BEFORE THE WASHINGTON

UTILITIES & TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION,

Complainant,

v.

CASCADIA WATER, LLC

Respondent.

DOCKET UW-240151

CROSS-EXAMINATION EXHIBIT OF MATTHEW J. ROWELL AND CULLEY J. LEHMAN ON BEHALF OF THE WASHINGTON STATE OFFICE OF THE ATTORNEY GENERAL PUBLIC COUNSEL UNIT

EXHIBIT MJR-CJL-__X

Cascadia Discovery Response to WCAW DR No. 4, Attachment 2 [Excerpt], "*2021CombinedIslandWSP*"

February 6, 2025

CASCADIA WATER ™
UNIFIED WATER SYSTEM PLAN

PO Box 549
Freeland, WA 98249

August 2021

Owner:
Cascadia Water
PO Box 549
Freeland, WA 98249

System Contact:
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Phone: (360) 578-7044

For Submittal to:
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Northwest Drinking Water Operations
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CERTIFICATE OF ENGINEER
Water System Plan for Cascadia Water

The technical material and data contained within this report has been prepared by or under the direction of the following registered professional engineer(s), licensed in accordance with the laws of the State of Washington to practice in the State of Washington.

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QUICK REFERENCE PROJECT INFORMATION

General Project Information

Group A Water Systems

Water System Name	W&B Waterworks 1
System ID #	46670-3
Active Connections/Approved Connections	456 / 471

Water System Name	Sea View Water, LLC
System ID #	77148-Y
Active Connections/Approved Connections	190 / 210

Water System Name	Beachcomber H_2O Co.
System ID #	04979-V
Active Connections/Approved Connections	128 / 159

Water System Name	Cal Waterworks
System ID #	31040-6
Active Connections/Approved Connections	100 / 121

Water System Name	TEL Company 1
System ID #	03099-5
Active Connections/Approved Connections	73 / 99

Water System Name	TEL Company 3
System ID #	93945-8
Active Connections/Approved Connections	24 / 50

Water System Name	TEL Company 4
System ID #	76976-N
Active Connections/Approved Connections	29 / 44

Group B Water Systems

Water System Name	TEL Company 5
System ID #	15533-A
Active Connections/Approved Connections	8 / 14

Water System Name	TEL Company 6
System ID #	38451-X
Active Connections/Approved Connections	7 / 7

Water System Name	TEL Company 10
System ID #	62060-V
Active Connections/Approved Connections	9 / 9

Water System Name	TEL Company 11
System ID #	00678-P
Active Connections/Approved Connections	8 / 9

Water System Name	Mutiny Bay Waterworks
System ID #	06371-3
Active Connections/Approved Connections	2 / 6

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ABBREVIATIONS

AC	Asbestos Cement
AF	Auditor's File
ADD	Average Day Demand
App	Approved
APWA	American Public Works Association
AWWA	American Water Works Association
BMPs	Best Management Practices
CCC	Cross-Connection Control
CCS	Cross-Connection Control Specialist
CFR	Code of Federal Regulations
CIP	Capital Improvement Plan
CWSP	Coordinated Water System Plan
CWSSA	Critical Water Supply Service Area
DOH	Washington State Department of Health
DOE	Washington State Department of Ecology
DS	Dead Storage
DSL	Distribution System Leakage
ERU	Equivalent Residential Unit
ES	Equalizing Storage
Ex	Existing
FSS	Fire Suppression Storage
gpm	Gallons Per Minute
GMA	Growth Management Act
GWI	Ground Water Under the Influence of Surface Water
HGL	Hydraulic Grade Line
ID	Identification
ICC	Island County Code
LID	Local Improvement District
LLC	Limited Liability Corporation
MCL	Maximum Contaminant Level
MDD	Maximum Day Demand
MMADD	Maximum Month Average Day Demand
mg/L	Milligram per liter
NFPA	National Fire Protection Association
No.	Number
OS	Operational Storage
PE	Professional Engineer
PHD	Peak Hour Demand
ppb	Part Per Billion
psi	Pounds Per Square Inch
PVC	Polyvinyl Chloride
OFM	State Office of Financial Management
RCW	Revised Code of Washington
SAL	State Advisory Level
SBS	Standby Storage
SDWA	Safe Drinking Water Act
SOC	Synthetic Organic Chemical
SWI	Seawater Intrusion
UTC	Utilities and Transportation Commission

UBI	Unified Business Identifier
VOC	Volatile Organic Chemical
WAC	Washington Administrative Code
WDM	Water Distribution Manager
WDS	Water Distribution Specialist
WFI	Water Facilities Inventory
WHPA	Wellhead Protection Area
WQMS	Water Quality Monitoring Schedule
WRIA	Water Resources Inventory Area
WSP	Water System Plan
WTPO	Water Treatment Plant Operator
WSDOT	Washington State Department of Transportation
WUE	Water Use Efficiency

1 DESCRIPTION OF WATER SYSTEM

This Water System Plan has been developed to cover the combined individual systems owned and managed by Cascadia Water in Island County, Washington. This includes the seven (7) group A water systems and five (5) group B water systems outlined below.

1.1 Ownership and Management

The following sections summarize each water system's name and ID number, type of ownership, management structure, certified operator, engineer, and WFI.

1.1.1 *Water System Name and ID Number*

Group A Water Systems

Water System Name	W&B Waterworks 1
System ID #	46670-3
UBI Number	600-221-687

Water System Name	Sea View Water, LLC
System ID #	77148-Y
UBI Number	602-490-405

Water System Name	Beachcomber H_2O Co.
System ID #	04979-V
UBI Number	600-221-687

Water System Name	Cal Waterworks
System ID #	31040-6
UBI Number	600-221-687

Water System Name	TEL Company 1
System ID #	03099-5
UBI Number	600-221-687

Water System Name	TEL Company 3
System ID #	93945-8
UBI Number	600-221-687

Water System Name	TEL Company 4
System ID #	76976-N
UBI Number	600-221-687

Group B Water Systems

Water System Name	TEL Company 5
System ID #	15533-A
UBI Number	600-221-687

Water System Name	TEL Company 6
System ID #	38451-X
UBI Number	600-221-687

Water System Name	TEL Company 10
System ID #	62060-V
UBI Number	600-221-687

Water System Name	TEL Company 11
System ID #	00678-P
UBI Number	600-221-687

Water System Name	Mutiny Bay Waterworks
System ID #	06371-3
UBI Number	

1.1.2 *Type of Ownership and Management*

Cascadia Water, LLC (Cascadia) is a private investor-owned utility company consisting of water systems located on Whidbey Island and the Olympic Peninsula in the State of Washington. Cascadia is a wholly owned subsidiary of NW Natural Water Company, LLC.

1.1.3 *Management Structure*

Cascadia Water, LLC was formed on November 2, 2018 through the acquisition and combination of Lehman Enterprises, Inc. and Sea View Water, LLC on Whidbey Island. Cascadia is a for-profit corporation incorporated in the State of Washington. As noted above, Cascadia is a wholly owned subsidiary of NW Natural Water Co. Because Cascadia owns multiple water systems with a combined number of customers greater than 100, its systems are regulated by the Washington Utilities and Transportation Commission.

1.1.4 *Water System Operations*

Daily operation and compliance for all water systems is handled internally by Cascadia. These services include meter reading, billing, and general accounting. Contact information for Cascadia is provided below:

Cascadia Water
Mailing Address:
PO Box 549, Freeland, WA 98249
Physical Address:
18181 SR 525, Freeland WA 98249
Phone: (360) 331.7388
E-Mail: info@cascadiawater.com

1.1.5 *Cascadia Water Staff*

Name	Position	Certification
Justin Palfreyman	President	-
Culley Lehman	General Manager	WDM 2
Adam Lehman	System Operator	CCS, WDM 3, WDS, WTPO 1
Jeff Breilein	System Operator	-
Dale Metzger	System Operator	-
Andrew Mathis	Field Technician	WDM-IT 1*
Amy Lehman	Office Manager	-
Stephani Long	Office Administrator	-

* Approved to test for certification

1.1.6 *Engineer*

Water system engineer of record:

DCG, Inc.
Jeff Tasoff, P.E., Principal/Civil Engineer
Additional Principals: Erik Davido, P.E. and Quin Clements, P.E.
P.O. Box 1132
Freeland, WA 98249
Phone: (360) 331-4131 x203
Email: jeff@dcgengr.com or quin@dcgengr.com

The Water System's engineer performs the following services:

1. Identifying source, storage, or water distribution system deficiencies and recommending improvements
2. Analyzing system operation and identifying improvements to ensure robustness or increased efficiencies
3. Analyzing water usage, determining system capacity, and analyzing compliance with water right limitations
4. Integrated planning for system growth and future expansion
5. Develop system standards to ensure high level of service for the served customers and consistency design and installation across the various water systems
6. Preparing detailed construction documents to implement the system improvements
7. Assisting in permit approval, project plan approval, and contractor approval and oversight
8. Inspecting and testing the quality of the contractor's work and making necessary reports and recommendations to the water system, and
9. Completing Department of Health (DOH) certification documents to the extent that the engineer has direct knowledge of the as-built facilities.

1.1.7 *Water System Financial Accounting*

Cascadia provides billing services and maintains customer records, including water usage for all water systems. Cascadia also maintains each of the systems' financial records, estimates future budgetary needs, and proposes changes to the water rate structure. Cascadia is a private water company operating within Washington state that has 100 or more connections and/or charges more than $557 a year per customer, it is regulated by the Washington Utilities and Transportation Commission (UTC). The UTC

reviews the budgets, expenses, and profits of a water system to govern utility rates for customers. The latest tariff results from the UTC and system budgets are presented in Chapter 9 and APPENDIX P.

1.1.8 *Water Facility Inventory Form*

A copy of the current Water Facilities Inventory (WFI) for each system is attached in APPENDIX E.

1.2 System History and Background

The following subsections provide a brief history of the water systems.

1.2.1 *History of Water System Development and Growth*

1.2.1.1 W&B Waterworks 1

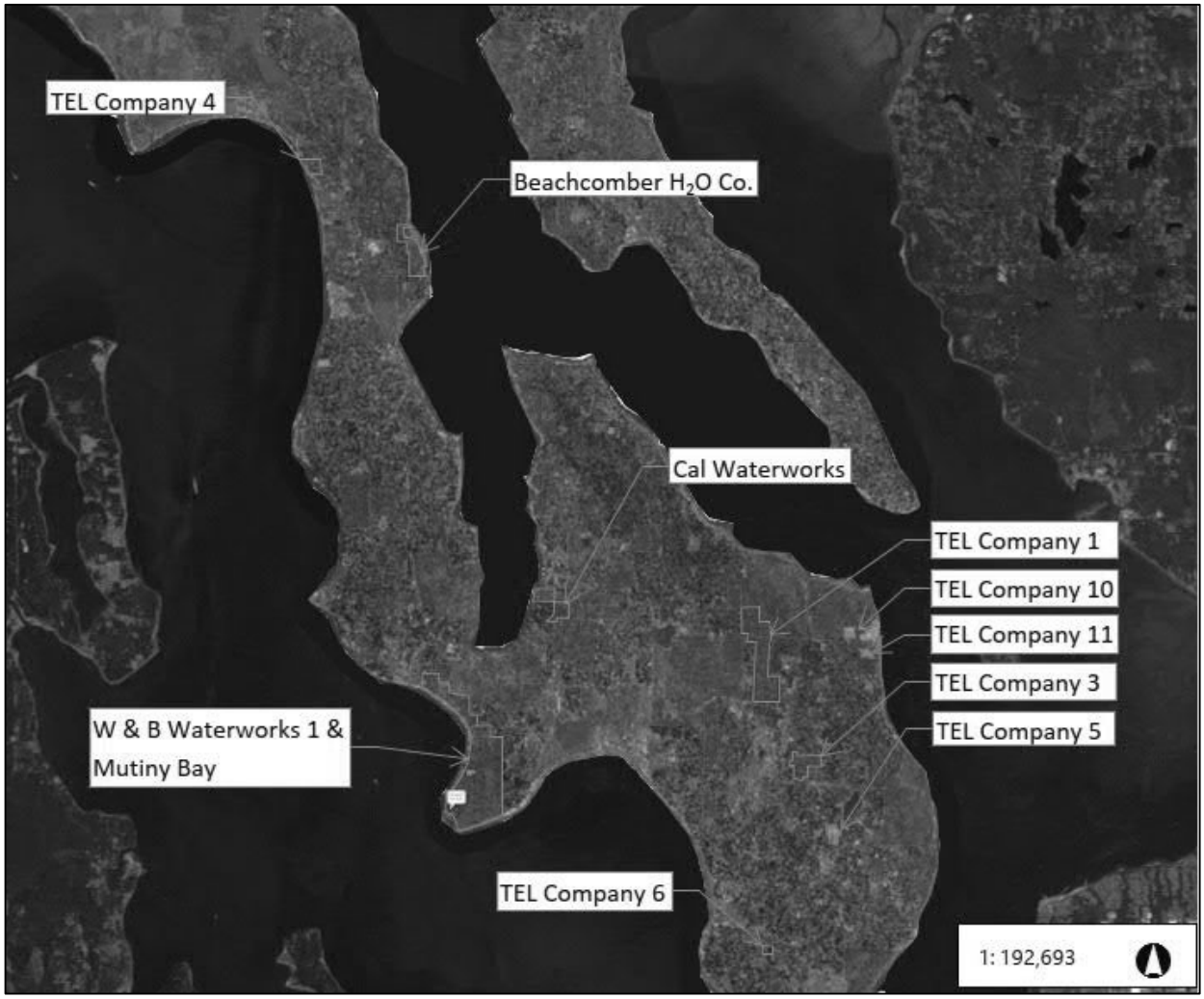
W&B Waterworks 1 is located in Freeland, WA in the southern portion of Whidbey Island and serves the area near Mutiny Bay adjacent to Mutiny Bay Road and Wahl Road. The location of the service area is shown in Figure 1-1. The existing served connections are currently single-family residential units.

The water system was installed in 1975 and the initial system components included a single groundwater well (Well #1) capable of producing 50-gallons per minute (gpm) and a 50,000-gallon storage reservoir. In 1977 a second well (Well #2) capable of producing 75-gpm was installed. Two additional wells (Well #3 and Well #4) and an additional 50,000-gallon reservoir were installed in 1984. Well #3 and Well #4 produce 75-gpm and 30-gpm respectively. The system's service area increased in 1986 when it extended to serve the Mutiny Bay Group B system. 6-and 8-inch PVC distribution piping was installed to support this expansion. From the years 1987 through 1991 the service area extended to include the Wahl Farm, additional parcels in the Mutiny Bay area, and the Stanley Short Plat.

The system's four wells are listed as a well field and have a total combined capacity of 275-gpm according to the system WFI, with the instantaneous withdrawal rate limited to 225-gpm by the Department of Ecology (DOE) water right. Most of the system's connections are gravity fed. Based upon the reservoir elevation the hydraulic Grade Line (HGL) of the gravity distribution system is 265-feet. Pressure reducing valves (PRV) are installed at three places along the distribution system to decrease pressure in the lower elevation of the service area. One PRV is installed at the southern end of Wahl Road near Ebb Tide Lane. This PRV is set to create a 155-feet HGL along Ebb Tide Lane. The second PRV is installed on the east end of Mutiny Lane. This PRV is set to create a 155-feet HGL along Robinson Road. The third PRV is installed at the intersection of Lancaster Road and Woodard Avenue. This PRV is set to create a 200-feet HGL along Mutiny Bay Road. There are eleven (11) connections near the reservoirs that are served by a small, pressured distribution system. The pressure system includes two booster pumps and a pressure tank. As of 2019, the service area has a total of 732 lots existing within the service area. Currently, the system has an installed capacity of 500 ERUs, an approved capacity of 478 connections (limited due to SWI concerns) and is serving 456 existing connections.

W&B Waterworks is in the process of integrating Del Bay (ID No. 18575K) into their water system. In order to integrate Del Bay into W&B, Cascadia Water will replace all of the watermains and service connections in the Del Bay service area while also connecting in the Del Bay well (DOE Tag: AGA812) and incorporating the Del Bay water right (G1-23683) into the system as a whole.

Figure 1-1 Central/South Whidbey Island Service Areas



1.2.1.2 Beachcomber H_2O Co.

Beachcomber H_2O Co. water system is located along North Bluff Road just north of Greenbank, WA in the central portion of Whidbey Island. The location of the service area is shown in Figure 1-1. The existing service connections for this system are currently single-family residential units.

The system was developed with a single well (Well #1) in 1963. The well was supported by a pumphouse with two 120-gallon pressure tanks. In 1983 an additional well was installed (Well #2). Upon installation each well's capacity was listed at 66-gpm.

In 1986 a 55,000-gallon storage reservoir was added, and the distribution system was divided into a 'pressure zone' and a 'gravity zone'. The 'pressure zone' is supported by two booster pumps. The gravity system has a separate outlet distribution pipe from the reservoir and is interconnected to the pressurized system via a pressure reducing valve. Currently, the system has an approved capacity of 159 connections, and 128 existing connections.

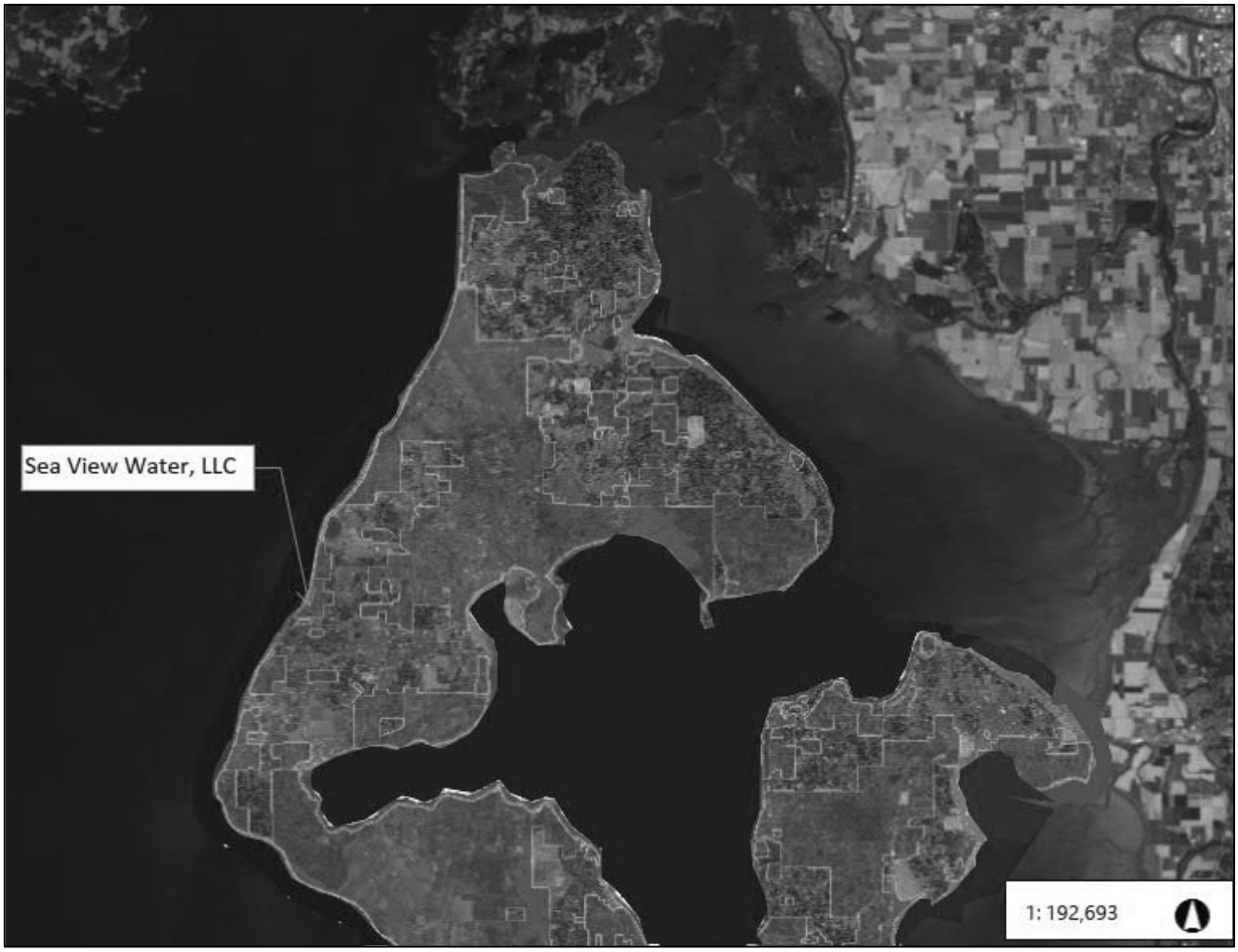
1.2.1.3 Sea View Water, LLC

Sea View Water, LLC is located near Fort Nugent and West Beach Road west of Oak Harbor, WA in the northern portion of Whidbey Island. The location of the service area is shown in Figure 1-2. The existing service connections for this system are currently single-family residential units.

The system was installed in the late 1960's and initially had a single well (Well #1) drilled in 1968 at the corner of Island View Drive and Island View Lane. In 1969, portions of the distribution system were constructed, and the first service was connected. At that time, the system was composed of submersible well pump and pressure tank connected directly to the distribution system. In 1973 a pumphouse (Pumphouse #1) and 30,000-gallon storage reservoir were constructed on the well site parcel. Two submersible booster pumps were installed within the reservoir in 1974 to pressurize the water from the reservoir. A second well (Well #2) was installed on this parcel in 1974. Combined, well #1 and #2 currently provide 100-gpm and are considered a secondary source for the system.

