	1.65	4,665 GPD

Rockport Water System Capacity Analysis

Table 3C: Rockport Government Water Consumption Analysis						
Description	Total Meters	ADD	MMADD:ADD Ratio	MMADD	MDD:MMADD Ratio	MDD
2018 Government Usage	3	217 GPD	2.47	536 GPD	1.65	884 GPD
2019 Government Usage	3	86 GPD	1.95	168 GPD	1.65	277 GPD
2020 Government Usage	3	66 GPD	3.00	198 GPD	1.65	327 GPD
Maximum Values	3	217 GPD	2.47	536 GPD	1.65	884 GPD

Table 3D: Rockport Recreational Water Consumption Analysis						
Description	Total Meters	ADD	MMADD:ADD Ratio	MMADD	MDD:MMADD Ratio	MDD
2018 Recreation Usage	1	2,020 GPD	1.70	3,434 GPD	1.65	5,666 GPD
2019 Recreation Usage	1	1,703 GPD	1.86	3,168 GPD	1.65	5,227 GPD
2020 Recreation Usage	1	2,076 GPD	2.78	5,771 GPD	1.65	9,522 GPD
Maximum Values	1	2,076 GPD	2.78	5,771 GPD	1.65	9,522 GPD

Rockport Water System Capacity Analysis

Table 4: Rockport Residential Water Consumption					
Description	ERUs	ADD _{ERU} ¹	ADD	MDD _{ERU} ²	MDD
Full-Time Residential Units	38	139 GPD	5,282 GPD	350 GPD	13,300 GPD
Part-Time Residential Units	8	139 GPD	1,112 GPD	350 GPD	2,800 GPD
Vacant Residential Units	15	139 GPD	2,085 GPD	350 GPD	5,250 GPD
New Residential Units	2	139 GPD	278 GPD	350 GPD	700 GPD
Future Residential Units	3	139 GPD	417 GPD	350 GPD	1,050 GPD
Summary Values	66		9,174 GPD		23,100 GPD
Notes: ADD_{ERU} - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage. MDD_{ERU} - Calculated Maximum Day Demand per ERU.					

Calculations	
$PHD = (MDD_{ERU} \div 1440) \times (C \times N + F) + 18$	(Equation 3-1)
$PHD = (350 \div 1440) \times (2.0 \times 109 + 75) + 18$	PHD = 89 gpm

Rockport Water System Capacity Analysis

Table 5: Rockport State Park Storage Tank Volumes

Description	Volume	Water Depth	Elevation	Minimum Pressure
Overflow			634.0 feet	
Freeboard		0.5 feet	633.5 feet	
Operating Storage	2,000 gal	1.0 feet	632.5 feet	
Equalizing Storage	0 gal	0.0 feet	632.5 feet	
Standby Storage	17,000 gal	8.5 feet	624.0 feet	
Fire Suppression Storage	0 gal	0.0 feet	624.0 feet	
Dead Storage	0 gal	0.0 feet	624.0 feet	
Summary Values	19,000 gal	10.0 feet		

Table 6: District's Rockport Storage Tank Volumes

Description	Volume	Water Depth	Elevation	Minimum Pressure
Overflow			467.0 feet	
Freeboard		0.5 feet	466.5 feet	
Operating Storage	4,000 gal	1.0 feet	465.5 feet	
Equalizing Storage ¹	7,400 gal	1.9 feet	463.6 feet	48 psi
Standby Storage ²	42,100 gal	10.6 feet	453.0 feet	43 psi
Fire Suppression Storage ³	15,000 gal	Nested	453.0 feet	
Dead Storage	0 gal	0.0 feet	453.0 feet	
Summary Values	53,500 gal	14.0 feet		

Notes:

1. Provide 30 psi minimum residual hydraulic head throughout the distribution system during PHD.
2. Provide 20 psi of residual hydraulic head throughout the distribution system during FF + MDD.
3. Consolidated (i.e., nested) in the Standby Storage component.