In 1978, a third well (Well #3) was installed along the north side of Fort Nugent Road near West Beach Road. Well #3 is currently the primary water source for the system and had capacity of 80-gpm when originally installed. Well #3 has experienced continued problems due to iron bacteria which is addressed in Chapter 8. In 1979, an additional pumphouse (Pumphouse #2) and 30,000-gallon storage reservoir (with a submersible booster pump) were installed. A treatment system for the removal of iron and manganese was installed within Pumphouse #2 in 1985. Throughout the years the distribution system has been expanded. As of 2019, there are 190 existing connections and 210 connections are approved by the DOH.

Figure 1-2 North/Central Whidbey Island Service Areas



1.2.1.4 Cal Waterworks

Cal Waterworks is located off of East Harbor Road north of Freeland, WA in the southern portion of Whidbey Island. The location of the service area is shown in Figure 1-1. The majority of the existing service connections for this system are currently single-family residential units. This system does have a single wholesale connection as the current water source for the Goss Lakeridge Acres Association (PWS ID # 220700). The water system was first formed under the name Harbor Sands Distribution System (Harbor Sands) in 1963. The name of the system was changed from Harbor Sands to W&B Waterworks #2 and then changed to its current name of CAL Waterworks by 1996. Harbor Sands installed their first well (Well #1) in 1963 and the system was originally approved to serve 105 lots. In 1972, a 40,000-gallon concrete storage reservoir and booster pump station were installed. A second well (Well #2) was installed in 1985 and was approved as a secondary source in 1996. Both wells have an approved capacity of 45-gpm.

In 1993, the service area was expanded to include a total of 146 lots. The original booster pump station was built in 1996 and replaced in 2010. In 2014, a connection was made to the Goss Lakeridge Acres Association to provide wholesale water from CAL Waterworks through an agreement between the two

systems. A metered connection exists at the connection which is the primary water source for the Goss Lakeridge Acres Association. Goss Lakeridge Acres Association and their management agency currently own, operate, and maintain the system components on their side of the meter. This includes the booster pump station and the associated distribution system components.

1.2.1.5 TEL Company 1

TEL Company 1 is located along Coles Road south of Langley, WA in the southern portion of Whidbey Island. The location of the service area is shown in Figure 1-1. The system currently provides water for single family residential units.

TEL Company 1 was originally created as three separate water systems known as TEL Company 1, TEL Company 8, and TEL Company 9. The systems were combined into a single water system under the TEL Company 1 Water System. As a result, the system has multiple wells, pump houses, storage reservoirs, and interconnected distribution systems.

Well #1 was installed in 1979 for the original TEL Company 1 Water System. Well #8 was installed in 1979 at the original TEL Company 8 Water System and Well #9 was installed in 1985 for the original TEL Company 9 Water System. Well #1 has a listed capacity of 40-gpm, while Well #8 and Well #9 have a listed capacity of 20-gpm. The distribution system is supported primarily by the 50,000-gallon Inglewood reservoir, four booster pumps, and five 315-gallon vertical hydropneumatic pressure tanks located at the site of the original TEL 1 Water System site on Inglewood Drive. A 6,000-gallon reservoir and a small booster pump station with three (3) 81-gallon bladder pressure tanks at the former TEL 9 site provides additional system capacity. Well 8 is not used on regular basis due to elevated levels of arsenic detected in water samples obtained from this source. As of 2019 there are currently 73 existing connections, and the system is approved for a total of 99 connections by the DOH.

1.2.1.6 TEL Company 3

TEL Company 3 is located near the intersection of Goldfinch Road and Windfall Road near of Clinton, WA in the southern portion of Whidbey Island. The location of the service area is shown in Figure 1-1. The system currently provides water for single family residential units.

The system was first called the WB Waterworks #3 and was renamed to TEL Company 3. The system was established in 1975 with a single well (Well #1) capable of producing 50-gpm, a 23,000-gallon reservoir, and booster pump station. The booster pump station has three (3) booster pumps and three (3) pressure tanks to pressurize the distribution system. A second well (Well #2) was installed in 1984. As of 2019, the current well capacities are listed as 27-gpm each. The system has 24 existing connections, and a total of 50 connections are approved by the DOH.

1.2.1.7 TEL Company 4

TEL Company 4 is located along the Seacrest Lane south of Coupeville, WA in the central portion of Whidbey Island. The location of the service area is shown in Figure 1-1. The system currently provides water for single-family residential units.

The system is served by a single well drilled in 1973. The system was originally installed to support a plat of 19 lots. In 1986 the lots inside of the service area were further divided to create a total of 39 lots. The source capacity was originally noted at 26-gpm. The source capacity was increased in 1987 with the addition of another 25-gpm pump in the well. The wells discharge directly into the distribution system that also fills the 30,000 -gallon storage reservoir. The system is pressurized by gravity from the

elevation of the reservoir. Currently, the system has 29 existing connections, and 44 connections approved by the DOH.

1.2.1.8 TEL Company 5

TEL Company 5 is located along Cliffordsville Road a cross street of Deer Lake Road, west of Clinton, WA in the southern portion of Whidbey Island. The location of the service area is shown in Figure 1-1. The system currently provides water for single family residential units.

The system is served by a single well that has a listed capacity of 37-gpm, a booster pump station composed of two (2) booster pumps, two (2) 119-gallon hydropneumatic tanks, and two (2) 2,745-gallon storage reservoirs. The system is a Group B water system with eight (8) active service connections. The system has approval for a total of fourteen (14) residential service connections by the DOH.

1.2.1.9 TEL Company 6

TEL Company 6 is located along Bailey Road south of Clinton, WA. This is near the southern terminus of Whidbey Island. The location of the service area is shown in Figure 1-1. The system currently provides water for single-family residential units.

The system is served by a single well that has a capacity of 20-gpm and hydropneumatic tank totaling 250-gallons. The system is a Group B water system serving seven (7) active residential connections. As of 2019, the system has seven (7) connections approved by the DOH.

1.2.1.10 TEL Company 10

TEL Company 10 is located near the Camelot Court and Welcome Road area of Langley, WA in the southern portion of Whidbey Island. The location of the service area is shown in Figure 1-1. The system currently provides water for single family residential units.

The system is served by a single well installed in 1978 with a listed capacity of 10 gpm, a booster pump station, and a storage reservoir of 2,745 gallons. The system is a Group B water system serving nine (9) active residential connections. As of 2019, the system has nine (9) connections approved by the DOH.

1.2.1.11 TEL Company 11

TEL Company 11 is located near the Wilkinson Trace and Meander Lane area of Langley, WA in the southern portion of Whidbey Island. The location of the service area is shown in Figure 1-1. The system currently provides water for single family residential units.

The system is served by a single well installed in 1989 with a listed capacity of 16-gpm, booster pump station, and a storage reservoir of 2,745 gallons. The system is a Group B water system serving eight (8) active connections. As of 2019, the system has nine (9) connections approved by the DOH.

1.2.1.12 Mutiny Bay Waterworks

Mutiny Bay Waterworks is located in the Mutiny Bay and Wahl Road area in the southern portion of Whidbey Island. The system is considered part of the W&B Waterworks 1 service area. The location of the service area is shown in Figure 1-1. The system currently provides water for single family residential units.

The system is served by a single well that has a listed capacity of 12-gpm, booster pump station, and a storage reservoir of 650 gallons. The system is a Group B water system with two active connections. As

of 2020, the system has six connections approved by the DOH. Mutiny Bay Waterworks is in the process of being incorporated into W&B Waterworks 1.

1.2.2 *Geography and Topography*

The water systems included in this plan are located on Whidbey Island which is one of the two islands that make up Island County. The current service area maps are included in APPENDIX C. Half of the water systems share a border with either a Group A or Group B water system. The water systems with adjacent purveyors are discussed in section 1.2.4.

Geography throughout Whidbey Island consists of rolling hills, coastal bluffs, and pastureland. Some service areas are located on the coastline where the shoreline provides a natural boundary. Many areas located on the coastline have steep slopes down to sea level. Other areas have rolling topography molded by glacial action.

1.2.3 *Climate*

The climate in the northern and southern portion of Whidbey Island is similar. Both have cool, dry summers and mild, cloudy, and rainy winters. The rainfall in the central and northern portions of Whidbey Island is affected by the rain shadow effect of the Olympic Mountains and is the driest area of the Island. The average annual rainfall in Oak Harbor and in the central portion of Whidbey Island is about 20 inches and increases to 35 inches in the southern portion of the Island.

Temperatures are fairly consistent throughout Whidbey Island. Average low and high temperatures throughout the Island are 42.3°F and 56.3°F respectively. Temperature is modulated by the proximity to the waters of Puget Sound. Climate data is from the US Climate Data website.

Severe winter storms generally are prevented from moving into the Whidbey Island area by the Olympic Mountains.

1.2.4 *Neighboring/Adjacent Water Systems*

Table 1-1, below indicates some of the larger adjacent water systems to the water system covered under this plan. This table shows the water system owned by Cascadia and the adjacent water system(s).

Table 1-1 System and Adjacent Purveyor

System	Adjacent Water Systems	PWS ID	Number of Active Connections[1]
Sea View Water, LLC	Whidbey West Water Systems	36314	175
W&B Waterworks 1	Freeland Water and Sewer District Mutiny Sands Club	26450 57900	533 65
Cal Waterworks	Ridgeview Estates Community Assn. Maple Glen Community Association	26791 51115	37 56
TEL Company 1	South Whidbey Schools Water System City of Langley	10811 45950	5 993
TEL Company 3	Whidbey Institute	05235	5
TEL Company 10	City of Langley	45950	993

[1] Number of Active Connections based on Island County's GeoMap Data

1.2.5 *Ordinances/Bylaws*

The Ordinances/Bylaws affecting the design standards and fire flow requirements of the water systems are discussed in Section 3.1.

1.3 Inventory of Existing Facilities

Detailed system inventories for each Group A system are provided in APPENDIX O and Chapter 3 discusses each system's existing facilities in greater detail.

1.4 Related Plans

This plan is consistent with the following related plans:

- Island County Comprehensive Plan
  https://www.islandcountywa.gov/Planning/Pages/compplan.aspx
- Island County Ground Water Quality Assessment and Monitoring Program
  https://www.islandcountywa.gov/HealthEnv/Hydrogeology/OtherData/IC_Landfills_Rpt.pdf
- Island County Water Resource Management Plan
  https://www.islandcountywa.gov/Health/DNR/Documents/Final%20Plan.pdf
- Island County Coordinated Water System Plan (CWSP)
  https://www.islandcountywa.gov/Health/EH/Documents/1990_CWSP.pdf
- Island County Groundwater Management Program
  https://www.islandcountywa.gov/HealthEnv/Hydrogeology/WebStuff/1992%20IC_GWMP.pdf
- UTC Tariff for Cascadia Water (Issued Date: March 14, 2019)

1.5 Existing Service Area Characteristics

General descriptions of the various service areas' characteristics and existing zoning/land use are discussed in the following sections.

1.5.1 *Description of Service Area*

Each water system's service area is located on Whidbey Island. Sea View Water, LLC is located in North Whidbey Island while the remaining systems are located in Central or South Whidbey Island. The service area locations are shown on the maps in Figure 1-1 and Figure 1-2 They are also included in APPENDIX C. The service areas comply with the service area agreements recorded with Island County attached in APPENDIX A.

1.5.2 *Existing Zoning and Land Use*

The existing service areas of the water system vary between "Rural Agriculture" (RA), "Rural Residential" (RR), "Rural Forest" (RF), and "Rural" (R) by Island County's Terminology. Each zoning category is defined by the Island County Municipal Code (ICC) Section 17.03. RA (ICC 17.03.090) is for development at densities of 1 dwelling unit per 10-acres. RR (ICC 17.03.070) density varies for various communities depending on when the subdivision or plat was created. Typically, RR is for development at densities of 2 dwelling unit per 1/2-acre. RF (ICC 17.03.110) is for development at densities of 1 dwelling unit per 10-acres. R (ICC 17.03.060) is for development at densities of 1 dwelling unit per 5-acres. The following lists the zoning of each water system:

- *R/RR/RA:* Sea View Water, LLC
- *R/RR*: Beachcomber H_2O Co

- *R:* TEL Company 4, TEL Company 1, TEL Company 10, TEL Company 11, TEL Company 3, TEL Company 5, TEL Company 6
- *R:* CAL Waterworks
- *R/RR/RA/RF: W&*B Waterworks 1 and Mutiny Bay

1.6 Service Area Boundaries

Currently there is documentation for a Service Area Agreement and/or Franchise Agreements for Sea View Water, CAL Waterworks, and TEL Company 1 which are provided in Appendix A. Cascadia Water is pursuing measures to locate, coordinate, and finalize Service Area Agreements with Island County over the next two years. Any service area changes will comply with the Island County Coordinated Water System Plan and DOH requirements.

Cascadia Water is working with Island County to establish a company-wide Franchise Agreement. This process is in the initial phases with plans to complete the process by the end of 2021. The Township, Range, and Sections covered by the Franchise Agreement with the associated water system are provided in Table 1-2.

Table 1-2 Section, Township, Range for Franchise Agreements

System	Township	Range	Section
W&B Waterworks 1	29 North	2 East	9
W&B Waterworks 1	29 North	2 East	15
W&B Waterworks 1	29 North	2 East	16
W&B Waterworks 1	29 North	2 East	22
W&B Waterworks 1	29 North	2 East	27
W&B Waterworks 1	29 North	2 East	28
Sea View Water, LLC	32 North	1 East	6
Sea View Water, LLC	32 North	1 East	7
Beachcombers H2O	30 North	2 East	4
Beachcombers H2O	31 North	2 East	33
CAL Waterworks	29 North	2 East	1
CAL Waterworks	29 North	2 East	2
TEL Company 3	29 North	3 East	22
TEL Company 4	31 North	2 East	30

1.7 Service Area Policies

Cascadia Water has been updating their service area policies since the transfer of ownership. The revised service area policies will be completed with the current tariff filing in 2021.

The service area policies applicable to each system are regulated by the Washington Utilities and Transportation (UTC) rules and regulations. Each water system provides service to property owners within its service area based on the system's capacity and ability to do so. Commitment to serve a parcel is made only upon an official "application for service", payment of applicable fees, and if sufficient system capacity exists to support additional connections at that time. If a main extension is necessary to provide service to a parcel, the parcel owner is responsible for the installation of the new main as identified in the Developer Extension agreement.

Cascadia will be proactive in securing additional connections, when possible, to ensure that adequate connections are available to support the anticipated growth within the given retail service area. They will also work to resolve conditions of a technical and non-technical nature (e.g., annexation procedures, water right issues, seawater intrusion concerns, local ordinances, etc.) that may affect a system's ability to provide new water service connections.

1.8 Satellite Management Agencies

Cascadia intends to own and operate their water systems and may hire local staff as needed to properly support the systems they own. At this time, Cascadia is not interested in the services of an outside Satellite Management Agency (SMA) and is in the process of registering as an SMA to be considered for ownership of additional water systems.

1.9 Conditions of Service

The State Municipal Water Law (RCW 43.20.260) provides water service conditions to be followed by water utilities of the State. Under this law, a municipal water supplier has "a duty to provide retail water service within its retail service area". Cascadia water systems will proactively manage their systems to develop the needed capacity to provide water service to the properties within their respective, current retail service area. However, federal, state and local agencies may provide limitations to the number of service connections available to each of the water systems or the applicant may be required to expand the system to properly support their proposed project. Conditions of service are detailed in the Application for Water Service documents provided by Cascadia to potential and current customers.

Cascadia is committed to providing retail water service to all properties within its retail service area in a timely and reasonable manner, consistent with applicable Cascadia resolutions and policies, the Municipal Water Law, Washington State Department of Health rules and regulations and, other applicable federal, state, and local laws. Pursuant to RCW 43.20.260, as a municipal water supplier as defined in RCW 90.03.015, Cascadia water systems have a duty to provide retail water service within its retail water service area if:

- Water service can be available in a timely and reasonable manner;
- The system has sufficient water rights and other sources of supply to provide the service;
- The system has sufficient capacity to serve the water in a safe and reliable manner as determined by DOH; and
- It is consistent with the requirements of applicable comprehensive plans or development regulations adopted under Chapter 36.70A RCW (GMA) or any other applicable comprehensive plan, land use plan, or development regulation adopted by a city, town, or county for the service area.

1.10 Consistency from Local Planning

Concurrent with the state submittal, the Water System Plan will be coordinated with Island County to ensure consistency with the Island County Comprehensive Plan.

1.11 Complaints

Complaints are promptly referred directly to Cascadia administrative personnel. Complaints will be forwarded to the appropriate staff for investigation and resolution. If necessary, staff will be dispatched to investigate the complaint. A log of complaints for each system is kept by Cascadia.

The system is also regulated by UTC. The UTC will forward request it receives on system owned by Cascadia and Cascadia will respond directly to the UTC on those items.

2 BASIC PLANNING DATA AND WATER DEMAND FORECASTING

Current and projected planning data/parameters are discussed in this Chapter. There are currently 1,034 active connections throughout the water systems owned and operated by Cascadia. The systems provide service mostly to single-family residential customers; therefore, this report will use the terms service connection and ERU interchangeably.

This report looks at three planning phases. Phase 1 is the six-year planning window from 2020 to 2026. Phase 2 is for the extended planning period of 2026 to 2040. Phase 3 covers the long-term planning from the year 2040 and beyond. This chapter and the next will provide data to support an increase in the number of service connections that can be supported by the water systems.

2.1 Current Water Use

The current population, service connections, water use, and Equivalent Residential Units (ERUs) are discussed in the following sections for each of the water systems on Whidbey Island owned and operated by Cascadia.

2.1.1 *Current Population*

The present populations of the communities served by each of the water systems in this report varies. The Water Facility Inventory (WFI) for each system included in APPENDIX E provides the number of connections along with an estimated number of full-time residents served.

2.1.2 *Current Service Connections*

Cascadia Water's customers are composed almost entirely of residential connections. In order to properly assess the various consumer types a water system compares non-residential and multifamily water demands to the typical amount of water a single-family residential unit uses. The term "equivalent residential unit" (ERU) is used as a basis for this comparison. For the purposes of this Water System Plan the term connections typically refers to ERUs.

Cascadia currently has a total of 1,000 connections associated with their Group A water systems consisting of 999 single-family residence connections and 1 non-residential connection. These systems are currently approved for a total of 1,137 combined connections. The number of connections and potential connections for each Group A system is specified in Table 2-1. The Group B water systems have a total of 34 connections; all of which are single-family residences. These systems are currently approved for a total of 45 combined connections. The number of connections and potential connections for each Group B system is specified in Table 2-2.

Table 2-1 Group A Systems Connections

Water System Name	W&B Waterworks 1
System ID #	46670-3
Active Connections/Approved Connections	456
Approved Connections	471
Potential Connections in Service Area*	700
Water System Name	Sea View Water, LLC
System ID #	77148-Y
Active Connections	190
Approved Connections	210
Number of Potential Connections*	210
Water System Name	Beachcomber H_2O Co.
System ID #	04979-V
Active Connections	128
Approved Connections	159
Number of Potential Connections*	260
Water System Name	CAL Waterworks **
System ID #	31040-6
Active Connections	100
Approved Connections	146
Number of Potential Connections*	157
Water System Name	TEL Company 1
System ID #	03099-5
Active Connections	73
Approved Connections	99
Number of Potential Connections*	99
Water System Name	TEL Company 3
System ID #	93945-8
Active Connections	24
Approved Connections	50
Number of Potential Connections*	50
Water System Name	TEL Company 4
System ID #	76976-N
Active Connections	29
Approved Connections	44
Number of Potential Connections*	44

* The number of potential connections is an estimate of the number of parcels available to be served in each retail service area.

** CAL Waterworks has 99 existing residential connections and 1 non-residential connection (Goss Lakeridge Acres intertie) consisting of 15 residential connections for a total of 114 ERUs. CAL is approved for 146 ERUs, representing full build out for both CAL and Goss Lakeridge Acres (120 ERUs for CAL and 26 ERUs for Goss Lakeridge Acres).

Table 2-2 Group B Systems Connections

Water System Name	TEL Company 5
System ID #	15533-A
Active Connections	8
Approved Connections	14
Water System Name	TEL Company 6
System ID #	38451-X
Active Connections	7
Approved Connections	7
Water System Name	TEL Company 10
System ID #	62060-V
Active Connections	9
Approved Connections	9
Water System Name	TEL Company 11
System ID #	00678-P
Active Connections	8
Approved Connections	9
Water System Name	Mutiny Bay Waterworks
System ID #	06371-3
Active Connections	2
Active Connections	6

All the service areas associated with each of the water systems are composed almost exclusively of residential connections. The only exception is a single non-residential connection in CAL Waterworks' system which serves as an intertie for the wholesale of water to 15 residential connections in the Goss Lakeridge Acres Association water system.

2.1.3 *Water Usage History*

Water usage data from 2016 to 2018 were analyzed to determine current design values for each system. The water use data for these periods is provided in APPENDIX L. The following sections summarize the production, water loss, ADD, ERUs, MDD, and PHD calculations.

2.1.3.1 Water Demand

Historical water consumption for the Group A and Group B systems has been summarized in Table 2-3 and Table 2-4 respectively. Monthly water usage per ERU for 2016 through August 2019 can be found in APPENDIX L. The highest seasonal demand occurs during the summer. Variations in consumption rates reflect changes in weather conditions, community activities, and habits of the population. Additionally, a fire will demand a large quantity of water beyond that of normal system demand. Knowledge of the timing and extent of these variations from average demand is necessary for proper planning that ensures an adequate water supply.

Monthly source meter readings were not available for analysis for the system from 2016 through 2019. For those years consumer meter readings were used. ADD and MDD values for 2016 through 2019 were supplemented with water loss to account for system production. Source production data was available for 2020 and is included in the analyses in Appendix L.

2.1.3.2 Water Loss

Water loss has generally been on the decline in the majority of the systems as is shown in Table 2-3 and Table 2-4. The majority of all the connections are metered on these systems with a few exceptions where Cascadia has been unable to locate the service connections. Cascadia plans on having all service connections located and metered by the end of 2021. Replacement of aging infrastructure is proposed over the short to medium term to help reduce water loss. If the 3-year average rises above 10%, then the system will need to create a water loss control action plan. At a minimum the system operators should investigate possible leaks in the distribution lines and metered connections. Accurate DSL is dependent upon having accurate source and service meter reading. The system is investigating a meter replacement program with remote read meters to ensure that the system has access to timely and reliable consumption data.

Table 2-3 Historical Water Consumption and Loss - Group A Systems

Year	Total Water Usage (gallons)	Water Loss (%)	ADD (gpd/ERU)	Summer ADD (gpd/ERU)	MMADD (gpd/ERU)	MDD (gpd/ERU)	Total Usage (ac-ft/yr)
W&B Waterworks 1 – System ID 46670-3							
2016	31,986,562	10.1	172	291	342	462	98.16
2017	32,010,825	1.9	190	324	455	614	98.24
2018	32,599,102	8.1	180	322	389	526	100.04
Design		**6.7**	**200**	**330**	**455**	**615**	
Sea View Water, LLC – System ID 77148-Y							
2016	12,036,700	4.5	145	192	207	342	36.94
2017	10,861,600	2.3	145	188	215	355	33.33
2018	11,512,600	2.7	144	194	222	366	35.33
Design		**3.2**	**145**	**200**	**230**	**370**	
Beachcomber H_2O Co – System ID 04979-V							
2016	5,103,352	9.7	98	139	154	254	15.66
2017	4,977,053	8.8	97	135	176	290	15.27
2018	4,873,105	8.5	95	124	147	242	14.96
Design		**9.0**	**100**	**140**	**180**	**300**	
CAL Waterworks – System ID 31040-6							
2016	4,933,599	6.8	144	177	194	321	15.14
2017	6,425,673	18.9	164	210	268	442	19.72
2018	6,444,151	13.0	176	182	219	362	19.78
Design		**12.9**	**180**	**220**	**270**	**450**	
TEL Company 1 – System ID 03099-5							
2016	5,924,197	7.4	205	307	361	595	18.18
2017	6,279,452	2.9	229	371	538	887	19.27
2018	6,284,613	6.5	221	338	417	688	19.29
Design		**5.6**	**230**	**380**	**540**	**890**	

TEL Company 3 – System ID 93945-8							
2016	1,424,417	5.9	159	204	241	398	4.37
2017	1,516,719	10.7	161	223	303	501	4.65
2018	1,484,567	9.4	160	217	268	442	4.56
Design		**8.7**	**170**	**240**	**310**	**510**	
TEL Company 4 – System ID 76976-N							
2016	5,377,897	n/a	n/a	n/a	n/a	n/a	16.50
2017	1,604,991	49.6	92	164	325	536	4.93
2018	1,271,833	10.9	119	179	222	366	3.90
Design		**30.2**	**110**	**220**	**330**	**540**	

Table 2-4 Historical Water Consumption and Loss - Group B Systems

Year	Total Water Usage (gallons)	Water Loss (%)	ADD (gpd/ERU)	Summer ADD (gpd/ERU)	MMADD (gpd/ERU)	MDD (gpd/ERU)	Total Usage (ac-ft/yr)
TEL Company 5 – System ID 15533-A							
No water usage data is available for this system.							
TEL Company 6 – System ID 38451-X							
2016	349,189	n/a	136	179	191	325	1.07
2017	453,655	n/a	178	276	389	662	1.39
2018	354,874	n/a	139	187	188	320	1.09
Design			**180**	**280**	**290**	**670**	
TEL Company 10 – System ID 77148-Y							
2016	459,010	n/a	139	183	228	377	1.41
2017	598,565	n/a	182	278	276	621	1.84
2018	616,232	n/a	188	241	277	457	1.89
Design			**190**	**280**	**330**	**630**	
TEL Company 11 – System ID 77148-Y							
2016	467,425	n/a	160	182	194	320	1.43
2017	455,734	n/a	156	204	233	384	1.40
2018	423,697	n/a	145	162	172	283	1.30
Design			**160**	**220**	**240**	**390**	

2.1.4 *Average Day Demand*

Average day demand (ADD) is defined as the average usage by an ERU each day in the system. It is calculated by total volume of water produced in one year divided by the number of days in the year and the number of ERUs in the distribution system. Water usage from 2016 through 2020 was analyzed to determine current design values for the system. The water use data for these periods is provided in APPENDIX L. There is not reliable data available regarding full-time and part-time consumer for each of the systems analyzed and the WFI for each system does not indicate any part-time user. To provide a reliable design value for ADD the summer ADD value has been used in analyses of the system capacities. Summer ADD values provide a conservative value due to the higher number of consumers present and

increase in irrigation usage. The design value used for each Group A water system's annual ADD water usage for this period is provided in Table 2-3 while the design values for all the Group B systems are provided in Table 2-4. Additionally, the summer (May through August) ADD values for the last 3 years are provided in the same tables.

2.1.5 *Maximum Day Demand*

Maximum day demand (MDD) is ideally determined by meter readings and is the largest single-day usage of water based upon production. The maximum day demand (MDD) could not be determined from actual water use data due to lack of daily source meter readings. Therefore, the meter readings for each system were analyzed to determine a maximum monthly average day demand (MMADD). The MMADD is then multiplied by a peaking factor to determine MDD per the DOH Water System Design Manual (Design Manual) Section 3.4.1. The design MDD for each Group A and Group B water system is specified in Table 2-3 and Table 2-4 respectively.

2.1.6 *Peak Hour Demand*

Peak Hour Demand (PHD) was calculated in accordance with Section 3.4.2 of the DOH Water System Design Manual, 2019 edition (Design Manual). Equation 3-1 from the Design Manual uses the MDD and the number of potential connections to determine the PHD flowrate.

Equation 2-1

$$PHD = \frac{MDD}{1440}[(C)(N) + F] + 18$$

PHD = Peak Hourly Demand (gallons per minute)
N = number of potential connections
C = coefficient based on system size
F = coefficient based on system size
MDD = Maximum Daily Demand (gpd/ERU)

The coefficients used in the above formula are dependent upon the number of connections served as described in Table 2-5.

Table 2-5 Peak Hour Demand (PHD) Equation Coefficients

Range of ERUs	C	F
15-50	3.0	0
51-100	2.5	25
101-250	2.0	75
251-500	1.8	125
501-1,000,000	1.6	225

The design MDD for each Group A and Group B water system are provided in Table 2-3 and Table 2-4 respectively. Equation 2-1 and the values provided in Table 2-5 were used to calculate the PHD for 2020, 2026, 2040, the current number of DOH approved connections, and the maximum system physical capacity.

The estimated number of connections for 2026 and 2040 were determined by using a 2% population growth rate to establish the number of future residents served and 2.5 residents per residential

connection as recommended by DOH. The 2% population growth rate used for this report is an overestimation of the growth rates indicated in the Island County Comprehensive Plan. This overestimate ensures adequate capacity in the event of a population growth surge. The calculated PHD values for the Group A systems are summarized in Table 2-6.

Table 2-6 Group A Peak Hour Demand (PHD) Based on MDD

Year	N (ERUs)	MDD (gpd/ERU)	Coefficient Associated with Range of ERUs	Factor Associated with Range of ERUs	PHD (gpm)
W&B Waterworks 1 – System ID 46670-3					
2020	456	615	1.8	125	422
2026	494	615	1.8	125	458
2040	623	615	1.6	225	540
Approved	500	615	1.8	125	463
Max	528	615	1.6	225	482
Sea View Water, LLC – System ID 77148-Y					
2020	190	370	2.0	75	135
2026	223	370	2.0	75	152
2040	294	370	1.8	125	186
Approved	210	370	2.0	75	145
Max	290	370	1.8	125	184
Beachcomber H_2O Co – System ID 04979-V					
2020	128	300	2.0	75	87
2026	129	300	2.0	75	87
2040	170	300	2.0	75	104
Approved	159	300	2.0	75	100
Max	192	300	2.0	75	114
Cal Waterworks – System ID 31040-6*					
2020	114	450	2.0	25	113
2026	121	450	2.0	75	117
2040	156	450	2.0	75	139
Approved	146	450	2.0	75	133
Max	219	450	2.0	75	178
TEL Company 1 – System ID 03099-5					
2020	73	890	2.5	25	146
2026	83	890	2.5	25	162
2040	110	890	2.0	75	200
Approved	99	890	2.5	25	186
Max	108	890	2.0	75	198
TEL Company 3 – System ID 93945-8					
2020	24	510	3.0	0	44
2026	32	510	3.0	0	52
2040	42	510	3.0	0	62
Approved	50	510	3.0	0	71
Max	127	510	2.0	75	135

TEL Company 4 – System ID 76976-N					
2020	29	540	3.0	0	51
2026	29	540	3.0	0	51
2040	39	540	3.0	0	61
Approved	44	540	3.0	0	68
Max	133	540	2.0	75	146

Approved = Current number of DOH approved ERUs
Max = Maximum number of ERUs that the system can support based on the capacity analysis calculations provided in APPENDIX L.
*Assumes 15 ERUs for the 15 active residential connections in the Goss Lakeridge Acres Association. For all other systems 1 ERU = 1 connection.

2.2 Projected Land Use, Future Population, and Demand Forecasting

The projected land use, future population, and water demand forecasting for each water system is discussed in the following sections.

2.2.1 *Projected Land Use*

As discussed in Section 1, the water systems provide service primarily to land zoned for single-family residences with a potential for a few community buildings. A vicinity map showing the location of each water system is shown in Figure 1-1 and Figure 1-2. Zoning and Land Use maps for each of the water systems' boundaries are provided in APPENDIX D.

At the time this report is being written, the discussion and updating of Island County Code (ICC) Section 17.03.180.I is ongoing. The land use standards in Section 17.03.180.I indicate that Accessory Dwelling Units (ADUs) are allowed in the following zones: Rural (R), Rural Forest (RF), Rural Agriculture (RA), and Commercial Agriculture (CA) zones and on parcels 1-acre or larger in the Rural Residential (RR) zone. Either one attached or one detached ADU is permitted per single-family residence. The latest Island County Code should be reviewed to verify the County's current policy regarding allowed ADUs.

Site specific fire flow requirements for individual development projects are determined by Island County through its development review processes. The potential for any major business or larger multifamily structures being located within the water system areas are minimal due to the limited capacity of the land to host septic system drain fields of any substantial scale. There is a potential for Rural Cluster Developments within various service areas.

2.2.2 *Projected Connections*

There is not extensive data on past connection numbers, so for this projection the number of lots and prior inquiries to join the water systems were used. The projected number of ERUs served at the end of each planning Phase are specified in Table 2-6. Phase 3 planning looks beyond the 20-year window to determine what strategic planning may be necessary to safeguard the distribution system into the future. Total build-out within the various water service areas is difficult to estimate because of on-site septic limitations which potentially reduce the number of buildable homesites. In addition, there is the potential for various water systems to expand to serve other areas.

2.2.3 *Projected Demand*

Projected demands are based on ERU projections and trends in annual production and ADD. The project demand is summarized in Table 2-6.

3 SYSTEM ANALYSIS

This chapter summarizes the analysis of the existing systems to determine if the system facilities are capable of supplying sufficient quality and quantity of water to meet existing and projected demands as identified in Chapter 2. Improvements to the system to meet projected demands are discussed in the final section of this chapter.

3.1 System Design Standards

The Water Systems' technical specifications, provided in APPENDIX N, were developed to be in compliance with the following codes and standards:

- Design, construction, maintenance, and operation shall be in accordance with the requirements of Washington Administrative Code (WAC) 246-290, "Group A Public Water Supplies", as now existing or hereafter amended, and also with Chapter 13.03A of the Island County Code (ICC), as now existing or hereafter amended.
- Design and system operation shall be in accordance with the most recent version Washington State Department of Health Water System Design Manual. Water system sources should have capacity to serve the MDD while not exceeding 20-hours of pump run time in a 24-hour period. Source capacities should be evaluated by a hydrogeologist to assess effects on neighboring wells and impacts of seawater intrusion.

3.1.1 *Water Quality Parameters*

Groundwater wells provide the source water for each water system and therefore they are required to comply with the water quality requirements specified in WAC 246-290 Part 4 – Water Quality, which includes requirements from the Code of Federal Regulations (CFR) Title 40.

It is required that purveyors of community water systems shall have one complete analysis from each water source every thirty-six months. A selection of recent water quality test results is included in APPENDIX S and additional information is available on the DOH Sentry website:

https://fortress.wa.gov/doh/eh/portal/odw/si/Intro.aspx

Waivers are available to modify some of the testing requirements noted below. The DOH will provide each system with a water quality monitoring schedule (WQMs) that summarizes the specific testing requirements for that system. See Section 3.2.1 below for additional information. Required water quality monitoring locations and schedules, as specified in WAC 246-290 and 40 CFR, are summarized in Table 3-1.

Table 3-1 Water Quality Monitoring Schedule

Constituent	Sample Location	Schedule/Frequency
Asbestos	One sample from distribution system or if required by department, from the source.	One sample every 9 years.
Bacteriological	From representative points throughout distribution system.	Once a month.
Complete Inorganic Chemical & Physical	From a point representative of the source, after treatment, and prior to entry to the distribution system.	One sample every 3 years.
Lead/Copper	From the distribution system at targeted sample tap locations.	As directed by DOH.
Nitrate/Nitrite	From a point representative of the source, after treatment, and prior to entry to the distribution system.	One sample annually.
Potential Trihalomethanes – Ground Water *	From two representative points in the distribution system.	Two samples every 3 years.
Radionuclides	From the source.	One sample every 3 years.
Organic Chemicals (VOCs)	From a point representative of the source, after treatment, and prior to entry to distribution system.	One sample every 3 years.
Organic Chemicals (SOCs not including those listed below)	From a point representative of the source, after treatment, and prior to entry to distribution system.	One sample every 3 years.
Organic Chemicals (SOCs including EDB and other soil contaminants, Dioxin, Endothall, Diquat, Glyphosphate)	From a point representative of the source, after treatment, and prior to entry to distribution system.	State Waiver Through 2019

*Currently none of the water systems are chlorinating but chlorination may be added as future oxidation and filtration equipment or for preventative disinfection. If chlorination is used, then these testing requirements may need to be implemented.

3.1.1.1 Bacteriological Testing

The State requires that systems serving up to a population of 1,000 people have a minimum of one routine bacteriological analysis per month. The sample is to be taken from the distribution system. When any samples with a coliform presence are collected during the previous month, the purveyor must take 5 repeat samples. If those samples do not contain any presence of coliform bacteria, the sampling may revert to the statutory number of samples per month. If coliform bacterial is detected, four follow-up samples are required the same month, then five routine samples the following month if the four follow-up tests are negative; otherwise, DOH will specify follow-up requirements. The Coliform Monitoring Plan provided in APPENDIX R, provides the sampling points that will be used within each system.

3.1.1.2 Inorganic Chemical Testing

WAC 246-290 and CFR 40 specify testing for primary and secondary inorganic chemicals. The maximum contaminant levels (MCLs) for inorganic chemicals are summarized in Table 3-2.

Table 3-2 Inorganic Chemical Maximum Contaminant Levels (MCLs)

PRIMARY INORGANIC CHEMICALS		SECONDARY INORGANIC CHEMICALS	
Substance	**MCLs (mg/L)**	**Substance**	**MCLs (mg/L)**
Antimony (Sb)	0.006	Chloride (Cl)	250.0
Arsenic (As)	0.010	Fluoride (F)	2.0
Asbestos	7 million fibers/liter (longer than 10 microns)	Iron (Fe)	0.3
Barium (Ba)	2.0	Manganese (Mn)	0.05
Beryllium (Be)	0.004	Silver (Ag)	0.1
Cadmium (Cd)	0.005	Sulfate (SO_4)	250.0
Chromium (Cr)	0.1	Zinc (Zn)	5.0
Copper (Cu)	*		
Cyanide (HCN)	0.2		
Fluoride (F)	4.0		
Lead (Pb)	*		
Mercury (Hg)	0.002		
Nickel (Ni)	0.1		
Nitrate (as N)	10.0		
Nitrite (as N)	1.0		
Selenium (Se)	0.05		
Sodium (Na)	*		
Thallium (Tl)	0.002		

*Although the state board of health has not established MCLs for copper, lead, and sodium; there is sufficient public health significance connected with copper, lead, and sodium levels to require inclusion in inorganic chemical and physical source monitoring. For lead and copper, the EPA has established distribution system related levels at which a system is required to consider corrosion control. These levels, called "action levels," are 0.015 mg/L for lead and 1.3 mg/L for copper and are applied to the highest concentration in ten percent of all samples collected from the distribution system. The EPA has also established a recommended level of 20 mg/L for sodium as a level of concern for those consumers that may be restricted for daily sodium intake in their diets.

3.1.1.3 Physical Characteristics

WAC 246-290 and CFR 40 specify testing physical characteristics. The MCLs for physical characteristics are summarized in Table 3-3.

Table 3-3 Physical Characteristics

Substance	Secondary MCLs
Color	15 Color Units

Specific Conductivity	700 umhos/cm
Total Dissolved Solids (TDS)	500 mg/L

The generally accepted classification of hardness is summarized in Table 3-4. An MCL for hardness has not been established. In general, water having a hardness of less than 100 mg/L is not considered hard for ordinary domestic use.

Table 3-4 Relative Hardness

Description	Concentration of $CaCO_3$
Soft	0-60 mg/l
Moderately hard	61-120 mg/l
Hard	121-180 mg/l
Very hard	181 mg/l and over

The water hardness impacts the corrosivity of water and it may have negative impacts on lead and copper levels in delivered water. If water softening is desired in the future, lead and copper testing should be performed to ensure that water corrosivity concerns do not become an issue.

3.1.1.4 Disinfection Byproducts (DBP)

When chlorine is added to drinking water to serve as a disinfectant for various organisms, a residual must be maintained throughout the distribution system. However, chlorine is a very active substance and it reacts with naturally occurring substances to form compounds known as disinfection byproducts (DBPs). The most common DBPs formed when chlorine is used for disinfection are trihalomethanes (THMs), and haloacetic acids (HAAs).

The Stage 2 Disinfectants and Disinfection Byproducts Rule regulates the concentration of disinfectant chemicals and byproducts that may be present in the distribution system water. These chemical species are considered primary contaminants. Testing for DBPs is performed annually unless the MCL is exceeded, in which case a running annual average (RAA) is used for comparison against the MCL. The number of samples is dependent on system size. Each of the locational running annual average (LRAA) results must be in compliance.

The concentrations of each of the trihalomethane compounds (trichloromethane, dibromochloromethane, bromodichloromethane, and tribromomethane) are totaled to determine the total trihalomethanes (TTHM) level. The MCL for TTHM is 0.080 mg/L. The concentrations of each of the five haloacetic acid compounds (monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, bromoacetic acid, and dibromoacetic acid) are totaled to determine the haloacetic acids (HAA5s) level. The MCL for HAA5 is 0.060 mg/L.

3.1.1.5 Radionuclides

The State considers radionuclides primary contaminants. The MCLs for radionuclides are summarized in Table 3-6.

Table 3-5 Radionuclides MCLs

Substance	MCL (pCi/L)
Radium-226	3
Combined Radium-226 and Radium-228	5
Gross alpha particle activity (excluding uranium)	15

The State specifies that the average annual concentration shall not produce an annual dose equivalent to the total body or any internal organ greater than four millirem/year.

3.1.1.6 Volatile Organic Chemicals (VOCs)

The State requires that public water systems sample and evaluate for Volatile Organic Chemicals (VOCs). If there are violations of the MCLs for any constituent, they must be addressed for elimination immediately. If there are no violations of the MCLs, the purveyor must sample again for VOCs after twelve months. If no VOCs (excluding THMs) are verified after the initial twelve months of monitoring, purveyors of community water systems shall monitor each source at least once every thirty-six months. The VOC MCLs are summarized in Table 3-7.

Table 3-6 Volatile Organic Chemicals (VOCs) MCLs

Contaminant	MCL (mg/L)	Contaminant	MCL (mg/L)
Vinyl chloride	0.002	Monochlorobenzene	0.1
Benzene	0.005	o-Dichlorobenzene	0.6
Carbon tetrachloride	0.005	Styrene	0.1
1,2-Dichloroethane	0.005	Tetrachloroethylene	0.005
Trichloroethylene	0.005	Toluene	1
para-Dichlorobenzene	0.075	trans-1,2-Dichloroethylene	0.1
1,1-Dichloroethylene	0.007	Xylenes (total)	10
1,1,1-Trichloroethane	0.2	Dichloromethane	0.005
cis-1,2-Dichloroethylene	0.07	1,2,4-Trichlorobenzene	0.07
1,2-Dichloropropane	0.005	1,1,2-Trichloroethane	0.005
Ethylbenzene	0.7		

3.1.1.7 Synthetic Organic Chemicals (SOCs)

The synthetic organic chemical (SOC) MCLs are summarized in Table 3-7.