Rockport Water System Capacity Analysis

Table 7: Rockport ERU Capacity Summary			
Water System Specific Operating Basis			
Average Day Demand [ADD]	139 GPD/ERU		
Maximum Day Demand [MDD]	350 GPD/ERU		
Peak Hour Demand [PHD]	89 gpm		
Service Classification	Maximum Day Demand	Number of Connections	ERUs
Single-Family Residential	23,100 GPD	66 Connections	66 ERUs
Multi-Family Residential			
Non-Residential			
Industrial			
Commercial	4,665 GPD	2 Connections	13 ERUs
Governmental	884 GPD	3 Connections	3 ERUs
Agricultural			
Recreational	9,522 GPD	1 Connection	27 ERUs
Other			
Distribution System Leakage [DSL]	1,094 GPD	N/A	3 ERUs
Other (identify)			
Totals	39,265 GPD	72 Connections	112 ERUs
Maximum Service Capacity as ERUs and Gallons per Day			
Water System Components	Capacity for Each Component	Total ERU Capacity for Each Component	Excess ERU Capacity for Each Component
Source (Well AET032) @ 20 hr/day	48,000 GPD	137 ERUs	25 ERUs
Treatment	48,000 GPD	137 ERUs	25 ERUs
Equalizing Storage	11,000 gal	159 ERUs	47 ERUs
Standby Storage (350 gal per ERU)	55,500 gal	158 ERUs	46 ERUs
Transmission (FF + Max MDD)	> 527 gpm	Determined to be Adequate	
Water Rights Instantaneous	95 gpm	391 ERUs	279 ERUs
Water Rights Annual	19.0 acre-feet	122 ERUs	10 ERUs
Water System Capacity for Rockport		122 ERUs	10 ERUs

SKAGIT VIEW VILLAGE WATER SYSTEM

Water System Physical Capacity Analysis

April 23, 2024



OVERVIEW

1. Physical Capacity Analysis Objectives

Every water system should be designed and operated to provide safe and reliable water service to its customers. For existing systems, physical and legal limitations should periodically be evaluated and understood. As new customers request water service, the Skagit Public Utility District must know if there is adequate capacity for new connections and the impact of each new connection. This capacity analysis evaluates the physical and legal limitations to determine the system's capacity. This analysis follows procedures outlined in the Water System Design Manual¹.

2. Water System Background and Description

The Skagit View Village water system (PWS ID#968795) is in central Skagit County, south of the Skagit River, near the town of Concrete. The water system was constructed through LUD #27. Properties within the LUD include the Plat of Wilderness Village² and the Plat of Pressentin Ranch³. The Local Utility District consisted of 128 residential lots and 3 parcels owned by the community associations.

Each existing customer has a meter, which is read every two months for billing purposes.

3. Water System Facilities

The Skagit View Village water facility inventory and design parameters are presented in **Table 1**. The single well provides an estimated 62 gallons per minute [gpm]. A cylindrical concrete tank has a nominal volume of 157,000 gallons, providing operating, equalizing, standby, and fire suppression storage.

The water distribution system consists of 4-inch, 6-inch, 8-inch, and 12-inch ductile iron pipes. There are 12 fire hydrants distributed throughout the service area to provide a minimum of 500 gpm fire flow.

FACILITY ANALYSIS

1. Meter Classification and Evaluation

Most services within the two developments are classified as residential customers. Therefore, an equivalent residential unit [ERU] is defined as one full-time residential unit.

¹ *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

² Plat of Wilderness Village, AF#788213, July 1973

³ Plat of Pressentin Ranch, Plat No. PL00-0853, AF#200408090115, 2004.

There are three parcels owned by the community associations that represent 2 meters. Only one of these meters is installed and it is currently not active.

Metered water consumption was collected and evaluated for three years from 2018 through 2020. This evaluation revealed several part-time or vacant homes. Part-time services may represent families that spend a portion of the year in a second home in a different local (e.g., snowbirds). Vacant homes may have minimal or no water usage throughout the year due to no residency at all. These homes may be abandoned or changing ownership. Only full-time residential units were considered when determining average day demand [ADD].

During this period, it was noted that growth was approximately five services per year. A summary of the services and their classification is presented in **Table 2**. Fourteen (14) meter boxes were installed during the initial water system installation but have not yet been activated by the property owners. These potential future services could be activated and need to have sufficient capacity available.

2. Water Consumption

The ADD was determined for all full-time residential units for each of the three evaluation years. Also, the maximum month average day demand [MMADD] was determined, equating to the July-August billing period. The MMADD was used to estimate the maximum day demand [MDD] based on the DOH recommended peaking factor of 1.65 for systems serving fewer than 1,000 people⁴.

Table 3 summarizes the total full-time meters, ADD, MMADD, and MDD for the three evaluation years. The year with the maximum consumption appears to be 2019, but the maximum MMADD was in 2020. The estimated MDD of 340 gpd/ERU is slightly lower than the DOH minimum of 350 gpd/ERU. Therefore, the DOH minimum of 350 gpd/ERU was used for the facility evaluation.

The PHD is a calculation based on the number of ERUs and the MDD⁵. For the existing services, the PHD is calculated to be 78 gpm.

The consumption data indicated an estimated five part-time, four vacant, and seven new residential services within the water system. The MDD of 350 gpd/ERU was used to estimate the potential consumption by assuming the part-time, vacant, and new services could all potentially become full-time residential users. In addition, the community clubhouses, which are not currently used, could reflect consumption equal to 1 ERU each. The potential water consumption for all services is summarized in **Table 4**.

⁴ Section 3.4.1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁵ Equation 3-1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

3. Source Capacity

In conjunction with any storage designed to accommodate daily or longer peak use periods, total daily source capacity shall be sufficient to provide a reliable water supply equal to or exceeding the MDD⁶.

a. Water Rights

The Skagit View Village well has a water right permit (G1-20763P). The instantaneous withdrawal [Qi] limit is 200 gpm, and the annual withdrawal [Qa] limit is 38.4 acre-feet. A limitation in the permit states that 80 gpm of Qi is subject to Chapter 173-503 WAC, so a withdrawal limit of 120 gpm was used for this analysis.

b. Well Pump Capacity

The Skagit View Village water system is supplied by a single well [AET015]. The existing well pump has a capacity of 62 gpm and is controlled by floats within the storage tank.

c. Treatment Capacity

The source water is treated to remove iron and manganese using an ion-exchange treatment system manufactured by ATEC Systems Associates. The treatment system is designed to accommodate the installed well pump capacity.

The water system is also disinfected using sodium hypochlorite, which is injected through a metering pump.

4. Storage Capacity

The storage elements, including operating, equalizing, standby, and fire suppression storage, shall have sufficient volumes to provide a reliable water supply and minimum pressure to meet normal and abnormal demand and operating conditions⁷. The storage volume calculations for existing and full buildout conditions are presented in **Table 5** and **Table 6**.

a. Operating Storage

The PUD's operations set operating storage [OS] volume to operate the well pump efficiently. The setpoints have a span of 7.5 feet and an approximate operating storage volume of 29,800 gallons. The minimum well pump runtime is around 481 minutes.

b. Equalizing Storage

Equalizing storage [ES] volume is based on the peak hourly demand [PHD], which itself is calculated based on the MDD. The PHD will increase as new connections are added to the water system. Therefore, the ES requirement will also increase as the development moves toward full buildout. The ES must provide a minimum of 30 psi at all services.

Existing ES can also be estimated using the PUD's SCADA database. Under normal operating conditions, the bottom of the ES will be the lowest level reached in the storage tank. A review of SCADA records indicates that the water level in the tank does not drop below the bottom of the

⁶ WAC 264-290-222(4)

⁷ WAC 246-290-235

operating storage. This observation indicates that the actual PHD is less than the well pump capacity of 62 gpm. However, it is assumed that the PHD is 78 gpm based on Equation 3-1⁸.

By rearranging the equation for calculating the PHD, we can calculate the required ES at any point in time based on the number of ERUs, well pump flow rate, and MDD. This calculation is provided in Equation 4-5⁹.

c. Standby Storage

Standby storage [SB] volume allows the water system to maintain adequate pressure in an adverse operating condition, such as a firefighting situation or a mechanical, electrical, or water quality issue. Skagit PUD policy provides 300 gallons ERU as standby storage. However, DOH recommends SB volume equal the MDD¹⁰, which is 350 gpd/ERU for the Marblemount water system. Therefore, the more stringent requirement is used in this capacity analysis, specifically 350 gpd/ERU.

d. Fire Suppression Storage

The local Fire Marshal establishes fire suppression storage [FSS] volume. Minimum recommended FSS is listed in the Coordinated Water System Plan and equates to 15,000 gallons (500 gpm for 30 minutes)¹¹.