Table 3-7 Synthetic Organic Chemicals (SOCs) MCLs

Contaminant	MCL (mg/L)	Contaminant	MCL (mg/L)
Alachlor	0.002	2,4,5-TP	0.05
Aldicarb	0.003	Benzo[a]pyrene	0.0002
Aldicarb sulfoxide	0.004	Dalapon	0.2
Aldicarb sulfone	0.002	Di(2-ethylhexyl)adipate	0.4
Atrazine	0.003	Di(2-ethylhexyl)phthalate	0.006

Carbofuran	0.04	Dinoseb	0.007
Chlordane	0.002	Diquat	0.02
Dibromochloropropane	0.0002	Endothall	0.1
2,4-D	0.07	Endrin	0.002
Ethylene dibromide	0.00005	Glyphosate	0.7
Heptachlor	0.0004	Hexacholorbenzene	0.001
Heptachlor epoxide	0.0002	Hexachlorocyclopentadiene	0.05
Lindane	0.0002	Oxamyl (Vydate)	0.2
Methoxychlor	0.04	Picloram	0.5
Polychlorinated biphenyls	0.0005	Simazine	0.004
Pentachlorophenol	0.001	2,3,7,8-TCDD (Dioxin)	$3x10^{-8}$
Toxaphene	0.003		

3.1.2 *Average and Maximum Daily Demand*

The average day demand (ADD) and maximum day demand (MDD) standards shall be in accordance with the DOH Design Manual which allows the calculation of ADD and MDD based on system data if at least two years of good data is available. The ADD and MDD associated with each system served by Cascadia Water is summarized in Section 2.1.3.

3.1.3 *Peak Hour Demand*

The peak hour demand (PHD) standard shall be in accordance with the DOH Design Manual which allows the calculation of the PHD based on recorded MDD data and the number of system ERUs. The PHD associated with each system is summarized in Section 2.1.6.

3.1.4 *Storage Requirements*

The Water System's storage accounts for the five storage components identified by DOH including operational storage (OS), equalizing storage (ES), standby storage (SB), fire suppression storage (FSS), and dead storage (DS) as defined in the DOH Design Manual,2019 edition Chapter 7. The effective storage is the total storage volume less any dead storage.

The standby and fire suppression storage volumes are allowed to be nested if allowed by the CWSP, County Fire Marshal, and local ordinance. This is an allowable practice in Island County. WSDOH recommends developing source capacity such that distribution systems can replenish depleted fire suppression storage within a 72-hour period while concurrently supplying the MDD of the system.

Standby storage addresses unusual situations encountered by the water system which limits the ability to access source water. Ideally, standby storage will provide 2 days' worth of average day demand with the largest well out of service or a minimum standby storage of 200 gallons per ERU.

Storage reservoirs supplying distribution systems by gravity are required to meet minimum pressures for the various storage components, as highlighted in Table 3-8:

Table 3-8 Storage Component Pressure Requirements

Storage Component(s)	Pressure Requirements
Operating plus Equalizing (at bottom of equalizing)	30-psi to highest gravity fed service meter
Nested Standby and Fire Suppression (at bottom of nested storage)	20-psi to highest gravity fed service meter and booster pump stations

Water storage is necessary for three reasons: to equalize daily fluctuations in demand, to provide large volumes of water for fires and to provide an emergency reserve in case of source production problems. The volume of the storage reservoir is determined by estimating future storage demands during the reasonable life of the reservoir. Since fire demand is the most significant demand, it usually governs the size of the storage tank.

The DOH recommends that public water systems be able to meet a maximum daily demand (MDD) of not less than 800 gallons per day per residential connection or use an MDD established based on water usage data, and provide MDD plus the required fire flow at a pressure of at least 20-psi.

3.1.5 *System Pressure*

The distribution systems should be designed to permit gravity flow whenever feasible. Facilities should be designed and located to permit static pressures ranging from 40-psi to 90-psi and in no case produce static pressure below 30-psi. Ideally, the distribution systems should be interconnected and looped to provide maximum service and reliability. The distribution system must be able to deliver the required fire flow during peak demand conditions at a minimum residual of 20-psi.

There are key elevations and minimum pressures used in the capacity calculations. WAC 246-290-230 specifies system pressure requirements which include maintaining 30-psi minimum during peak hour demand and all equalizing storage depleted and maintaining 20-psi minimum during maximum day demand with equalizing and fire suppression storage depleted. Individual pressure reducing valves (PRVs) should be provided to service connections with an inlet pressure at or above 80-psi.

3.1.6 *Distribution System*

A general rule in system design is that a looped system comprised of moderately sized mains providing multiple (or alternate) routes to any area is much more reliable and efficient than a system comprised of a few large mains. A looped system also increases circulation of the water, which minimizes poor water quality associated with stagnant water.

Pipe material should be in conformance with specifications of the American Water Works Association (AWWA) and the American Society for Testing and Materials (ASTM). The life expectancy of new piping in a distribution system is at least 50 years and can often last many more. The pipe material should be selected to maximize life expectancy and perform as designed to meet strength requirements and prevent corrosion. Accordingly, materials and construction will continue to be in accordance with the Washington State Chapter of the American Public Works Association (APWA) Standard Specifications. Presently the preferred pipe is PVC C900 water pipe.

In calculating the required new pipe sizes, some general rules or criteria are followed:

- No pipe smaller than 6 inches should be used where fire service is involved. In addition, use of water mains of less than 6 inches in diameter must be justified by the transmission of a

hydraulic analysis to the DOH. Justification is difficult because of the severe pressure drops in 4-inch pipe during fire flows.

- There is little difference between the construction cost of installing an 8-inch diameter pipe and 6-inch diameter pipe, yet the capacity of an 8-inch pipe is nearly twice that of 6-inch pipe. This should be considered when selecting pipe size.
- An 8-inch diameter pipe should be provided between connections when the length between the connections exceeds 600 feet.
- A looped feeder or grid system comprised of moderately sized mains providing multiple (or alternate) routes to any area is much more reliable and efficient than a system comprised of a few large mains serving dead-end, small feeders.

3.1.7 *Telemetry System*

A telemetry system allows for the automatic operation of a water system that is necessary for optimizing system storage and capacity. In addition, telemetry systems can provide a security component for water systems. WSDOH recommends the use of telemetry systems for intrusion alarms installed on storage tanks, hatches and pump houses. Telemetry systems can range from simple analog controls to complex computerized systems (i.e., Programmable Logic Controllers – PLCs). Telemetry system parts, and installation should meet applicable electrical codes. At a minimum, the telemetry system should have the following capabilities:

- Automatically Control the Well(s) Operation Based on Reservoir Level
- Reservoir Level Alarms (High and Low)
- Automatic Regeneration/Backwashing of Treatment System Filters Based on Water Usage
- Power Failure Alarm
- Intrusion alarms on storage tanks, hatches and pump houses
- Auto-dialer for Alarm Conditions

3.1.8 *Backup Power Requirements*

Purveyors are required to plan for unscheduled power outages. The reservoir standby storage is intended to supply the system in the event of a power outage for approximately two days. In addition to the standby storage, a backup power generator setup to provide emergency power to the wells and booster pumps during power outages can provide added protection. DOH requires automatic backup power for some situations (e.g., water treatment); however, with adequate standby storage and an auto-dialer that calls the system operator with a power interruption warning, a manual switch should suffice. It is recommended that the water systems employ an emergency generator to allow continued booster pump station operation in order to provide pressurized water in the event of a power outage. The generator switch should meet all applicable electrical codes. The generator fuel supply should meet all applicable codes, particularly spill control measures.

3.1.9 *Valve and Hydrant Spacing*

WSDOT/APWA standards state that valves on mains 12-inches and smaller should be spaced no more than 1,000 feet apart and valves be installed at intersections of mains and/or streets such that individual streets (or portions of streets if over 1,000-feet long) can be isolated for maintenance purposes. According to the Island County Code Section 13.03A.090, “All hydrants in fire flow systems shall be spaced so as to ensure that all commercial, industrial, or multifamily structures or building sites served by the system shall be reached by unobstructed hose lays of no greater than 500 feet to all parts of any structure.” Additionally, “Fire hydrants shall be located at roadway intersections wherever possible, and the distance between them shall be no further than 900 feet, or as necessary to meet the hose lay requirements for commercial, industrial, or multifamily structures or building sites." The distribution systems’ hydrants shall be spaced to meet these standards.

3.2 Water Quality Analysis

Cascadia Water monitors the systems' water quality in accordance with Washington State Department of Health (DOH) requirements. The Safe Drinking Water Act (SDWA) and its amendments have increased the monitoring requirements to include Trihalomethanes, Radionuclides and Volatile and Synthetic Organic Compounds. The capital improvement plan calls for the addition of water treatment to various systems in order to reduce contaminants to recommended levels were applicable.

3.2.1 *Water Testing*

The latest water quality testing results are provided for each system in APPENDIX S. The testing schedule for each system is provided in APPENDIX Q. The frequency of testing for each system is dependent on size, past testing results, and system configuration. The following test are performed throughout the distribution systems:

- Radionuclides
- Arsenic
- Lead & Copper
- Synthetic Organic Chemicals
- Volatile Organic Chemicals
- Bacteriological
- Asbestos
- Iron
- Manganese
- Nitrates

3.2.2 *Source Water Quality*

The wellhead protection plan was developed to help identify items and situations that could possibly pose a threat to the water quality of the systems. A copy of the Wellhead Protection Plan is included in APPENDIX J.

The primary contaminants of concern for the water systems in this plan are iron and manganese, which are naturally occurring contaminants of concern for multiple systems in this plan. Currently the only system providing treatment is Sea View Water which is currently treating both of it used sources for iron and manganese via oxidation/filtration with a chemical feed of potassium permanganate ($KMnO_4$) as the oxidant and Greensand Plus media. The capital improvements plans in Table 3-26 and Table 3-27 include the addition of treatment for W&B Waterworks #1, CAL Waterworks, TEL Company 1, TEL Company 3, and TEL Company 11. In addition, the Sea View Water filtration system will be modified to support an increased treatment capacity.

TEL Company 10 has developed a new well (Well 2) during the initial review of this Plan due to excessive levels of nitrate in Well 1. Well 8 for TEL Company 1 and Well 2 for TEL Company 10 both have evaluated levels for arsenic. Well 8 at TEL Company 1 is not currently is use while TEL Company 10 manages the excessive levels of arsenic and nitrate which are managed by the mixing of the two wells at TEL Company 10.

3.2.3 *Wellhead Protection*

Since groundwater wells are the sole source for the Cascadia water systems, protection of the source aquifer is critical to the long-term viability of the systems. Cascadia has prepared a wellhead protection program (see Section 5.3) and has plans to implement the initial public education phase of the program. The current Wellhead Protection Program is included in APPENDIX J. Currently the groundwater sources

for these systems are typically from relatively deep wells, with adequate pollution control radii and a subsurface confining layer to help protect the underlying aquifer.

3.2.4 *Safe Drinking Water Act*

The amendments to the Safe Drinking Water Act are not expected to significantly impact the plan that Cascadia is currently implementing. Analysis of treatment needs and treatment installation are planned in the immediate to near-term for most of the Group A systems.

3.2.5 *Seawater Intrusion*

Due to the existence of seawater intrusion (SWI) in many wells located on the shorelines of Washington State, the possibility of seawater intrusion into the potable water aquifers must be investigated on a regular basis. ICC 8.09.099 identifies the seawater intrusion risk categories. Based on the static water levels and the chloride concentration of water samples from the Cascadia wells, the Island County categorizes most of the water sources as low risk. The low-risk category includes water systems with a history of chloride analysis showing concentration of less than 100 mg/L and not in proximity (1/2 mile) to any ground water source with chloride concentrations equal to or greater than 100 mg/L or wells with a static water level in excess of 8.4 feet above NAVD 88. In areas of elevated SWI risk, Island County may limit or phase the expansion of a water system to allow monitoring of the impact that the additional withdrawal may have on the aquifer.

It is recommended that Cascadia continue testing of its wells for chloride to check for any long-term trends in the aquifer. In addition, accurate elevations for the static and pumping water level of each of the system's wells should be obtained for historical trending and analysis.

3.2.6 *Finished Water Quality*

Water quality samples from the distribution system generally show adequate water quality with a few exceptions. Where water quality improvements have been identified a capital improvement project has been identified and scheduled for the immediate term. See section 8.2.2 for additional information.

3.3 System Description and Analysis

Potential system improvements were determined by analysis of system testing, studies, review of water system inventories, consultation with the system operator regarding needed improvements, and longer-term goals for the systems. The distribution systems' needs by functional group are summarized in the following sections

3.3.1 *Existing System Configurations*

The general configuration of the water systems is shown in the drawings provided in APPENDIX B. For the purposes of discussion, the facilities have been grouped into areas of supply, treatment, storage, pumping, and distribution. A brief description of each system is included below.

W&B Waterworks #1

The system is currently supplied by four wells. The wells are located on the system owned lot on Roy Road at the high point in the service area. The wells function on a lead/lag orientation with Well 1, followed by Well 3, which is followed by Wells 2 and 4 running simultaneously. The well lot also contains two storage reservoirs and a booster pump for a small high-elevation service area adjacent to the reservoirs. Well function is controlled by level floats in the one of the reservoirs. Wells 1, 2, and 4 pump into one of the reservoirs while Well 3 pumps into the other reservoir. The reservoirs are intertied and hydraulically equivalent. The system has water right certificates with a combined withdrawal rate of

225-gpm and annual withdrawal of 150 acre-feet per year (See Table 3-9). A summary of each of the groundwater source wells is included in Table 3-10. Wells 2 and 3 are enclosed in wood frame buildings while wells 1 and 4 are in vaults. The wells are equipped with the requisite source water meter, check valve, isolating valve, screened air vent and probe tube.

The distribution system includes two 12-foot tall concrete reservoirs each with a total storage volume of 57,000-gallons. Reservoir No. 2 (east reservoir) supplies the north service area while Reservoir No. 1 (west reservoir) supplies the south service area. A valve at the reservoir site connects the two service areas and is normally open. The distribution system is supplied by gravity except for the high elevation service area near the reservoir site that is served by a pump system. This pump system currently supplies eleven (11) customers. The booster pump (2-hp F&W Model CJ101) is housed in the wood frame building containing Well No. 2 along with two (2) 81-gallon bladder tanks. The pressure switches for the pump controls are currently set to go on at 40-psi and shut off at 60-psi.

The hydraulic Grade Line (HGL) of the gravity fed system is 270 based upon the reservoir elevation (263 feet) and the height of water in the tank at the bottom of equalizing storage (7 feet). The static gravity pressure at sea level would be 117-psi. Therefore, for the customer's convenience and to reduce the operating pressure on the mains, the system contains three pressure reducing valve stations located at the following locations:

- Wahl Road & Ebb Tide Lane in the south service area
- Mutiny Lane approximately 500-feet west of Wahl Road in the north service area
- Mutiny Bay Road east of the Woodard Avenue intersection.

The PRV at the southern end of Wahl Road near Ebb Tide Lane is set to 25-psi, creating an HGL of 155-feet. The second PRV installed on the east end of Mutiny Lane is set to 35-psi creating an HGL of 155-feet along Robinson Road. The third PRV is installed at the intersection of Lancaster Road and Woodard Avenue. This PRV is set to 70-psi creating an HGL of 200-feet along Mutiny Bay Road. The distribution system is divided into two areas designated as: "north service area" and "south service area". Both service areas are supplied by gravity from the reservoirs on Roy Road.

Due to the aging facilities and other concerns W&B Waterworks 1 is in the process of integrating Del Bay into the W&B service area. Del Bay borders the W&B Waterworks 1 service area on the North. Before connecting the connecting Del Bay consumers to the W&B distribution system, Cascadia Water will replace all water mains and service connections within the Del Bay service area. Various portions of the Del Bay infrastructure will be removed and disposed of including the reservoirs and portions of the pumphouse. The groundwater well will be connected to the W&B distribution system.

Currently W&B serves 456 of its 478 approved connections. The W&B distribution system capacity was reviewed by the Washington State Department of Health (DOH) in 2015 (DOH Submittal No. 15-0303) and showed that the system had physical and legal capacity to serve up to 500 ERUs. A copy of the DOH correspondence regarding the W&B Waterworks system capacity is included in APPENDIX U. This correspondence notes that additional connections are subject to seawater intrusion review under Island County Code (ICC) 8.09.099. As the combination of water systems will not result in a net increase in water removed from the aquifer, this limit is not applicable. It is the intent of W&B to pursue the incorporation of the water right from Del Bay into the combined system. Section 3.4, and its associated subsections, provides a capacity analysis of W&B Waterworks 1 with the Del Bay water right which shows that the system has the capacity for a maximum of 528 ERUs (Equivalent Residential Units)

Sea View Water LLC.

The system is currently supplied by three wells. The wells are located on system owned lots. Wells 1 and 2 are located on Island County parcel S8135-02-0000A-0, off Island View Road, while Well 3 is located on Island County Parcel R13206-065-4900, just north of Fort Nugent Road. Each of the parcels which house the wells also contain a 30,000-gallon concrete reservoir and a pumphouse containing treatment facilities and booster pumps. Wells 1 and 2 operate together and operate on a lead/lag with Well 3. Wells are controlled by reservoir levels and discharge into the reservoir located on their respective parcels. The system has water right certificates with a combined withdrawal rate of 100 gpm and annual withdrawal of 65 acre-feet per year (See Table 3-9). A summary of each of the groundwater source wells is included in Table 3-10. Each of the wells is equipped with the requisite source water meter, check valve, isolating valve, screened air vent and probe tube.

The system includes two concrete reservoirs each with a storage volume of 30,000-gallons. Both reservoirs are on the system owned lots previously mentioned where the wells are located. Water pulled from the wells is treated through filters for the removal of iron and manganese prior to storage in the concrete reservoirs. The distribution system is within a single pressure zone with operating pressures varying between 40- to 70-psi. Pressure tanks located in the pumphouses housing the filters stabilize the pressure in the distribution mains and minimize the cycling of the booster pumps.

At the time of this report, Sea View Water and Whidbey West Water System are in the initial phases of establishing an Intertie Agreement. The Whidbey West Water System is located to the north of Seaview Water and the two systems share a water service area boundary. There is an existing physical connection between the two systems, located on the service area boundary, consisting of a 4-inch gate valve in the closed position. According to the information available this intertie has never been used. Both systems recognize that the existing connections is insufficient to protect the systems in instances where the intertie is required. Along with the intertie agreement Cascadia will plan on modifying the intertie connection. The proposed intertie would be located in an easement on the west side of West Beach Road.

After the water systems have signed an Intertie Agreement, an engineered connection will be designed. Following WSDOH approval of the design, the intertie connection will be installed. A more formal intertie with meters and pressure sustaining valves should be installed to ensure that adequate system pressures are maintained in the event the intertie is put into operation. A metered intertie is proposed in Table 3-26 to address this problem.

Beachcomber H_20 Co.

The system is currently supplied by two wells. The wells are located on a system owned lot located off Mastodon Drive in Greenbank, Washington (Island County Parcel S6095-05-00033-0). The well lot also contains two storage reservoirs. One reservoir was originally sized to serve the gravity portion of the system and the other, a high-elevation service area with the use of booster pumps. The system has water right certificates with a combined withdrawal rate of 78 gpm and annual withdrawal of 63.1 acre-feet per year (See Table 3-9). A summary of each of the groundwater source wells is included in Table 3-10. Both wells are equipped with the requisite source water meter, check valve, isolating valve, screened air vent and probe tube.

Both reservoirs are located on the system owned lot near the wells at an elevation of 280 feet. The distribution system includes two concrete reservoirs. Well 1 fills the larger 55,000-gallon reservoir which is controlled by a pressure transducer and pressurizes the gravity portion of the system. The other,

34,000-gallon, reservoir is filled by Well 2 also controlled by a pressure transducer. This reservoir is connected to the onsite booster pump station which serves the pressurized portions of the system.

The gravity fed portion of the system, with a HGL of 305 feet, serves the lots beyond and below the 260-foot elevation. Starting at the pump house, an 8-inch line continues to North Bluff Road where it branches to the north and south. The north branch conveys water up to Beach Way and serves Beachcomber Divisions 1, 2, 4, and Hidden Beach Lots. The south branch continues to the southern boundary of the water system along North Bluff Road. The pressure distribution system is within one pressure zone with operating pressures varying between 40- to 70-psi. Pressure tanks located in the pumphouses stabilize the pressure in the distribution mains and minimize the cycling of the booster pumps.

CAL Waterworks

The system has two wells located on a system owned lot containing a storage reservoir and two separate booster pump stations (Island County Parcel R22902-136-5260). The two wells function in a lead/lag configuration which are controlled by reservoir levels. A summary of the sources for CAL Waterworks is available in Table 3-10. A well field was designated in 1994 for the purpose of water quality monitoring. The system has water right certificates with a combined withdrawal rate of 90-gpm and annual withdrawal of 54.0 acre-feet per year (See Table 3-9).

The system includes a single concrete reservoir with a total storage volume of 40,000-gallons (nominal volume). The booster pump stations are located on the well lot adjacent to the reservoir. The twin 5-hp pumps supply water to the entire service area. A second booster pump station consisting of twin 1.5-hp pumps further increase the pressure from the discharge of the 5-hp pumps to properly supply the high elevation pressure zone. Fire flow is not provided. The twin 5-hp booster pump motors are protected from frequent on-off cycling by three 315-gallon vertical hydropneumatic tanks. Two 220-gallon vertical hydropneumatic tanks provide pump protection to the twin 1.5-hp booster pump motors. Data on ASME certification of the tanks was not found. The operating pressure range of the distribution system for Pressure Zone 1 is 10-psi to 75-psi and for Pressure Zone 2 it is 35-psi to 95-psi.

Hydraulic modeling indicates that while supplying PHD there are portions of the distribution system that experience low service pressures along Ravenridge Drive, Harbor Sands Lane, and east along Goodell Road into Goss Lakeridge Acres. The low pressures are caused by a lack of a closed loop in water main along East Harbor Road between Beachwood Drive and Harbor Sands Lane. A watermain extension/replacement project is proposed in Table 3-26 to address this problem.

The Goss Lakeridge Acres Water System utilizes CAL Waterworks as their source of water. The Goss Lakeridge Acres Water System is located on the north end of the CAL distribution system along East Goodell Road. Goss Lakeridge Acres purchases water wholesale from CAL Waterworks.

TEL Company 1

The service area for TEL Company 1 Water System is comprised from the combination of three originally independent water systems. The individual water systems were previously known as TEL Company 1, TEL Company 8, and TEL Company 9. The general configuration of the water system is shown in the drawings in APPENDIX B to this Plan.