The Skagit County Fire Marshal allows the FS to be nested with the SB storage within the storage tank.

e. Dead Storage

All storage must be capable of providing a minimum of 20 psi to all services and fire hydrants at the bottom of the fire suppression storage. The Skagit View Village water system's minimum elevation to be served is a meter at an elevation of 195 feet. This meter elevation requires a water level in the storage tank of 264 feet, which is below the tank's base elevation of 277.3 feet. Therefore, there is no dead storage in the tank.

5. Distribution System Capacity

The distribution system consists of 8-in and 12-in ductile iron pipelines transporting water to the service area. Within the service area are looped 4-in and 6-in pipelines that distribute the water to the services. The fire hydrants are primarily connected to the 6-in and 8-in distribution pipelines, but the looping characteristics of the network provide adequate flow to meet the 500 gpm fire flow requirement stated in the Coordinated Water System Plan¹².

6. Distribution System Leakage

The distribution system leakage [DSL] for the Skagit View Village water system was determined to have a 3-year average (2021-2023) of 276 gpd. This leakage rate equals approximately 1 ERU, as shown in **Table 7**.

⁸ Equation 3-1, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

⁹ Equation 4-5, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

¹⁰ Section 7.1.1.3, *Water System Design Manual*, Washington State Department of Health, DOH Publication 331-123, June 2020.

¹¹ Table 4-3, *Skagit County Coordinated Water System Plan*, Economic and Engineering Services, Inc., July 2000.

¹² Table 4-3, *Skagit County Coordinated Water System Plan*, Economic and Engineering Services, Inc., July 2000.

WATER SYSTEM CAPACITY CONCLUSIONS

The purpose of a Water System Physical Capacity Analysis is to inform managers when and which water system facilities need to be addressed to maintain capacity and support community growth. The water system operating data and physical capacity analysis are presented in **Table 7**.

As mentioned previously, the Skagit View Village water system is comprised of mostly single-family residential units with the addition of two community associated parcels. The total number of existing connections is 89, which equates to 89 ERUs. If all existing connections are active, the estimated MDD is 30,800 gpd. When the DSL and the community clubhouses are added, the total existing water system represents 90 ERUs.

1. Maximum Service Capacity

The following assessment of the maximum service capacity is based on the water system's physical and legal limitations. This information is summarized in **Table 7**.

- The existing well pump can supply 74,400 gallons during a 20 hour per day pumping cycle. This volume is sufficient to supply 213 ERUs, 123 ERUs more than what the existing water system is currently serving.
- The ATEC treatment system is sized to treat the water supplied by the well pump. Therefore, the existing treatment system has sufficient capacity to accommodate 213 ERUs, 123 ERUs more than what the existing water system is currently serving. Furthermore, the sodium hypochlorite metering pump capacity exceeds the well pump capacity.
- The ES and SB storage volumes were balanced to meet the requirements for the maximum number of services. Both the ES and SB can serve 291 ERUs, which is 201 ERUs more than what the existing water system is currently serving.
- It is estimated that the lowest elevation of the equalizing storage will provide a minimum of 47 psi to the highest service within the distribution system. Furthermore, the lowest elevation of the standby storage will provide a minimum of 36 psi at the highest fire hydrant and service within the distribution system.
- The PUD has determined that the existing distribution pipeline network is sufficient to provide a firefighting flow of 500 gpm under MDD conditions.
- Assumed for this analysis, the instantaneous water right limitation of 120 gpm is sufficient to supply 494 ERUs, 404 ERUs more than what the existing water system is currently serving.
- The annual water right limitation of 38.4 acre-feet is sufficient to supply 213 ERUs, 123 ERUs more than what the existing water system is currently serving.

Based on the operating conditions, physical water system components, and water rights limitations, the Rockport water system has sufficient capacity to serve 213 ERUs. The limiting component is water rights annual withdrawal. Considering the water system is currently serving 90 ERUs, the excess capacity is 123 ERUs.