The system has three wells distributed throughout the water system with individual wells being the previous sources of the separate water systems (Well 1 with TEL 1, Well 8 with TEL 8, and Well 9 with TEL 9). Currently Well 8 is not used to supply water to the system due to elevated arsenic levels. Well 1 and Well 9 alternate in a lead/lag operation. Wells are controlled by reservoir levels at the large reservoir located on Island County Parcel R32904-240-3550, along with Well 1. Well 9 is located offsite

from the reservoir and pumps directly into the distribution system. The wells are summarized in Table 3-10. The system has water right certificates with a combined withdrawal rate of 80-gpm and annual withdrawal of 88.4 acre-feet per year (See Table 3-9).

The system is primarily served by a 60,000-gallon reservoir which is located at the end of Inglewood Drive in the original service area of TEL 1. There is also a pumphouse and small 6,000-gallon reservoir located on the north side of Rabbit Run Road (formerly TEL 9) which provides pressure to the southern portion of the system and connects the well from TEL 9 to the system. The well from TEL 8 is currently an emergency source, due to elevated levels of arsenic (0.011 mg/L) detected in water samples for this source.

The distribution system is comprised of a single pressure zone. A booster pump station maintains system pressures between 40 to 60-psi in the pumphouse. Pressure tanks located in the TEL 1 (Inglewood Road) pumphouse provide pump protection for the booster pumps.

TEL Company 3

The system is currently supplied by two wells. The wells are located on a system owned lot (Island County parcel R32922-339-5190) which is located completely in Parcel R32922-355-5150 northwest of the intersection of Cultus Bay Road and Goldfinch Lane. The parcel contains the wells, a 23,000-gallon octagonal concrete reservoir, and a pumphouse containing the system's booster pumps and pressure tanks. The wells operate in a lead/lag scenario which are controlled by reservoir levels. The system has a water right certificate with a combined withdrawal rate of 80 gpm and annual withdrawal of 37.5 acre-feet per year (See Table 3-9). A summary of each of the groundwater source wells is included in Table 3-10. Each of the wells is equipped with the requisite source water meter, check valve, isolating valve, screened air vent and probe tube.

Water pulled from the wells is discharged into the 23,000-gallon concrete reservoir. The reservoir feeds three booster pumps which are 2.5-hp, 1.5-hp, and 1-hp respectively. The distribution system is a single pressure zone with operating pressures varying between 40- to 70-psi. Pressure tanks located in the pumphouses provide pump protection for the booster pumps.

TEL Company 4

The system is currently supplied by a single groundwater well. The well is located on a system owned lot (Island County parcel S8125-00-0000A-0) which is located at the intersection of Roving Place and Jamaica Road. This parcel also contains a 30,000-gallon concrete reservoir and a pumphouse containing booster pumps and pressure tanks. The system has a water right certificate with a combined withdrawal rate of 25 gpm and annual withdrawal of 20.0 acre-feet per year (See Table 3-9). A summary of the groundwater source wells is included in Table 3-10. The well is equipped with the requisite source water meter, check valve, isolating valve, screened air vent and probe tube.

Water pulled from the well is discharged into a 30,000-gallon concrete reservoir. The distribution system is a single pressure zone with operating pressures maintained by booster pumps fed from the reservoir. Pressure tanks located in the pumphouses provide pump protection for the booster pump. See system maps in APPENDIX B for further system details.

Group B Water Systems

The Group B water systems consist of TEL Company 5, TEL Company 6, TEL Company 10, and TEL Company 11. For the purposes of this discussion Mutiny Bay Water Company is not included since it is currently in the process of being connected to the W&B Waterworks 1 system.

Each of the Group B systems has a similar configuration. Wells are located inside or directly adjacent to pumphouses. Wells discharge water into small storage reservoirs with storage capacities between 500 and 2,500-gallons. The distribution systems are a single pressure zone with operating pressures maintained by booster pumps fed from the reservoirs. Pressure tanks located in the pumphouses provide pump protection for the booster pumps. See system maps in APPENDIX B for further system details.

3.3.2 *Water Rights*

A summary of the water rights belonging to Cascadia's multiple water systems is provided in Table 3-9. Copies of these water rights are provided in Appendix F. TEL Company 6 does not have a water right permit and its exempt well is limited to a total daily withdrawal less than 5,000 gallons.

Table 3-9 Cascadia Water Rights

W&B Waterworks 1	Water Right G1-22510C	Water Right G1-24539C	Water Right G1-23683C ***
Priority Date	6/4/1975	8/24/1984	9/25/1980
Instantaneous Withdrawal (gpm)	225.0	225.0*	37.5
Annual Withdrawal (acre-ft/yr)	45.0	105.0**	25
Source	Well	4 Wells	Well
Place of Use	Sec 22 T29N R02E	Sec 22 T29N R02E	Sec 9 T29N R02E
Type	Community Domestic Supply – Continuous	Community Domestic Supply – Continuous	Community Domestic Supply – Continuous

*Non-additive
** Supplemental to G1-22510 for a total of 150 acre-ft/yr.
*** Water right will be transferred from Del Bay to W&B Waterworks 1

Sea View Water, LLC.	Water Right G1-00670	Water Right G1-26973
Priority Date	7/17/1968	2/11/1993
Instantaneous Withdrawal (gpm)	100	100*
Annual Withdrawal (acre-ft/yr)	65	65*
Source	(2) Wells	(1) Wells
Place of Use	Sec 7 T32N R01E	Sec 7 T32N R01E
Type	Community Domestic Supply – Continuous	Community Domestic Supply – Continuous

*Non-additive

Beachcomber H_20, Co.	Water Right G1-00511C	Water Right G1-24218C
Priority Date	7/14/1970	12/17/1982
Instantaneous Withdrawal (gpm)	38.0	40.0
Annual Withdrawal (acre-ft/yr)	63.1	63.1*
Source	Well	Well
Place of Use	Sec 33 T31N R02E	Sec 33 T31N R02E
Type	Community Domestic Supply – Continuous	Community Domestic Supply – Continuous

*Non-additive

Cal Waterworks	Water Right G1-00032C	Water Right G1-27478C
Priority Date	12/23/1971	6/1/1994
Instantaneous Withdrawal (gpm)	55.0	35.0
Annual Withdrawal (acre-ft/yr)	27.5	26.5
Source	Well	2 Wells
Place of Use	Sec 2 T29N R02E	Sec 2 T29N R02E
Type	Community Domestic Supply	Municipal – Continuous

TEL Company 1	Water Right G1-23691P	Water Right G1-26967P	Water Right G1-26968P	Water Right G1-26969P
Priority Date	10/10/1980	2/19/1993	2/19/1993	2/19/1993
Instantaneous Withdrawal (gpm)	40.0	20.0	20.0	40.0*
Annual Withdrawal (acre-ft/yr)	50.0	38.4**	38.4**	38.4**
Source	Well	Well	Well	Well
Place of Use	Sec 4 T29N R03E	Sec 15 T29N R03E	Sec 10 T29N R03E	Sec 4 T29N R03E
Type	Community Domestic Supply – Continuous	Community Domestic Supply	Domestic Supply	Domestic Supply

*Total for G1-23691 and G1-26969.

**The total combined quantity for all four water rights.

TEL Company 3	Water Right G1-23439C
Priority Date	7/17/1979
Instantaneous Withdrawal (gpm)	80.0
Annual Withdrawal (acre-ft/yr)	37.5
Source	Two Wells
Place of Use	Sec 22 T29N R03E
Type	Community Domestic Supply – Continuous

TEL Company 4	Water Right G1-20753C
Priority Date	7/16/1973
Instantaneous Withdrawal (gpm)	25.0
Annual Withdrawal (acre-ft/yr)	20.0
Source	Well (8”x220’)
Place of Use	Sec 30 T31N R02E
Type	Community Domestic Supply – Continuous

GROUP B SYSTEM WATER RIGHTS

TEL Company 5	Water Right G1-27434P	TEL Company 10	Water Right G1-24674P	Water Right G1-25693P
Priority Date	3/14/1994	Priority Date	7/16/1973	5/3/1990
Instantaneous Withdrawal (gpm)	25.0	Instantaneous Withdrawal (gpm)	5.0	5.0
Annual Withdrawal (acre-ft/yr)	4.0	Annual Withdrawal (acre-ft/yr)	1.0	1.7
Source	Well (1)	Source	Well	Well
Place of Use	Sec 26 T29N R03E	Place of Use	Sec 2 T29N R03E	Sec 2 T29N R03E
Type	Community Domestic Supply – Continuous	Type	Community Domestic Supply – Continuous	Community Domestic Supply – Continuous

TEL Company 11	Water Right G1-25694P
Priority Date	5/8/1990
Instantaneous Withdrawal (gpm)	17.0
Annual Withdrawal (acre-ft/yr)	2.7
Source	Well
Place of Use	Sec 11 T29N R03E
Type	Community Domestic Supply – Continuous

3.3.3 *Source*

The Cascadia water systems have multiple Certificates of Water Rights from the Washington State Department of Ecology (DOE) for multiple wells serving the various water systems. Each source is equipped with the required raw water sample tap. Development of future sources should ensure that raw water sample taps are installed in accordance with the requirements of the DOH. Source types, locations, use information, and limiting conditions are summarized in Table 3-10 for Group A systems and in Table 3-11 for Group B Systems.

Table 3-10 Group A - Source Type, Location, and Use Information

W&B Waterworks 1	**Well 1**	**Well 2**	**Well 3**	**Well 4**
Source Type	Well (Non GWI)	Well (Non GWI)	Well (Non GWI)	Well (Non GWI)
DOE Tag	AGA932	AGA931	AGA930	AGA929
Source Location	Sec 22 T29N R02E	Sec 22 T29N R02E	Sec 22 T29N R02E	Sec 22 T29N R02E
Purpose of Use	Domestic Water Supply – Primary	Domestic Water Supply – Seasonal	Domestic Water Supply – Primary	Domestic Water Supply – Seasonal
Place of Use	See Water Right	See Water Right	See Water Right	See Water Right
Year of Installation	1973	1977	1984	1984
App. Capacity (gpm)	50	75	75	75
Ex. Capacity (gpm)	52	75	75	125
Pump Size (hp – gpm)	5 hp – 55 gpm	7.5 hp – 75 gpm	7.5 hp – 75 gpm	5 hp – 150 gpm
Casing Size	6”	6”	6”	8”
Ground Elev. (ft)	260	260	260	260
Bottom Well Depth (ft)	310	301	285	264
Static Water Depth (ft)	252.5	253	253	252
Top of Screen (ft)	300	291	270	262
Bottom of Screen (ft)	310	301	280	264
Drawdown (ft)	2	8	9.5	8
Sea View Water, LLC.	**Well 1**	**Well 2**	**Well 3**	**Del Bay**
Source Type	Well (Non GWI)	Well (Non GWI)	Well (Non GWI)	Well (Non GWI)
DOE Tag	AGA874	AGA875	ABR011	AGA812
Source Location	Sec 7 T32N R01E	Sec 7 T32N R01E	Sec 6 T32N R01E	Sec 9 T29N R02E
Purpose of Use	Domestic Water Supply – Primary	Domestic Water Supply – Primary	Domestic Water Supply – Primary	Domestic Water Supply – Primary
Place of Use	See Water Right	See Water Right	See Water Right	See Water Right
Year of Installation	1973	1968	1978	1962
App. Capacity (gpm)	50	50	80	37.5
Ex. Capacity (gpm)	50	50	80	n/a
Pump Size	7.5 hp – 55 gpm	7.5 hp – 55 gpm	7.5 hp – 85 gpm	3 hp
Casing Size	8”	8”	8”	6”
Ground Elev. (ft)	235	240	250	71
Bottom Well Depth (ft)	277	271	288	254
Static Water Depth (ft)	226.5	229	243	60.5
Top of Screen (ft)	267	261	277.5	n/a
Bottom of Screen (ft)	277	271	288	n/a
Drawdown (ft)	8	0	9	13’-7”

Beachcomber H_20, Co.	**Well 1**	**Well 2**
Source Type	Well (Non GWI)	Well (Non GWI)
DOE Tag	AGA901	AGA915
Source Location	Sec 33 T31N R02E	Sec 33 T31N R02E
Purpose of Use	Domestic Water Supply – Primary	Domestic Water Supply – Primary
Year of Installation	1983 (re-drill)	1983
Place of Use	See Water Right	See Water Right
App. Capacity (gpm)	66	66
Ex. Capacity (gpm)	55	55
Pump Size	7.5 hp – 55 gpm	7.5 hp – 55 gpm
Casing Size	6”	6”
Ground Elev. (ft)	300	300
Bottom Well Depth (ft)	305	445
Static Water Depth (ft)	267	262.25
Top of Screen (ft)	300	420
Bottom of Screen (ft)	305	440
Drawdown (ft)	0	11.1
Cal Waterworks	**Well 1**	**Well 2**
Source Type	Well (Non GWI)	Well (Non GWI)
DOE Tag	AGA928	AGA927
Source Location	Sec 1 T29N R02E	Sec 2 T29N R02E
Purpose of Use	Domestic Water Supply – Primary	Domestic Water Supply – Primary
Place of Use	See Water Right	See Water Right
Year of Installation	1963	1988
App. Capacity (gpm)	45	45
Ex. Capacity (gpm)	35	35
Pump Size	3 hp – 35 gpm	3 hp – 35 gpm
Casing Size	6”	6”
Ground Elev. (ft)	165	150
Bottom Well Depth (ft)	178	185
Static Water Depth (ft)	147	148.6
Top of Screen (ft)	173	174
Bottom of Screen (ft)	178	179
Drawdown (ft)	2	2.5

TEL Company 1	Well 1	Well 8	Well 9
Source Type	Well (Non GWI)	Well (Non GWI)	Well (Non GWI)
DOE Tag	AGA903	AGA814	AGA819
Source Location	Sec 4 T29N R03E	Sec 15 T29N R03E	Sec 10 T29N R03E
Purpose of Use	Domestic Water Supply – Primary	Emergency	Domestic Water Supply – Primary
Place of Use	See Water Right	See Water Right	See Water Right
Year of Installation	1979	1985	1978
App. Capacity (gpm)	40	20	20
Ex. Capacity (gpm)	35	19	19
Pump Size	5 hp – 35 gpm	2 hp – 19 gpm	2 hp – 19 gpm
Casing Size	6”	6”	6”
Ground Elev. (ft)	210	200	220
Bottom Well Depth (ft)	288	236	97
Static Water Depth (ft)	200	180	66
Top of Screen (ft)	278	225	87
Bottom of Screen (ft)	288	235	97
Drawdown (ft)	5	50	6

TEL Company 3	Well 1	Well 2
Source Type	Well (Non GWI)	Well (Non GWI)
DOE Tag	AGA858	AGA842
Source Location	Sec 22 T29N R03E	Sec 22 T29N R03E
Purpose of Use	Domestic Water Supply – Primary	Domestic Water Supply – Seasonal
Place of Use	See Water Right	See Water Right
Year of Installation	1978	1984
App. Capacity (gpm)	27	27
Ex. Capacity (gpm)	25	25
Pump Size	3 hp – 27 gpm	3 hp – 27 gpm
Casing Size	6”	6”
Ground Elev. (ft)	380	380
Bottom Well Depth (ft)	170	169
Static Water Depth (ft)	138	140
Top of Screen (ft)	165	163
Bottom of Screen (ft)	170	169
Drawdown (ft)	8	18

TEL Company 4	Well 1
Source Type	Well (Non GWI)
DOE Tag	AGA933
Source Location	Sec 30 T31N R02E
Purpose of Use	Domestic Water Supply – Primary
Place of Use	-
Year of Installation	1973
App. Capacity (gpm)	60
Ex. Capacity (gpm)	42
Pump Size	(2) 2 hp – 19 gpm
Casing Size	8”
Ground Elev. (ft)	178
Bottom Well Depth (ft)	223.0
Static Water Depth (ft)	175.8
Top of Screen (ft)	-
Bottom of Screen (ft)	-
Drawdown (ft)	-

Table 3-11 Group B - Source Type, Location, and Use Information

TEL Company 5	Well 1	TEL Company 6	Well 3
Source Type	Well (Non GWI)	Source Type	Well (Non GWI)
DOE Tag	AKY756	DOE Tag	AKY757
Source Location	Sec 26 T29N R03E	Source Location	Sec 03 T28N R03E
Purpose of Use	Domestic Water Supply – Primary	Purpose of Use	Domestic Water Supply – Primary
Place of Use	See Water Right	Place of Use	See Water Right
Year of Installation	1981	Year of Installation	1982
App. Capacity (gpm)	36	App. Capacity (gpm)	20
Ex. Capacity (gpm)	19	Ex. Capacity (gpm)	10
Pump Size	1.5 hp – 19 gpm	Pump Size	1 hp – 10 gpm
Casing Size	6”	Casing Size	6”
Ground Elev. (ft)	392	Ground Elev. (ft)	120
Bottom Well Depth (ft)	150	Bottom Well Depth (ft)	160
Static Water Depth (ft)	101	Static Water Depth (ft)	72
Top of Screen (ft)	141	Top of Screen (ft)	76
Bottom of Screen (ft)	149	Bottom of Screen (ft)	86
Drawdown (ft)	48	Drawdown (ft)	-

TEL Company 10	**Well 1**	**TEL Company 10**	**Well 2**
Source Type	Well (Non GWI)	Source Type	Well (Non GWI)
DOE Tag	AKY755	DOE Tag	BKI990
Source Location	Sec 2 T29N R03E	Source Location	Sec 2 T29N R03E
Purpose of Use	Domestic Water Supply – Primary	Purpose of Use	Domestic Water Supply – Primary
Place of Use	See Water Right	Place of Use	See Water Right
Year of Installation	1978	Year of Installation	2020
App. Capacity (gpm)	10	App. Capacity (gpm)	n/a
Ex. Capacity (gpm)	10	Ex. Capacity (gpm)	19
Pump Size	1/2 hp – 10 gpm	Pump Size	1.5 hp – 19 gpm
Casing Size	6”	Casing Size	6”
Ground Elev. (ft)	214	Ground Elev. (ft)	150
Bottom Well Depth (ft)	84	Bottom Well Depth (ft)	239
Static Water Depth (ft)	74	Static Water Depth (ft)	213
Top of Screen (ft)	79	Top of Screen (ft)	234
Bottom of Screen (ft)	84	Bottom of Screen (ft)	239
Drawdown (ft)	10	Drawdown (ft)	3
Mutiny Bay Waterworks	**Well 1**	**TEL Company 11**	**Well 3**
Source Type	Well (Non GWI)	Source Type	Well (Non GWI)
DOE Tag	APH048	DOE Tag	AKY754
Source Location	Sec 15 T29N R02E	Source Location	Sec 11 T29N R03E
Purpose of Use	Domestic Water Supply – Primary	Purpose of Use	Domestic Water Supply – Primary
Place of Use	See Water Right	Place of Use	See Water Right
Year of Installation	-	Year of Installation	1989
App. Capacity (gpm)	12	App. Capacity (gpm)	16
Ex. Capacity (gpm)	10	Ex. Capacity (gpm)	12
Pump Size	1 hp – 10 gpm	Pump Size	1 hp – 10 gpm
Casing Size	-	Casing Size	6”
Ground Elev. (ft)	86	Ground Elev. (ft)	150
Bottom Well Depth (ft)	192	Bottom Well Depth (ft)	135
Static Water Depth (ft)	93	Static Water Depth (ft)	100
Top of Screen (ft)	-	Top of Screen (ft)	120
Bottom of Screen (ft)	-	Bottom of Screen (ft)	135
Drawdown (ft)	-	Drawdown (ft)	10

DOH requirements for ground water sources specify that the well shall be located, constructed and maintained in a manner which will ensure the minimum possibility of contamination, and be so situated and developed as to prevent surface water from entering the well. Each source is installed with an individual dedicated sampling tap. To ensure adequate sanitary control in the vicinity of the well, the water systems must control all land within a radius of 100-feet of the well, except that the systems shall

control land of a greater or lesser size or of a different shape than is defined by a 100-foot radius where an evaluation of geological and hydrological data, well construction details, and other relevant factors indicates that a control area of different size or shape will assure adequate sanitary control in the vicinity of the well. Bacteriological, chemical and physical water quality requirements are discussed in Section 3.1.1 in conjunction with a brief analysis of the treatment needs for existing sources.

3.3.3.1 *Current Facility Age and Estimate of Future Life Expectancy*

The groundwater wells that serve as sources for the various water systems served by Cascadia vary in age from 30-years to 56-years. Wells in excess of 50-years old should be considered to be nearing the end of their useful life and in need of replacement. These wells should be evaluated for their current condition and the availability of redundant sources in each particular water system to determine timelines and priorities for replacement.

Depending on the operating conditions of the well pumps (i.e., if the head/flow and cycle times are within manufacturer recommendations), the well pumps should last through the Phase I planning cycle. However, as submersible pumps may fail without much warning, it is recommended that documentation on the installed submersible pumps and adequate reserves be kept on hand to fund and facilitate an emergency well pump replacement.

3.3.3.2 *Condition and Capacity of Transmission Mains*

The transmission mains from groundwater wells to the reservoirs appear to be in good condition; however, the yard piping at the reservoir sites are not well documented. As-built drawings should be created for each water system to indicate the location of piping and valves.

3.3.4 *Treatment*

The only system owned and operated by Cascadia that provides treatment for source water is Sea View Water, LLC. The other systems are not providing treatment for their source water currently. The Capital Improvements Plan includes the addition of treatment for many of the Group A systems as outlined in Table 3-26.

Sea View Water, LLC. currently treats their source water for the removal of iron and manganese. The system oxidizes with potassium permanganate and chlorine and uses a catalytic filtration media for removal of the contaminates. Source 1 (Wells #1 and #2) uses two (2) 48-inch diameter pressure filters with a flow rate of 60-gpm per filter. Backwash is automatic, controlled by a timer which can be set to provide optimum frequency of backwashing. A chemical feed pump introduces a supersaturated solution of potassium permanganate ($KMnO_4$) and sodium hypochlorite into the feed line between the wells and the filters.

Source 2 (Well #3) uses three (3) 42-inch diameter pressure filters with a flow rate of 50-gpm per filter. Backwash is automatic with each filter staggered for each filter allowing continual use. Backwash is controlled by a timer which can be set to provide optimum frequency of backwashing with each filter. As with source 1, a solution of $KMnO_4$ and sodium hypochlorite is fed into the raw water line between the wells and the filters.

3.3.5 *Storage*

Water storage is necessary for multiple reasons. These reasons include an adequate storage volume to meet the daily fluctuations in demand, a sufficient volume to allow adequate runtime for pumps and the treatment system(s), an emergency reserve in case the supply system should fail, and to provide a large volume water for potential firefighting needs.

The capacity for each individual system was analyzed to determine the necessary storage volumes associated with each reservoir. A complete set of calculations are included in APPENDIX L. The following storage components were analyzed and reported:

- Operational Storage (OS)
- Equalizing Storage (ES)
- Standby Storage (SBS)
- Fire Suppression Storage (FSS)
- Dead Storage (DS)

Operational storage is the height difference between where the well pumps are turned on and off. Equalizing storage is defined as the volume of storage needed to supplement the sources when the peak hourly demand exceeds the total source pumping capacity. Stand-by storage is defined as the volume of stored water available for use during a loss of well production, such as from a power interruption, well pump failure, or similar short-term emergency. Fire suppression storage is the required volume of stored water available for firefighting purposes as determined by the local fire protection authority or county fire marshal. Dead storage is the portion of the reservoir that is not usable for storage. Dead storage includes the volume at the top that is needed for installation of the overflow pipe and the offset at the bottom of the tank that is used for silt accumulation. The storage components are calculated in Section 3.4.6 and its related subsections.

All of the Cascadia systems discussed in this Water System Plan provide storage aside from the Group B water system TEL Company 6. A summary of the storage facilities for each system are provided in Table 3-12.

Table 3-12 Storage Facilities

Volume (gallons)	Height (feet)	Material	Shape	Year Built	Location
W&B Waterworks 1					
57,300	12.0	Concrete	Octagonal	1975	Roy Rd
57,300	12.0	Concrete	Octagonal	1984	Roy Rd
Sea View Water					
30,000	12.0	Concrete	Square	1973	Source 1
30,000	12.0	Concrete	Octagonal	1979	Source 2
Beachcomber H_20, Co.					
34,000	35.0	Concrete	Circular	1986	Mastodon Dr
55,000	55.0	Concrete	Circular	1970	Mastodon Dr
CAL Waterworks					
40,000	12.0	Concrete	Octagonal	1971	Easement
TEL Company 1					
60,200	14.5	Corrugated Steel Stave	Circular	1980	TEL 1 Inglewood
6,000	17.0	Steel	Circular	1980	TEL 9
TEL Company 3					
23,000	12.0	Concrete	Octagonal	1984	Easement
TEL Company 4					
25,000	10.0	Concrete	Square	1987	Donahey Rd
TEL Company 5					
2,745	8.0	Polyethylene	Circular	2005	Cliffordsville
2,745	8.0	Polyethylene	Circular	2005	Cliffordsville
TEL Company 10					
2,745	8.0	Polyethylene	Circular	1990	Welcome Rd
TEL Company 11					
2,745	8.0	Polyethylene	Circular	1996	Meander Ln

3.3.5.1 *Current Facility Age and Estimate of Future Life Expectancy*

Concrete Storage Reservoirs typically have a 50 to 70-year anticipated service life. The concrete reservoirs serving the various water systems served by Cascadia vary in age from 33-years to 49-years. Reservoirs in excess of 50-years old should be considered to be nearing the end of their useful life and in need of replacement. The reservoirs should be routinely inspected for leaks and cracking. The square and octagonal reservoirs are especially susceptible to cracking at the corners. The availability of multiple reservoirs for a particular water system is a factor in prioritizing possible reservoir replacement.

3.3.6 *Distribution*

Mains throughout the systems are tapped for the individual service connections. The following sections provide additional details on the distribution system.

3.3.6.1 Length, Diameter, and Type of Pipe

A comprehensive inventory of each system, including distribution system piping, is provided in APPENDIX O. The system Standard Specifications provided in APPENDIX N require Schedule C-900 PVC or ductile iron pipe for new extensions and replacements. The distribution systems will continue to strive to increase the service capacity of the distribution system and complete loops to provide a more reliable and efficient distribution system. Looping of the water mains also reduces stagnant water and dead-end lines which improve water quality via increased circulation.

3.4 Capacity Analysis

The system capacity was calculated in accordance with the DOH Water System Design Manual (October 2019) using the equations/procedures in Chapter 4: Water System Capacity Analysis.

The capacity calculations are based on the accepted design values as outlined in Table 2-3 and Table 2-4 for both Average Daily Demand (ADD) and Maximum Daily Demand (MDD). The capacities were calculated and expressed in terms of Equivalent Residential Units (ERUs) based on existing system parameters. System consumption data, including ADD and MDD expressed in terms of gallons per day per ERU, were used throughout the system capacity calculations.

This updated Water System Plan provides an analysis of the existing capacities for each of the Group A and Group B systems served by Cascadia on Whidbey Island to support an increase in the approved number of connections as noted in this WSP. Full calculations for each capacity analysis are included in APPENDIX L.

3.4.1 *Water Right Capacity Based on Annual Volume*

The water rights for each system allow for a specified annual withdrawal as noted in Section 3.3.2. The equation below is provided in the Design Manual to determine the number of ERUs based upon Average Daily Demand (ADD) and water right. The number of ERUs that can be supported by each system's water right based on ADD is provided in Table 3-13.

Equation 4-4b:

$$\mathrm{N} = \frac{(Q_a)}{(ERU_{ADD})(365)}$$

N = ERUs Supported
Q_a = Annual Volume (gallons/year)
ERU_{ADD} = ADD value per ERU (Section 2.1.4)

Table 3-13 Capacity based on Water Rights and ADD

System*	Q_a (gal/yr)	ADD (gpd/ERU)	N (ERUs)
W&B Waterworks 1	48,874,320	220	609
Sea View Water	21,178,872	150	387
Beachcomber H_2O	20,559,797	160	352
CAL Waterworks	17,594,755	210	230
TEL Company 1	12,511,826	260	132
TEL Company 3	12,218,580	190	176
TEL Company 4	6,516,756	280	64
TEL Company 5	1,303,315	160	22
TEL Company 6 *	-	-	-
TEL Company 10	879,738	190	13
TEL Company 11	879,738	160	15

*TEL 6 does not have a water right and is limited to less than 5,000-gallons per day.

3.4.2 *Water Right Capacity Based on Instantaneous Flow*

The water rights for each of the water systems also allows for an instantaneous pumping rate as specified in Section 3.3.2. The equation below provided in the Design Manual to determine the number of ERUs based upon Maximum Daily Demand (MDD) and water right.

Equation 4-4a:

$$\mathrm{N} = \frac{(Q_i)}{(ERU_{MDD}/1440)}$$

N = ERUs Supported
Q_i = Instananous Allowed Pumping Rate (gallons/minute)
ERU_{MDD} = MDD value per ERU (Section 2.1.5)

Table 3-14 Capacity based on Water Rights and MDD

System*	Q_i (gpm)	t_d (min/day)	MDD (gpd/ERU)	N (ERUs)
W&B Waterworks 1	225	1,440	625	518
Sea View Water	100	1,440	420	343
Beachcomber H_2O	78	1,440	350	321
CAL Waterworks	90	1,440	530	245
TEL Company 1	80	1,440	920	125
TEL Company 3	80	1,440	560	206
TEL Company 4	25	1,440	790	46
TEL Company 5	20	1,440	960	30
TEL Company 6	5,000*		670	7
TEL Company 10	7	1,440	630	16
TEL Company 11	17	1,440	390	63
*TEL 6 is limited to a maximum of 5,000 gallon per day based upon the water right exemption criteria.				

3.4.3 *Source Capacity Based on Maximum Day Demand*

The Design Manual Section 4.4.2.7 also outlines the evaluation procedure to the number of ERUs that can be supported based upon source capacity and MDD. The Design Manual provides the equation shown below for this evaluation.

Equation 4-3:

$$N = \frac{\sum(Q_i)(t_i)}{ERU_{MDD}}$$

N = ERUs Supported
Q_i = Delivery rate of source (gallons per minute)
t_i = Time that the source (Qi) delivers flow based on 20 hours per day (1,200 minutes)
ERU_{MDD} = MDD value per ERU (Section 2.1.5)

Table 3-15 Capacity based on Source Capacity and MDD

System*	Q_i (gpm)	t_i (minutes)	MDD (gpd/ERU)	N (ERUs)
W&B Waterworks 1	275	1,200	625	528
Sea View Water	180	1,200	420	514
Beachcomber H_2O	132	1,200	350	453
CAL Waterworks	90	1,200	630	204
TEL Company 1	80	1,200	920	104
TEL Company 3	54	1,200	560	116
TEL Company 4	60	1,200	790	91
TEL Company 5	36	1,200	960	45
TEL Company 6	20	1,200	670	36
TEL Company 10	10	1,200	630	19
TEL Company 11	16	1,200	390	49

Section 3.10.4 of the Design Manual recommends against designs based on pumping a source 24-hours per day. Rather, assessing source capacity based on an assumption of pumping the source no more than 20 hours per day provides a factor of safety and an increased ability to meet unexpected demands. Therefore, the number of ERUs that can be supported by each systems source is shown in Table 3-15.

3.4.4 *System Capacity Based on Treatment Capacity*

Currently the only system providing treatment is Sea View Water, LLC. Equation 4-3 from the Design Manual was used to evaluate the allowable ERUs associated with the treatment capacity and MDD.

Equation 4-3:

$$\mathrm{N} = \frac{\sum(Q_i)(t_i)}{ERU_{MDD}} = \frac{(270gpm)(24\ hrs)}{420\ gpd/ERU} = 926\ ERUs$$

N = ERUs Supported
Q_i = Treatment Capacity (gallons per minute)
t_i = Time that the treatment system is available to treat source water in a 24-hour period (minutes)
ERU_{MDD} = MDD value per ERU (Section 2.1.5)

The total treated system capacity of 270-gallons per minute could support 926 ERUs.

3.4.5 *System Capacity Based on Booster Pump Capacity*

Booster pumps are needed to meet the system peak hour demand in pressurized distribution systems. Equation 3-1 may be used to determine the number of ERUs available based on booster pump capacity. Table 3-16 outlines the capabilities of the booster pumps to support the available ERUs. A full set of calculations for system capacity for each water system can be found in APPENDIX L.

Equation 3-1:

$$N = \frac{\left[\frac{1440(PHD - 18)}{MDD - F}\right]}{C}$$

Where: N = Number of ERUs
PHD = Peak Hour Demand, (gallons/minute) (Booster Pump Capacity)
MDD = Maximum Daily Demand per ERU (gpd/ERU)
F = PHD Coefficient from Table 2-5
C = PHD Coefficient from Table 2-5

Table 3-16 Capacity Based on Booster Pump Production

System	Q_b (gpm)	F	C	MDD (gpd/ERU)	N (ERUs)
W&B Waterworks 1	80	125	1.8	625	99
Sea View Water	277	225	1.6	420	1,195
Beachcomber H2O	105	225	1.6	350	626
CAL Waterworks	366	225	1.6	530	450
TEL Company 1	350	225	1.6	920	430
TEL Company 3	155	0	3.0	560	117
TEL Company 4	Gravity Distribution				
TEL Company 5	48	0	3.0	960	15
TEL Company 6	20	0	3.0	670	1
TEL Company 10	37.5	0	3.0	630	15
TEL Company 11	37.5	0	3.0	390	24

Each water system except TEL Company 6 has enough capacity to adequately serve the connections supported by the booster/well pumps. A capital improvement plan for TEL Company 6 has been provided to address the noted deficiency.

Fire flow requirements are not included in the above analysis since the systems were not required to provide fire flow when initially established. The systems noted above do not have fire flow capacity in their pressurized distribution systems. The Island County requirement for residential fire flow is set at 500 gpm. Capital improvement projects have been developed to support the addition of fire flow capacity in the larger systems as the booster pump systems are upgraded or replaced.

3.4.6 *System Capacity Based on Existing Storage Volumes*

The Water storage is necessary for multiple reasons. These reasons include an adequate storage volume to meet the daily fluctuations in demand, a sufficient volume to allow adequate runtime for pumps and the treatment system(s), an emergency reserve in case the supply system should fail, and to provide a large volume water for potential firefighting needs.

The capacity for each individual system was analyzed to determine the necessary storage volumes associated with each reservoir. A complete set of calculations are included in APPENDIX L. The following storage components were analyzed and reported:

- Operational Storage (OS) – Section 3.4.6.1
- Equalizing Storage (ES) – Section 3.4.6.2
- Standby Storage (SBS) – Section 3.4.6.4
- Fire Suppression Storage (FSS) – Section 3.4.6.5
- Dead Storage (DS) – Section 3.4.6.3

Operational storage is the height difference between where the well pumps are turned on and off. Equalizing storage is defined as the volume of storage needed to supplement the sources when the peak

hourly demand exceeds the total source pumping capacity. Stand-by storage is defined as the volume of stored water available for use during a loss of well production, such as from a power interruption, well pump failure, or similar short-term emergency. Fire suppression storage is the required volume of stored water available for firefighting purposes as determined by the local fire protection authority or county fire marshal. Dead storage is the portion of the reservoir that is not usable for storage. Dead storage includes the volume at the top that is needed for installation of the overflow pipe and the offset at the bottom of the tank that is used for silt accumulation. The storage capacity of each system is discussed in the following subsections.

3.4.6.1 Operational Storage

Operational Storage (OS) is the amount of volume that is needed to supply the system when the well pumps are off. This prevents the excess cycling of well pumps, in a similar manner that bladder tanks provide pump protection. For the Group A systems, it is assumed that six inches of elevation difference exists between the well pump on and off signals. Operational storage is sized to limit the number of well pump starts to six per hour. The OS for Group B systems is also sized to limit well pumps to no more than six starts per hour, the minimum OS value is calculated as the pump supply capacity times 2.5 minutes.

The OS is calculated as follows for the distribution system storage as show in the equation below. Corresponding OS for each Group A Water System is provided in Table 3-17.

Equation:

$OS = (\Delta H)(V/H)$

ΔH = Change in height between well on and off operations (feet)

V = Total volume of storage reservoir (gallons)

H = Total Height of storage reservoir (feet)

Table 3-17 Operating Storage

System	ΔH (feet)	V (gallons)	H (feet)	OS (gallons)
Group A Systems				
W&B Waterworks 1	0.5	114,634	12	4,776
Sea View Water, LLC	0.5	58,509	10	2,925
Beachcomber H2O Co	0.5	102,985	30	1,237
CAL Waterworks	0.5	41,200	12	1,717
TEL Company 1	0.5	61,474	14	2,279
TEL Company 3	0.5	23,500	10	1,175
TEL Company 4	0.5	23,115	10	1,156
Group B Systems				
TEL Company 5	0.5	5,000	8.0	300
TEL Company 6	-	0	-	-
TEL Company 10	0.5	3,000	8.0	188
TEL Company 11	0.5	3,000	8.0	188

3.4.6.2 Equalizing Storage

Equalizing Storage (ES) is the volume of water that is needed to meet the peak demand period for the water system. ES is calculated for Group A systems from Equation 7-1 of the DOH Water System Design Manuel, 2019 edition:

ES (gallons) = (PHD-Qs) x 150 minutes

Where:

PHD = peak hour demand (Section 2.1.6 above);
Qs = well pump capacity,

ES for Group B water systems is determined using Equation 7-1 and Table 7.1 of the Group B Water System Design Guidelines (DOH 331-468) but must be greater than 0.

ES (gallons) = (PHD-Qs) x T

Where:

PHD = peak hour demand (Section 2.1.6 above);
Qs = well pump capacity,
T = minutes (determined from Table 7-1)

The required equalizing storage for each Group A system is outlined in Table 3-18 with results shown for the current approved connection capacity and the maximum potential capacity of the system as established in APPENDIX L. The required equalizing storage for the Group B systems is outlined in Table 3-19 with results shown for the current number of approved ERUs and the maximum number of ERUs that the system can support based on the current approved connection capacity.

Table 3-18 Equalizing Storage Capacity Requirements – Group A Systems

N (ERUs)	PHD (gpm)	Q_s (gpm)	ES Volume (gallons)	Depth
W&B Waterworks 1				
471	440	225	32,283	3.4
Sea View Water, LLC				
210	162	100	9,356	1.6
Beachcomber H2O Co				
159	114	78	5,328	2.2
CAL Waterworks				
146	153	90	9,461	2.8
TEL Company 1				
99	192	80	16,815	3.7
TEL Company 3				
50	76	30	6,950	3.0
TEL Company 4				
44	90	25	9,813	4.2

Table 3-19 Equalizing Storage Capacity Requirements – Group B Systems

N (ERUs)	PHD (gpm)	Q_s (gpm)	ES Volume (gallons)	Depth
TEL Company 5				
14	46	36	1,500	2.5
TEL Company 6				
7	36	20	1,360	-
TEL Company 10				
9	41	10	3,040	-
TEL Company 11				
9	41	16	2,450	-

TEL Companies 6, 10, 11 do not currently have the installed reservoir storage capacity indicated in Table 3-19. These deficiencies are further addressed in Section 3.5.3.

3.4.6.3 Dead Storage

Dead Storage (DS) is the unusable volume at the top and bottom of the tank. Approximately six inches (6”) is provided at the top for the overflow pipe (freeboard) and additional six inches (6”) at the bottom of the tank. Therefore, a total of twelve inches (12”) or one foot (1.0’) of dead storage is provided. The dead storage assumed for each system is provided in the capacity calculations included in APPENDIX L.

3.4.6.4 Standby Storage

Standby storage (SBS) is the volume of water that would be needed to supply the system in case of a problem with the source. The volume is based on consumer expectations and can be assumed to be the amount of storage not already utilized.

SBS = Total Reservoir capacity – OS – ES – DS

The minimum recommended volume is 200 gallons per ERU. Table 3-20 provides values for both the recommended standby storage, the available standby storage, and the gallons available per ERU for both the currently approved number of ERUs and the maximum potential capacity of the system as established in APPENDIX L.

Table 3-20 Standby Storage Capacity – Group A Systems

Water System Name	N (ERUs)	Recommended Standby Storage (gallons)	Depth	Available Standby Storage (gallons)	Depth	Available Gallons per ERU	Min Standby Storage Met?
W&B Waterworks	518	103,600	10.8	68,022	7.1	131	No
Sea View Water	210	42,000	7.2	40,376	6.9	192	No
Beachcomber H2O	159	31,800	12.9	93,947	38.0	591	Yes
CAL Waterworks	146	29,200	8.5	26,589	7.7	182	No
TEL Company 1	99	19,800	4.3	37,821	8.3	382	Yes
TEL Company 3	50	10,000	4.3	13,024	5.5	260	Yes
TEL Company 4	44	8,800	3.8	9,835	4.3	224	Yes

As indicated in Table 3-20, the standby storage is below the recommended minimum storage at the calculated capacity for both W&B Waterworks 1 and Sea View Water. During the public meeting held to discuss this Water System Plan it was noted that W&B Waterworks and Sea View Water consumers accepted a reduced standby storage volume and would implement water conservations measures during emergency situations. Standby storage should be evaluated and increased as storage reservoirs are repaired or replaced as part of future system improvements. W&B Waterworks has plans to replace its reservoir with a larger reservoir sufficient sized to supply adequate standby storage capacity.

Standby Storage is not required for Group B systems, however, various Cascadia Group B systems have SBS available as indicated in Table 3-21.

3.4.6.5 Fire Suppression Storage

WB Waterworks 1 is the lone system that currently has fire flow capacity. The other systems are not currently required to provide fire flow. For future planning purposes the reservoir capacity for each system was analyzed to determine if fire suppression storage requirements could be met. Residential fire flow requirements are 500-gpm for 30-minutes, equating to 15,000-gallons of storage. Fire suppression storage can be nested with standby storage. The Group A water systems discussed in this plan provide sufficient standby storage for nested fire flow storage except for TEL Company 3 and TEL Company 4. Storage capacities should be evaluated as reservoirs are replaced in upcoming planning phases as discussed in Chapter 8.

3.4.6.6 Storage Summary

The provided storage volumes (assuming the maximum potential capacity of the system as established in APPENDIX L) are summarized in the Table 3-21 below.