Skagit View Village Water System Capacity Analysis

Table 1: Skagit View Facility Inventory	
Storage Tank	Data
Base Elevation	277.3 feet
Spill Elevation	316.8 feet
Water Elevation in Tank	39.5 feet
Side Wall Depth	40 feet
Tank Diameter	26 feet
Tank Radius	13 feet
Tank Unit Volume	4,000 gal/ft
Nominal Tank Volume	157,000 gal
Well Pump	
Pump Discharge	62 gpm
"Pump On" Setpoint	31.0 feet
"Pump Off" Setpoint	38.5 feet
Hydraulic Constraints	
Highest Meter Elevation	195 feet
Highest Fire Hydrant Elevation	192 feet
Tank Hydraulic Grade Line	316 feet
Demand Constraints (DOH Water System Design Manual Table 3-1)	
Number of ERUs [N]	51 - 100
C factor	2.5
F factor	25 gpm

Table 2: Skagit View Village Meter Services			
Meter Classification	2018	2019	2020
Full-Time Residential	65	66	72
Part-Time Residential	6	7	5
Vacant Residential	4	5	4
New Residential	3	6	7
Non-Residential (Clubhouse)	1	1	1
Total Meters	79	85	89
Well Production	531,300 CF	550,800 CF	503,400 CF

Skagit View Village Water System Capacity Analysis

Description	Total Meters	ADD_{ERU}¹	MMADD:ADD Ratio	MMADD_{ERU}²	MDD:MMADD Ratio³	MDD_{ERU}³
2018 Full-Time Residential Usage	65	148 GPD	1.39	206 GPD	1.65	340 GPD
2019 Full-Time Residential Usage	65	153 GPD	1.32	202 GPD	1.65	333 GPD
2020 Full-Time Residential Usage	72	138 GPD	1.49	206 GPD	1.65	340 GPD
Maximum Values	72	153 GPD	1.35	206 GPD	1.65	340 GPD
Minimum MDD allowed by DOH						350 GPD

Notes:

- ADD_{ERU}** - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage.
- MMADD_{ERU}** - Maximum Month's Average Day Demand per ERU based on the peak bi-monthly period, which includes July and August.
- MDD:MMADD Ratio** - Recommended ratio by the Department of Health for water systems serving fewer the 1,000 people.

Skagit View Village Water System Capacity Analysis

Table 4: Skagit View Village Residential Water Consumption					
Description	ERUs	ADD _{ERU} ¹	ADD	MDD _{ERU} ²	MDD
Full-Time Residential Units	72	153 GPD	11,016 GPD	350 GPD	25,200 GPD
Part-Time Residential Units	5	153 GPD	765 GPD	350 GPD	1,750 GPD
Vacant Residential Units	3	153 GPD	459 GPD	350 GPD	1,050 GPD
New Residential Units	7	153 GPD	1,071 GPD	350 GPD	2,450 GPD
Development Clubhouses ³	2	153 GPD	306 GPD	350 GPD	700 GPD
Maximum Values	89		13,617 GPD		31,150 GPD
Notes: ADD_{ERU} - Average Day Demand per Equivalent Residential Unit [ERU] based on annual water meter usage. MDD_{ERU} - Calculated Maximum Day Demand per ERU. - Each clubhouse uses less than 1 ERU, but assume it is equal to 1 ERU.					

Calculations	
$PHD = (MDD_{ERU} \div 1440) \times (C \times N + F) + 18$	
$PHD = (361 \div 1440) \times (2.5 \times 89 + 25) + 18$	PHD = 78 gpm
$N = 1/C[1440/MDD_{ERU} \times (ES/150 + Q_s - 18) - F]$	
$N = 1/2.5[1440/350 \times (2,400/150 + 62 - 18) - 25]$	N = 89 ERUs

Skagit View Village Water System Capacity Analysis

Table 5: Skagit View Village Storage Tank Volumes

Description	Volume	Depth	Elevation	Minimum Pressure
Overflow			316.8 feet	
Freeboard		1.0 feet	315.8 feet	
Operating Storage	29,800 gal	7.5 feet	308.3 feet	
Equalizing Storage ¹	2,400 gal	0.6 feet	307.7 feet	49 psi
Standby Storage ²	120,700 gal	30.4 feet	277.3 feet	36 psi
Fire Suppression Storage ³	15,000 gal	Nested	277.3 feet	
Dead Storage	0 gal	0.0 feet	277.3 feet	
Maximum Values	152,900 gal	39.5 feet		

Notes:

1. Provide 30 psi minimum residual hydraulic head throughout the distribution system during PHD.
2. Provide 20 psi of residual hydraulic head throughout the distribution system during FF + MDD.
3. Consolidated (i.e., nested) in the Standby Storage component.