Table 3-21 Storage Components

Component	Volume (gallons)	Equivalent Height (feet)
W&B Waterworks 1		
Top Dead Storage	4,776	0.5
Operational Storage	4,776	0.5
Equalizing Storage	32,283	3.4
Standby Storage	68,022	7.1
Fire Suppression (nested with SB)	(15,000)	(1.6)
Bottom Dead Storage	4,776	0.5
Total	**114,634**	**12.0**
Sea View Water, LLC		
Top Dead Storage	2,925	0.5
Operational Storage	2,925	0.5
Equalizing Storage	9,356	1.6
Standby Storage	40,376	6.9
Fire Suppression (nested with SB)	(15,000)	(2.6)
Bottom Dead Storage	2,925	0.5
Total	**58,509**	**10.0**
Beachcomber H2O Co		
Top Dead Storage	1,237	0.5
Operational Storage	1,237	0.5
Equalizing Storage	5,328	2.2
Standby Storage	93,947	38.0
Fire Suppression (nested with SB)	(15,000)	(6.1)
Bottom Dead Storage	1,237	0.5
Total	**102,985**	**41.6**
CAL Waterworks		
Top Dead Storage	1,717	0.5
Operational Storage	1,717	0.5
Equalizing Storage	9,461	2.8
Standby Storage	26,589	7.7
Fire Suppression (nested with SB)	(15,000)	(4.4)
Bottom Dead Storage	1,717	0.5
Total	**41,200**	**12.0**
TEL Company 1		
Top Dead Storage	2,279	0.5
Operational Storage	2,279	0.5
Equalizing Storage	16,815	3.8
Standby Storage	37,821	8.6
Fire Suppression (nested with SB)	(15,000)	(3.3)

Bottom Dead Storage	2,279	0.5
Total	**61,474**	**14.0**
TEL Company 3		
Top Dead Storage	1,175	0.5
Operational Storage	1,175	0.5
Equalizing Storage	6,950	5.2
Standby Storage	13,024	5.5
Fire Suppression (nested with SB)	(5,874)	(2.5)
Bottom Dead Storage	1,175	0.5
Total	**23,499**	**10.0**
TEL Company 4		
Top Dead Storage	1,156	0.5
Operational Storage	1,156	0.5
Equalizing Storage	9,813	4.2
Standby Storage	9,835	4.3
Fire Suppression (nested with SB)	(3,820)	(6.5)
Bottom Dead Storage	1,156	0.5
Total	**23,115**	**10.0**
TEL Company 5		
Top Dead Storage	600	1.0
Operational Storage	300	0.5
Equalizing Storage	1,500	2.5
Standby Storage	2,305	3.8
Bottom Dead Storage	300	0.5
Total	**5,005**	**8.0**
TEL Company 6		
No storage reservoir.		
TEL Company 10		
Top Dead Storage	375	1.0
Operational Storage	188	0.5
Equalizing Storage	2,250	6.0
Standby Storage	0	0
Bottom Dead Storage	188	0.5
Total	**3,000**	**8.0**
TEL Company 11		
Top Dead Storage	375	1.0
Operational Storage	188	0.5
Equalizing Storage	2,250	6.0
Standby Storage	0	0
Bottom Dead Storage	188	0.5
Total	**3,000**	**8.0**

3.4.6.7 Water Age and Turnover

Water age may sometimes become a problem in storage reservoirs, especially when the system is not at its maximum design capacity. The average age of water in each system's reservoir(s) is calculated based

upon the lowest recorded monthly average day demand in the Water Use Data provided in the Capacity Calculations included in APPENDIX L and the currently existing number of ERUs. The calculation for water age is provided as follows:

$$\text{Water Age} = \frac{\text{Storage Volume}}{\text{ADD} \times \text{ERUs}}$$

Table 3-22 Water Age

Water System	ADD (gpd/ERU)	ERUs	Storage Vol. (gallons)	Days
Group A Systems				
W&B Waterworks #1	75	456	105,000	3.1
Sea View Water LLC.	110	190	53,000	2.5
Beachcomber H20 Co.	62	128	72,000	9.0
CAL Waterworks	107	114	38,000	3.1
TEL Company 1	120	73	57,000	6.5
TEL Company 3	108	24	21,000	8.1
TEL Company 4	69	29	21,000	10.5
Group B Systems				
TEL Company 5*	160	14	5,005	2.2
TEL Company 6	No Reservoir			
TEL Company 10	97	9	3,000	3.4
TEL Company 11	104	9	3,000	3.2

*Water usage data unavailable for TEL Company 5.

It is recommended that complete turnover of water should occur at least every three to five days. Systems with complete turnover over 5 days, as shown in Table 3-22, should consider installing an aeration system or a recirculating pump to increase in turnover, if complaints are received during months will lower usage.

3.4.7 *Hydraulic Analysis of Distribution Systems*

Hydraulic analyses were done for each water system using the hydraulic modeling software EPANET 2.2. The model uses the Hazen-Williams equation was used to estimate head-losses throughout the system. The hydraulic model is a single-timestep model that analyzes each system at an instant in time rather than over a period of time.

Each system is either pressurized by storage reservoirs (gravity systems), or by a booster station (pressure systems). Pressure systems were modelled starting after the booster pumps and then to the rest of the distribution system; booster pumps were not modelled or analyzed as a part of the hydraulic analysis. Therefore, only the distribution system capacity was modelled.

Elevations at each node within the models were estimated using the Island County Topographic Map which has contours of 5 ft. Therefore, the accuracy of the elevations of the nodes within each model are expected to be within 5 ft. Lengths of pipe segments were estimated to the nearest 10-feet using scaled project drawings and Island County GIS Maps.

The hydraulic analysis for each system includes a PHD scenario and a fire-flow (FF) scenario. The PHD scenario models the system at PHD, which is the maximum flow rate that the system is expected to undergo during normal operation. Per the DOH Water System Design Manual, waters systems are required to be capable of providing the PHD to the system while maintaining a required minimum pressure at all service connections.

Expanding water systems need to be capable of supplying fire flow. Island County Municipal Code Section 13.03A.100 specifies that the fire flow requirement for residential developments is 500-gpm for 30-minutes. In accordance with the Design Manual, systems should be capable of providing fire flow during MDD while supplying a minimum pressure of 20-psi at all service location. While the distribution systems are not currently required to provide fire flow, each system was modelled at MDD and FF to determine if the distribution system can meet minimum pressure of 20-psi so that future improvements can be properly sized and to assess needed system improvements more accurately.

PHD and MDD values were taken from Table 2-6. The flow rates for PHD and MDD were distributed across the entire system based on the number of connections. The 500-gpm demand from FF was placed on a single node, representing an existing or potential fire hydrant, in the system. Model results are summarized in Table 3-23. The results for each water system are discussed in the following paragraphs and detailed in APPENDIX M.

Table 3-23 Hydraulic Model Results Summary

Water System	PHD Scenario		Fire Flow Scenario	
	Lowest Pressure[A]	Pass/Fail[B]	Lowest Pressure[A]	Pass/Fail[C]
W&B Waterworks 1	31 psi	Pass	< 0 psi	Fail
Sea View Water Company	35 psi	Pass	13 psi	Fail
Beachcomber H2O:				
Gravity System	33 psi	Fail	13 psi	Fail
Pressure System	39 psi	Pass	n/a	n/a
CAL Waterworks	< 0 psi	Fail	< 0 psi	Fail
TEL Company 1	25 psi	Fail	11 psi	Fail
TEL Company 3	30 psi	Pass	n/a	n/a
TEL Company 4	36 psi	Pass	n/a	n/a

[A]The lowest pressures are taken from nodes where there is a service connection.
[B]Minimum pressure for the PHD scenario is 30-psi.
[C]Minimum pressure for the Fire Flow scenario is 20-psi.

All systems failed the FF scenario. This is mostly due to small water mains that do not have the capacity to convey fire flow. For future distribution system improvements, all water mains providing flow to an existing or proposed fire hydrant should have a minimum diameter of 6-inches.

3.4.7.1 W&B Waterworks 1: Hydraulic Model Results and Discussion

The estimated lowest pressure that occurs at a service connection during the PHD scenario for this water system was 31-psi. Therefore, this system meets the minimum pressure requirements for the PHD scenario.

The system has the storage and elevation necessary for the gravity portions of the system to provide the requisite fire flow. However, the southwest portion of the system have water mains that are too small to convey the full 500-gpm. When fire flow is modeled along Bay Road, the 4-inch lines surpass their flow capacity resulting in the negative pressures. The 4-inch service main down Ebb Tide Lane and Bay Road should be increased to 6-inch diameter pipes when those sections are replaced. This is identified in the Medium Term in the capital improvement project 11 for W&B Waterworks 1 in Table 3-26.

3.4.7.2 Sea View Water: Hydraulic Model Results and Discussion

According to the hydraulic model, the lowest service pressure in the Sea View Water Company is 35-psi which meets PHD minimum pressure requirements.

The system has the storage necessary for fire suppression, but the booster pump facilities and 4-inch water mains are not currently sized for FF and MDD capacity resulting in reduced pressures at the service locations shown in the model. Future improvements to the pumphouse and distribution system should be sized for fire flow. All water mains serving existing or potential fire hydrant locations should be increased to 6-inch diameter pipes. In addition, the booster pump system needs to increase in capacity to provide the flows required during a FF and MDD scenario. The booster pump system has been identified as capital improvement project number 4 in Table 3-26.

3.4.7.3 Beachcomber H2O: Hydraulic Model Results and Discussion

The Beachcomber H20 water system includes both a gravity zone and a pressure zone. The gravity zone is pressurized by a taller 55,000-gallon reservoir while the pressure zone is served by a smaller 34,000-gallon reservoir which feeds a booster pump station which pressurizes the system. Both zones were analyzed separately. Separate PHD values were calculated for each zone using Equation 2-1 and Table 2-5 using an MDD value of 300 gpd/ERU from Table 2-6.

The pressure zone, which has a total of 110 lots, is estimated to have a maximum PHD of 79 gpm. The lowest pressure within the pressure zone during PHD was found to be 39-psi, which is compliant with DOH minimum pressure of 30-psi. The gravity zone, which has a total of 82 lots, has an estimated maximum PHD of 66-gpm. The lowest service pressure in the existing distribution system during the PHD scenario is 33-psi.

If the gravity system is expanded to serve Banning Place at the far North of the system, then the service pressures at this location will be below the minimum recommended pressure of 30-psi. If the system is expanded to this area the system pressures will need to be increased either by a taller reservoir or a booster pump system for this portion of the service area. The system pressures along Hidden Beach Drive are higher than is recommended for service connections (120-psi). Capital improvement project 7 for Beachcombers H2O in Table 3-26 addresses this item.

The fire flow is provided by the Gravity system. All service connections have pressure over 20-psi aside from the hydrant located at the intersection of North Bluff Road and Black Fin Road and the next hydrant located approximately 800-feet south on North Bluff Road. These lower pressures can be addressed by capital improvements project 3 for Beachcombers H2O in Table 3-26.

3.4.7.4 CAL Waterworks: Hydraulic Model Results and Discussion

The hydraulic analysis resulted in negative pressures for the PHD scenario for CAL Waterworks. This means that the distribution system does not have the capacity to meet PHD. These pressure losses are due to an incomplete loop of the distribution system between Beachwood Drive and Harbor Sands Lane. Once looped, the system is capable of providing adequate pressures to all portions of the system.

Capital improvement project 1 for CAL Waterworks in Table 3-26 addresses this system deficiency. There are immediate plans to complete this project.

The system does not have the booster pump capacity to provide fire flow if the system was to be expanded. When capital improvement projects 2 and 4 for CAL Waterworks in Table 3-26 are designed and installed they should be sized to address desires for fire flow capacity. Additionally, any future water main replacement or installation projects for lines that will serve fire hydrants should have a minimum pipe diameter of 6-inches.

3.4.7.5 TEL Company 1: Hydraulic Model Results and Discussion

The TEL Company 1 water system which has a booster station with pressure settings of 40/60 psi did not meet the 30-psi minimum pressure during the PHD scenario. The lowest pressure on the system during the PHD scenario was 25-psi which occurs at the node with the highest elevation. The model results show that the distribution system has capacity to convey PHD, but the booster station which has a pressure setting of 40/60 psi does not provide enough pressure to meet the minimum pressure requirements.

System pressures in the distribution system will be modified to provide the requisite minimum pressures. In order to provide fire flow capacity, the booster pump system will need to increase in capacity. The necessary projects to complete the system modifications are addressed in projects 3 and 10 in Table 3-26 for TEL Company 1. In addition, the reservoir replacement, project number 4, should be sized to provide adequate storage for full system buildout including standby and fire storage requirements.

3.4.7.6 TEL Company 3: Hydraulic Model Results and Discussion

The hydraulic model results show that the TEL Company 3 has the capacity to meet the minimum pressure of 30-psi during PHD with the lowest service pressure at 30-psi.

The system is not expected to expand so fire flow is not anticipated to be a future requirement. At a minimum, when future improvements are completed for TEL Company 3 the pumphouse should be sized to provide adequate room for an increase in booster pump and pressure tank capacity.

3.4.7.7 TEL Company 4: Hydraulic Model Results and Discussion

The hydraulic model results show that distribution system for the TEL Company 4 is capable of meeting minimum pressures during PHD with the lowest service pressure at 36-psi.

The system is not expected to expand so fire flow is not anticipated to be a future requirement. At a minimum, when future improvements are completed for TEL Company 4 the reservoir should be sized to provide adequate standby and fire suppression storage. In addition, the future pumphouse should be sized to provide adequate room for an increase in booster pump and pressure tank capacity, if required.

3.4.8 *Summary of System Capacities*

An analysis of each water systems' components, water rights and well capacities were performed to determine the factors that limited the system and to what extent the system was limited. A full set of calculations are provided in APPENDIX L. The results are summarized in Table 3-24 with the limiting factor for each system highlighted in green.

Table 3-24 Connection Limiting Factors

Systems	Annual Water Right (Q_a & ADD)	Instant. Water Right (Q_{di} & MDD)	Instant. Source Production (Q_i & MDD)	Treatment System (Q_i & MDD)	Standby Storage Capacity (SB_A/SB_i) [C]	Booster Pumps (Q_b & MDD)
Group A Systems						
W&B Waterworks	609	518	528	N/A	140/340	99[B]
Sea View Water	387	343	514	926	150/202	1,195
Beachcomber H_2O	352	321	453	N/A	469	626
CAL Waterworks	230	245	204	N/A	150/132	450
TEL Company 1	132	125	104	N/A	189	430
TEL Company 3	176	206	116	N/A	65	117
TEL Company 4	64	46	91	N/A	49	N/A
Group B Systems						
TEL Company 5	22	30	45	N/A	N/A	15
TEL Company 6[A]	N/A	N/A	36	N/A	N/A	1
TEL Company 10	13	16	19	N/A	N/A	15
TEL Company 11	15	63	49	N/A	N/A	24

[A] TEL Company 6 does not have a water right and has a groundwater permit exemption that allows domestic uses of up to 5,000 gallons per day.
[B] W&B Waterworks 1 requires booster pumps to serve eleven (11) residential connection.
[C] SB_A is the locally adopted minimum SBS volume per ERU. The value of SB_i is typically 200 gal/ERU.

It is important to note that the limiting factor for some of the water systems is the standby storage capacity. However, in water systems that have two or more sources with permanent on-site auxiliary power, the water system can operate with less than recommended standby storage. All group A water systems except for TEL Company 4 have more than one source that meets this requirement. Therefore, the standby storage is not considered to limit the water systems' capacity for the group A water systems, with TEL 4 as an exception.

Below is a summary for the available ERUs that can be supported by each Group A system based on the capacity calculations and the available number of lots that can be served in each retail service area. Group B won't expand due to the number of lots that can be connected at this time.

W&B Waterworks 1

The system has approximately 700 lots that can be served in the retail service area. The capacity calculations show that the system can physically and legally support 528 ERUs limited by the source production and the systems MDD. The system is currently limited to 471 ERUs due to Island County's Seawater Intrusion Code (SWI). Cascadia Water is currently working to expand the W&B service area agreement with Island County to include the Del Bay water system. The combination of water systems will not result in a net increase in water removed from the aquifer, so the SWI limit is not applicable. It is the intent of W&B to pursue the incorporation of the water right from Del Bay into the combined system. To incorporate all Del Bay consumers the number of approved connections for W&B Waterworks 1 will need to be 509 connections. As show in the above sections the system has the physical capacity for this expansion.

Sea View Water
The system has approximately 210 lots that can be served in the retail service area and the system is approved for 210 ERUs. The capacity calculations show that the system can physically and legally support 290 ERUs limited by the water right's annual withdrawal. The system does not require additional connections until there is a need to expand the retail service area.

Beachcomber H2O
The system has approximately 260 lots that can be served in the retail service area. The capacity calculations show that the system can physically and legally support 192 ERUs limited by the instantaneous water right and the systems MDD.

CAL Waterworks
In 2018, CAL Waterworks received DOH approval for 146 residential connections, which covers full build out of CAL Waterworks retail service area and the existing connections at Goss Lakeridge Acres. This approval includes 120 residential connections and a single non-residential connection, consisting of the 26 residential connections for the Goss Lakeridge Acres Association. As of 2020, CAL Waterworks has 99 existing residential connections and Goss Lakeridge Acres is serving 15 connections. The combined retail service area currently contains 157 combined connections (131 connections at CAL Waterworks and 26 at Goss Lakeridge Acres).

The capacity calculations show that the system can physically and legally support 219 ERUs limited by the water right's annual withdrawal. The system does not require additional connections until there is a need to expand the retail service area.

TEL Company 1
The system has approximately 99 lots that can be served in the retail service area and the system is approved for 99 ERUs. The capacity calculations show that the system can physically and legally support 108 ERUs limited by the instantaneous source production. The system does not require additional connections until there is a need to expand the retail service area.

TEL Company 3
The system has approximately 50 lots that can be served in the retail service area and the system is approved for 50 ERUs. The capacity calculations show that the system can legally support 127 ERUs limited by the instantaneous source production. The system does not require additional connections until there is a need to expand the retail service area.

TEL Company 4
The system has approximately 44 lots that can be served in the retail service area and the system is approved for 44 ERUs. The capacity calculations show that the system can legally support 133 ERUs limited by the instantaneous source production. The system does not require additional connections until there is a need to expand the retail service area.

3.5 Selection and Justification of Improvement Projects

System needs discussed in this chapter were selected and prioritized based on the categories shown in Table 3-25:

Table 3-25 Potential Improvements Prioritization Categories

Category	Description	Time Frame
Emergency	Improvement needed to eliminate a health risk or serious physical risk to the system	Now
Immediate	Improvement that should be investigated, initiated, and/or completed as soon as possible to minimize potential risk or to get process started for future needs	Within 1 year
Near Term	Improvement that improves capacity, flow, or redundancy	1 to 2 years
Medium Range	Improvement that is not necessary near term but will improve system enough that it should not be long term	2 to 6 years
Long Range	Improvement that is needed in the future	6+ years
Budget Providing	Non-critical improvement that can occur anytime budget providing	Anytime budget providing

The time frames shown in Table 3-25 are for guidance purposes and are subject to change based on such factors as regulations and the Cascadia's financial situation.

Based on the analysis of each system and their existing components included in this chapter, potential system improvements were prioritized based on the categories in Table 3-25 and are summarized in Table 3-26 and Table 3-27.

3.5.1 *Source Needs*

All the systems currently have sufficient sources to meet the demand of their respective service areas. However, many of the sources are nearing the end of their expected life cycles and some are experiencing contamination or production issues. The following systems require source replacement in the immediate to near term:

1. Sea View Water
2. CAL Waterworks
3. TEL Company 1
4. TEL Company 10

Sea View Well #3 requires frequent rehabilitation due to iron bacteria growth blocking the well screen and decreasing the source capacity. A replacement well will be developed to the east of this well in the near future.

Water samples from the TEL Company 10 groundwater well have elevated levels of nitrate. A new deeper source is being developed for TEL 10 to replace the aging well and possibly eliminate the nitrate contamination issue.

W&B Waterworks 1 requires a new source in the near term to medium range to begin replacing the existing aging sources and increase system source capacity to support future growth.

3.5.2 *Treatment Needs*

Currently the only system providing treatment to the ground water wells is Sea View Water, LLC which has an iron and manganese filtration system. The existing Sea View Water iron and manganese filtration system needs to be evaluated for treatment effectiveness and optimized or upgraded as needed.

Multiple systems also have exceedances for iron and manganese in the source water and would benefit from the installation of a filtration system. Cascadia would like to standardize its new treatment systems to decrease system complexity. Oxidation/filtration with sodium hypochlorite (and potassium permanganate if required) and manganese dioxide-based filter media is the preferred treatment option.

The following water systems have been identified to benefit from having treatment installed in the near future. New structures will be required to house the proposed treatment components on these systems:

- W&B Waterworks
- CAL Waterworks
- TEL Company 3
- TEL Company 11

The remaining systems should be continually monitored for iron and manganese levels to ensure that proper treatment is provided for the source water.

Cascadia will also investigate having chlorination installed on their water systems. Chlorination would provide a disinfection residual in the distribution system but will also oxidize the iron and manganese present in the source water which may lead to discoloration of the water and additional sediment build up. The potential to form disinfection byproducts will also be evaluated prior to implementing chlorination.

The TEL Company 1 has an existing well that is not in use due to elevated levels of arsenic in water samples taken from this well. Coagulation and precipitation with iron has been proven effective for removal of arsenic in Island County groundwater sources. Treatment for this source is currently scheduled in the near term.

As discussed above, TEL Company 10 has a groundwater well with elevated levels of nitrates. A replacement well is being developed for this system. A new source that does not require treatment would be the preferred alternative, to minimize operational complexity and costs. Water quality tests on the new well will indicate if treatment system installation can be avoided on this system. Typically, on smaller system like TEL Company 10 nitrate selective resin would be utilized in an ion exchange treatment system.

CAL Waterworks' two wells reflect a gradual increase in nitrate level over the last several years. Analyses completed in December 2020 indicate nitrate levels at 3.83 mg/L in Well #1 (8E7) and 3.77 mg/L in Well #2 (8E9). CAL Waterworks will continue to monitor nitrate levels in both sources. Treatment options and/or additional source locations will be investigated to address elevated nitrates before they exceed WSDOH's maximum contaminant level of 10 mg/L.

3.5.3 *Storage Needs*

The capacity analysis for each system and as referenced in Table 3-26 and Table 3-27, indicates that the storage capabilities in multiple systems needs to be evaluated for upgrades. The following systems have storage needs that are addressed in their Capital Improvement Project priorities:

W&B Waterworks 1
Due to aging infrastructure and to improve system pressures a new 200,000-gallon reservoir should be installed on a neighboring property on Roy Road east of the existing site. This location provides a higher base elevation that would address some existing system pressure deficiencies. The increased size would provide the system with the recommended standby storage.