Table 6: Future Skagit View Village Storage Tank Volumes

Description	Volume	Depth	Elevation	Minimum Pressure
Overflow			316.8 feet	
Freeboard		1.0 feet	315.8 feet	
Operating Storage	29,800 gal	7.5 feet	308.3 feet	
Equalizing Storage ¹	20,800 gal	5.2 feet	303.1 feet	47 psi
Standby Storage ²	102,500 gal	25.8 feet	277.3 feet	36 psi
Fire Suppression Storage ³	15,000 gal	Nested	277.3 feet	
Dead Storage	0 gal	0.0 feet	277.3 feet	
Maximum Values	153,100 gal	39.5 feet		

Notes:

1. Expanded to accommodate potential future connections.
2. Reduced to accommodate increased ES.
3. Consolidated (i.e., nested) in the Standby Storage component.

Skagit View Village Water System Capacity Analysis

Table 7: Skagit View Village ERU Capacity Summary			
Water System Specific Operating Basis			
Average Day Demand [ADD]	153 GPD/ERU		
Maximum Day Demand [MDD]	350 GPD/ERU		
Peak Hour Demand [PHD]	78 gpm		
Service Classification	Maximum Day Demand	Number of Connections	ERUs
Single-Family Residential	30,450 GPD	87 Connections	87 ERUs
Multi-Family Residential			
Non-Residential			
Industrial			
Commercial			
Governmental			
Agricultural			
Recreational			
Other (Clubhouse)	350 GPD	1 Connection	2 ERU
Distribution System Leakage [DSL]	276 GPD	N/A	1 ERU
Other (identify)			
Total Existing ERUs (Residential + Non-Residential + DSL + Other)			90 ERUs
Maximum Service Capacity as ERUs and Gallons per Day			
Water System Components	Capacity for Each Component	Total ERU Capacity for Each Component	Excess ERU Capacity for Each Component
Source (Well AET015) @ 20 hr./day	74,400 GPD	213 ERUs	123 ERUs
Treatment	74,400 GPD	213 ERUs	123 ERUs
Equalizing Storage	20,800 gal	291 ERUs	201 ERUs
Standby Storage (350 gal per ERU)	102,500 gal	292 ERUs	202 ERUs
Transmission (FF + Max MDD)	> 552 gpm	Determined to be Adequate	
Water Rights Instantaneous	120 gpm	494 ERUs	404 ERUs
Water Rights Annual	38.4 acre-feet	213 ERUs	123 ERUs
Water System Capacity for Skagit View Village		213 ERUs	123 ERUs

Appendix F: Skagit PUD Online Documents

Policy on Governance and Management

<https://www.skagitpud.org/home/showpublisheddocument/136/638119102030770000>

Strategic Plan 2023-2027

<https://www.skagitpud.org/home/showpublisheddocument/84/638301968191570000>

Water Policy Manual

<https://www.skagitpud.org/about-us/governance/water-policy-manual>

1996 Memorandum of Agreement

<https://www.skagitpud.org/home/showpublisheddocument/202/638121405540030000>

2010 Skagit River Watershed Control Program

<https://www.skagitpud.org/home/showpublisheddocument/200/638121397526070000>

2021 Cultus Mountain Watershed Management Plan

<https://www.skagitpud.org/home/showpublisheddocument/2698/638412515621430000>

Financial Reports

<https://www.skagitpud.org/about-us/financials>

Consumer Confidence Reports

<https://skagitpud.prod.govaccess.org/Home/Components/News/News/48/>

Interlocal Agreements

<https://www.skagitpud.org/about-us/interlocal-agreements>

Cross-Connection Control Policy Manual

<https://skagitpud.prod.govaccess.org/home/showpublisheddocument/38/638271017531870000>

Standard General Notes

<https://skagitpud.prod.govaccess.org/home/showpublisheddocument/76/638116622636270000>

Design Standards

<https://skagitpud.prod.govaccess.org/home/showpublisheddocument/78/638116623428300000>