Sea View Water
The system is currently served by two octagonal concrete reservoirs that are nearing the end of their useful life cycles. A new 60,000-gallon storage reservoir (size to be verified in design) should be installed to replace both the existing tanks. Increasing the storage capacity should be evaluated to meet recommended standby storage volume as long as the water age isn't compromised.

Beachcomber H2O Company
A new 35,000-gallon reservoir (size and configuration to be verified in design) is recommended for installation adjacent to the existing reservoirs. This new reservoir is needed due to aging infrastructure and to improve the system's function.

CAL Waterworks
The system is currently only served by a single octagonal concrete reservoir that is near or at the end of its expected service life. A new reservoir with additional capacity should be installed to adequately meet the future service needs for both the CAL Waterworks service area and the Goss Lakeridge Acres service area. The new reservoir should be at least 60,000-gallons which will provide adequate fire suppression, equalizing, and standby storage.

TEL Company 1
The primary storage for the entire system comes from a 60,000-gallon corrugated galvanized steel stave reservoir. The interior of the tank is lined for potable water storage, but the components of the reservoir have passed their expected useful life. A new concrete reservoir is recommended to decrease operational costs and provide a consistent system configuration. The new reservoir should be increased in size to supply a sufficient volume for equalizing, standby, and fire suppression storage. It is anticipated that a 70,000-gallon reservoir is needed, though this size should be verified in design.

Group B Water Systems
A new storage reservoir and associated booster pump station is needed for TEL Company 6 to provide adequate service levels for this system. This is priority project since this will address an existing known deficiency. In general, the Group B water systems should have either a 2,000-gallon or 5,000-gallon reservoir installed to replace aging infrastructure and provide additional standby storage for power outages. The recommendation for the individual Group B system can be found in Table 3-27.

3.5.4 Booster Pump Needs

The overall goal will be to plan to provide fire flow capacity to the larger water system when feasible. The individual water systems booster pump capacity needs for each system is listed below.

Sea View Water, LLC.
The system should install a new pumphouse with a booster pump station that can be sized to provide adequate fire flow capabilities. This would eliminate the submersible well pumps installed in the reservoirs that are currently used to pressurize the system.

Beachcomber H2O Company
An updated booster pump station should be designed to provide adequate pressures to support the entire distribution system for daily and fire flow demands.

CAL Waterworks Company
The system at CAL Waterworks does not have the booster pump capacity to meet fire flow demands throughout the system. The booster pumps station should be upgraded to provide sufficient capacity to meet fire flow demands as other waterline replacement projects are completed.

TEL Company #1
The pumphouse for TEL 1 needs to be increased in size to properly house an expanded booster pump station and the other improvements within this report. The booster pump system should be designed to provide fire flow capacity throughout the distribution system. The pumphouse should be sized to allow the installation of the treatment system noted above.

TEL Company #3
The pumphouse for TEL 3 needs to be increased in size to properly house an expanded booster pump station and the other improvements within this report. The booster pump system should be designed to provide fire flow capacity throughout the distribution system. The pumphouse should be sized to allow the installation of the treatment system noted above.

TEL Company #4
The pumphouse for TEL 4 needs to be increased in size to properly house an expanded booster pump station and the other improvements within this report. The booster pump system should be designed to provide fire flow capacity throughout the distribution system. The pumphouse should be sized to allow the installation of the treatment system noted above.

In the immediate term, the existing bladder tanks are undersized. A new bladder pressure tanks system should be designed and installed to protect existing pumps. This system should be sized or configured for expandability to support future identified improvements.

Group B Systems
The Group B Systems owned on Whidbey Island by Cascadia will be upgraded to have the similar booster pump facilities format to improve the function of the systems and provide standardized components and layouts. New pumphouses will be installed in each system with sufficient size to house treatment facilities, new booster pumps, bladder pressure tanks, and system controls.

3.5.5 Distribution Needs

The individual water systems have a variety of needs in their distribution system to ensure that they are providing an adequate service level to their customers. The needs are more fully outlined in Table 3-25 and Table 3-26. Below, each of the systems is listed with their corresponding needs.

W&B Waterworks #1

The distribution system is almost exclusively served by gravity which provides the pressure to meet the peak hour demand throughout the system. The majority of the system can also support the requisite fire flow demands of 500-gpm for residential neighborhoods in Island County. Some of the existing hydrants in the distribution system are located on water lines that are 4-inches or smaller. These hydrants are not able to supply the 500 gallons per minute required for domestic fire flow in Island County. These waterlines are older, are in need of replacement, and upsizing to meet current code requirements. The Capital Improvement Projects list has prioritizing the replacement of the water mains along Ebb Tide Lane and Bay Road out on the southwest end of the distribution system.

The system has three pressure reducing valves installed to reduce the system pressures at the lower elevations in the service area. The three pressure reducing valves have exceeded their anticipated useful life and should be replaced in the near future.

Cascadia Water will replace all watermain associated with the Del Bay water system prior to its incorporation into the W&B distribution system due to the undersized main size, water loss issues, and general aging facilities associated with the Del Bay system. As part of the integration into W&B the aging water mains will be replaced and installed in the Island County right-of-way and service connections will be reconnected to the new mains.

Sea View Water, LLC.

The system currently does not have adequate booster pump capacity or distribution system capacity to support fire flow needs. Water mains throughout the system should be replaced and upsized to support the future addition of fire flow capacity. The water line located in the easement along the south property line of parcels S8135-02-00025-0 and S815-02-00036-2 connecting Peacock Lane and Island View Road is not operational. This section of pipe should be replaced in the immediate term to provide adequate redundancy in the system. Pipe bursting may be needed for this section due to the location and impacts to improvements on the indicated parcels. A new water line should be installed in the system owned lot on the north side of Fort Nugent Road that will extend west from the pumphouse to intersect the existing main along West Beach Road. This would provide an alternate route of supply to the main distribution system and would provide an additional loop for the system on the north end.

Beachcomber H2O Company

The distribution system consists of both a gravity and a pressure system. Both systems require improvements to work in a more cohesive manner. The gravity system does not provide adequate pressures at higher elevations in the distribution system. The pressurized and gravity distribution systems need to be reconfigured to remove the higher elevation service area from the gravity system. Alternatively, the pressurized and gravity systems could be interconnected and with a booster pump capacity increase to support the entire system and fire flow needs. The addition of the booster pump station will likely require the addition of a pressure reducing valve along the water main that serves the waterfront properties.

CAL Waterworks Company
The existing 4-inch main line from the pumphouse that travels north along East Harbor Road that serves the Harbor Sands Plat does not appear to fully loop between Beachwood Drive and Harbor Sands Lane. A new 8-inch line should be installed to connect the existing 4-inch line at Beachwood Drive with the existing 6-inch line further down East Harbor Road. Once this extension is completed the system should have sufficient capacity to fully serve the currently approved connections for CAL Waterworks and Goss Lakeridge Acres. This is an existing identified deficiency and thus a priority project.

The existing 4-inch main line along East Harbor Road is undersized and should be replaced with an 8-inch watermain up to the project noted above. When this line is installed the lots along East Harbor Road should be relocated to the new line from the 2-inch water main serving the high-pressure zone. These two projects may be combined in a single project.

In the near to medium term for the system, the water mains down Beachwood Drive and Harbor Sands Lane should be replaced with 6-inch water lines and the service connections moved into the right-of-way along the road frontage of these parcels.

TEL Company #1
Distribution system improvements are recommended to replace aging undersized distribution mains. Projects have been identified to install new 8-inch distribution system piping.

TEL Company #3
Distribution system improvements are recommended to replace aging undersized distribution mains. Projects have been identified to install new 8" distribution system piping.

TEL Company #4
Distribution system improvements are recommended to replace aging undersized distribution mains. Projects have been identified to install new 6" distribution system piping.

Group B Systems
The Group B Systems owned on Whidbey Island by Cascadia will be upgraded to have the similar distribution format to improve the function of the systems and provide standardized components and layouts.

3.5.6 Control and Telemetry Needs

The system would benefit from having an integrated supervisory control and data acquisition (SCADA) system that could be monitored from a central location. A SCADA system is planned for installation to allow the operators to more efficiently monitor the many systems located throughout Whidbey Island. At a minimum, the SCADA system should provide the functionality to monitor and adjust well pump run status, booster pump run status, system pressures, treatment system status, reservoir elevation, source production values, and alarm status.

When possible, control and telemetry upgrades should be incorporated with other capital improvement projects. For example, the controls and telemetry of the W&B Waterworks 1 system should be upgraded with the installation of the new reservoir, pumphouse and treatment installation previously noted in Table 3-25.

TEL Company #1 needs a new electrical panel to provide enough capacity to properly serve the existing system and the proposed generator noted in Table 3-26. The existing controls for TEL Company #4 need replacement in the near term.

Cascadia Water is planning to provide security improvements to their individual systems. The security improvements include site fencing around pumphouses and reservoirs, intrusion alarms on storage tanks, reservoir hatches, and pumphouse doors.

3.5.7 Non-Facility Needs

Cascadia is in the process of testing remote read meters to replace/upgrade their existing meters. The remote read meters would reduce labor costs associated with meter reading and would have the capability to alert customers of potential leaks on their property. Meter replacement projects will be prioritized based on age of existing meters, system with higher distribution system leakage, ease of installation and potential labor savings. Source meters will also be placed on a routine replacement scheduled to ensure accuracy of well production data.

Table 3-26 Prioritized Potential Group A System Improvements Needs

W&B Waterworks 1				
#	**Prioritization**	**Component**	**Component Description**	**Cost**
1	Immediate (2020)	Distribution	Pressure Reducing Valve (PRV) Replacements – Three (3) PRVs on the distribution system need to be replaced as they are no longer functioning properly.	$60,000 $20,000/each
2	Immediate (2021)	Distribution	Pumphouse Building with Booster Pump Station – Installation of a new building with sufficient size to install a filtration system, booster pumps, hydropneumatic tanks, and other appurtenances. Includes the design and installation of a booster pump station for the pressure distribution system.	$125,000
3	Immediate (2021)	Treatment	Iron & Manganese Filtration Treatment System – Installation and design of a filtration system for the water system to oxidize and filter out Fe and Mn from source water. Perform testing and verification necessary to ensure performance of the new system.	$125,000
4	Immediate (2021)	Storage	New storage reservoir – Installation of a new 200,000-gallon reservoir (size to be verified in design) to provide adequate storage for the distribution system. Project will include the necessary site piping (approx. 600-feet) to connect the reservoir to the pumphouse and distribution system.	$400,000
5	Immediate/ Near Term (2021)	Distribution	Generators for Booster Pumps – A properly designed generator will be sized and installed to allow for functioning of the booster pumps a possible a well pump during power outages in the area.	$10,000
6	Immediate/ Near Term (2021)	Source	The source meters on the system will be replaced.	$8,000 $2,000/meter
7	Immediate/ Near Term (2021)	Distribution	Water meters throughout the system will be replaced with remote read meters.	$320,000 $700/meter

W&B Waterworks 1 (continued)				
8	Near Term/ Medium Range (2021)	Distribution	Waterline Replacement – Repair and install a new crossing of the creek near the intersection of Lancaster Road and Wahl Road. Crossing will likely be accomplished by horizontal directional drilling and installation of fused HDPE water main.	$50,000
9	Near Term/ Medium Range (2022-2025)	Controls & Telemetry	Security fencing will be installed around the system reservoirs and wells located off Wells Road. Security alarms will be added to reservoir hatches.	$30,000
10	Near Term/ Medium Range (2022-2025)	Distribution	Create As-Built Record Drawings of the distribution system to allow for better planning and future maintenance of the system.	$15,000
11	Near Term/ Medium Range (2025-2030)	Distribution	Waterline Replacement – Replacement of Watermains along Wahl Road towards Ebb Tide Lane. Wahl Road is the main trunk to provide service to the southwestern portions of the system. These main lines need replacement due to the age of the existing infrastructure and various sections that are inadequately sized for fire flow.	$150 - $200 per foot of pipe ($1,350,000)
12	Near Term/ Medium Range (2025-2030)	Distribution	Waterline Replacement – Replacement of Watermains along Wahl Rd and Mutiny Bay Rd. Mutiny Bay Road is the main trunk to provide service to the northern portions of the system. These main lines need replacement due to the age of the existing infrastructure and various sections that are inadequately sized for fire flow.	$150 - $200 per foot of pipe ($1,460,000)
13	Near Term/ Medium Range (2025-2030)	Source	New Water Well – The installation of a new water well along with the necessary permitting and obtain/transfer of water rights. Project will include the necessary piping to connect the new well to the reservoir(s)	$50,000
14	Near Term/ Medium Range (2025-2030)	Distribution	Fire Hydrant Addition and Waterline Replacement – The replacement of aging water lines with the addition of Fire Hydrants in necessary locations in the distribution system. Following project number 2 above the system will again evaluate pipes and prioritize those areas of highest concern. This will likely start along Mutiny Bay Road.	$150 - $200 per foot of pipe

W&B Waterworks 1 (continued)				
15	Near Term/ Medium Range (2025-2030)	Distribution	Combination Air Release and Air Vacuum valves to be installed every 2,000 to 2,500 feet along the main distribution line	$5,000/each

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Sea View Water, LLC.				
1	Immediate (2020)	Source	New Water Well – The installation of a new water well along with the necessary permitting and creation/transfer of water rights. Project will include the necessary piping to connect the new well to the distribution system	$50,000
2	Immediate (2020)	Source	The source meters on the system will be replaced.	$6,000 $2,000/meter
3	Immediate (2020)	Source	Intertie – Sea View will enter into an agreement to formally create an intertie with the Whidbey West Water Association and provide an approved metered connection.	$50,000
4	Immediate/ Near Term (2021)	Distribution	Pumphouse Building with Booster Pump Station – Installation of a new building with sufficient size to store the new/upgraded /filtration system, booster pumps, hydropneumatics tanks, and other appurtenances. Includes the design and installation of a booster pump station to maintain system pressures.	$155,000
5	Immediate/ Near Term (2021)	Treatment	Iron & Manganese Filtration Treatment System – Installation and design of improvements to or replacement of the existing filtration system. Perform testing and verification necessary to ensure performance of the system.	$80,000
6	Immediate/ Near Term (2021)	Storage	New storage reservoir – Installation of a new 60,000-gallon reservoir (size to be verified in design) to provide adequate storage for the system needs.	$100,000
7	Immediate/ Near Term (2021/2022)	Distribution	Generators for Booster Pumps – A generator will be sized and installed to allow for functioning of the booster pumps during power outages in the area.	$10,000
8	Immediate/ Near Term (ongoing)	Distribution	Water meters throughout the system will replaced with remote read meters.	$140,000 $700/meter
9	Immediate/ Near Term (2022 – 2025)	Distribution	Waterline Replacement – Installation of a new waterline from the reservoir along Fort Nugent Road West Beach Road. .	$150 - $200 per foot of pipe ($60,000)

Sea View Water, LLC. (continued)				
10	Near Term/ Medium Range (2022 - 2025)	Distribution	Replacement of the waterline located in the easement along the south property line of lots 25 and 36-3 connecting Peacock Lane and Island View Rd.	$150 - $200 per foot of pipe ($80,000)
11	Near Term/ Medium Range (2022-2025)	Controls & Telemetry	Security fencing will be installed around the reservoirs and wells located off both Island View Rd and Fort Nugent Rd. Security alarms will be added to reservoir hatches and pumphouse doors.	$60,000
12	Near Term/ Medium Range (2022 - 2025)	Distribution	Create As-Built Record Drawings of the distribution system to allow for better planning and future maintenance of the system.	$10,000
13	Near Term/ Medium Range (2022 - 2025)	Distribution	Waterline Replacement – The replacement of aging water lines with the addition of Fire Hydrants in necessary locations in the distribution system. Line sizing should be increased to meet the fire flow requirements of Island County. The water main replacement will need to occur throughout the distribution system.	$150 - $200 per foot of pipe ($1,170,000)

Beachcomber H2O Company				
1	Immediate (2021)	Storage	New storage reservoir – Installation of a new 35,000-gallon reservoir (size to be verified in design) to provide adequate storage for the pressure portion of the distribution system.	$75,000
2	Immediate/ Near Term (2021)	Distribution	Reservoir site piping improvements – Revised design and configuration of the piping at the reservoir sites to allow the pressure and gravity portions of the system to function jointly providing additional reliability and necessary redundancy in the distribution system.	$10,000
3	Immediate (2025)	Distribution	Booster Pump Station – Installation of new booster pumps, hydropneumatics tanks, and other appurtenances for the distribution system. Includes the design of a booster pump station to maintain system pressures.	$25,000
4	Immediate/ Near Term (2021)	Controls & Telemetry	Security alarms will be added to reservoir hatches and pumphouse doors at the site off Mastodon Drive.	$10,000
5	Immediate/ Near Term	Distribution	Generators for Booster Pumps – A properly designed generator will be sized and installed to allow for functioning of the booster pumps during power outages in the area.	$10,000
6	Immediate/ Near Term	Source	The source meters on the system will be replaced in the immediate to medium range with new and accurate master-meters.	$4,000 $2,000/meter
7	Immediate (2020)	Distribution	Pressure Reducing Valve (PRV) – A PRV to be placed on the system to address higher system pressures along Hidden Beach Drive.	$50,000
8	Immediate/ Near Term	Distribution	Water meters throughout the system will be replaced from the immediate to medium range with remote read meters.	$91,000 $700/meter
9	Near Term/ Medium Range	Distribution	Create As-Built Record Drawings of the distribution system to allow for better planning and future maintenance of the system.	$10,000
10	Medium Range/ Long Term	Distribution	Waterline Replacement – The distribution system infrastructure is aging, and water mains should be replaced in a timely manner as leaks increase. Water mains should be increased to 6” or 8” lines to provide adequate flow.	$150 - $200 per foot of pipe

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Cal Waterworks				
1	Immediate (2020)	Distribution	Waterline Installation – Installing approximately 150-feet of 6” water main to close the loop in water main along East Harbor Road between Beachwood Drive and Harbor Sands Lane.	$150 - $200 per foot of pipe ($25,000)
2	Immediate/ Near Term (2020/2021)	Distribution	Pumphouse Building with Booster Pump Station – Installation of a new building with sufficient size to store the new treatment system, booster pumps, hydropneumatics tanks, and other appurtenances. Includes the design and installation of a booster pump station to maintain system pressures.	$175,000
3	Immediate/ Near Term (2021)	Controls & Telemetry	Security fencing will be installed around the reservoir and wells located off Pheasant Farm Lane. Security alarms will be added to reservoir hatches and pumphouse doors.	$25,000
4	Immediate/ Near Term (2021)	Storage	New storage reservoir – Installation of a new 60,000-gallon reservoir (size to be verified in design) to provide adequate storage for the distribution system.	$100,000
5	Immediate/ Near Term (2021)	Distribution	Waterline Replacement – Installation of a new 8” line from the pumphouse north along East Harbor Road to the existing 6” water line installed between Harbor Sands Lane and Beachwood Drive to ensure proper functionality of the water system and to maintain service up to Goss Lake Acres.	$150 - $200 per foot of pipe ($375,000)
6	Immediate/ Near Term (2022 – 2025)	Distribution	Waterline Replacement – Installation of a new line off the 8” line proposed in item 4 down both Harbor Sands Lane and Beachwood Drive. The new 6” waterline will loop this neighborhood providing better service and prepare the system to provide sufficient fire flow.	$150 - $200 per foot of pipe ($550,000)
7	Immediate/ Near Term	Distribution	Generators for Booster Pumps – A generator will be sized and installed to allow for functioning of the booster pumps during power outages in the area.	$10,000

Cal Waterworks (continued)				
8	Near Term/ Medium Term (2025)	Source	New Water Well – The installation of a new water well along with the necessary permitting and obtain/transfer of water rights. Project will include the necessary piping to connect the new well to the distribution system	$50,000
9	Near Term/ Medium Term (2025)	Source	The source meters on the system will be replaced.	$4,000 $2,000/meter
10	Immediate/ Near Term	Distribution	Water meters throughout the system will be replaced with remote read meters.	$70,000 $700/meter
11	Near Term/ Medium Range	Distribution	Create As-Built Record Drawings of the distribution system to allow for better planning and future maintenance of the system.	$7,500
12	Medium Range/ Long Term	Distribution	Waterline Replacement – The distribution system infrastructure is aging, and water mains should be replaced in a timely manner as leaks increase. Water mains should be increasing mains to 6” or 8” to provide adequate flow.	$150 - $200 per foot of pipe

TEL Company #1				
1	Immediate (2020)	Distribution	Electrical Panel and Generator – Installation of a new 200-amp electrical panel with generator connection to allow for the future improvements to the pumphouse. The generator will be sized and installed to allow for functioning of the booster pumps during power outages in the area	$15,000
2	Immediate/ Near Term (2021)	Distribution	Pumphouse Building with Booster Pump Station – Installation of a new building with sufficient size to store the new treatment system, booster pumps, hydropneumatics tanks, and other.	$100,000
3	Immediate/ Near Term (2021)	Treatment	Arsenic and Manganese Treatment System – Installation and design of a filtration system to reduce concentration of arsenic from source water produced from Well #8. Treatment to also provide capacity to reduce the manganese concentration of water produced from Well #1. Includes testing and verification necessary to ensure effectiveness of the new system.	$120,000
4	Immediate/ Near Term (2021)	Storage	New storage reservoir – Installation of a new 70,000-gallon reservoir (size to be verified in design) to provide adequate storage for the system.	$100,000
5	Immediate/ Near Term (2021)	Controls & Telemetry	Security fencing will be installed around the reservoirs and wells located off throughout the system. Security alarms will be added to reservoir hatches and pumphouse doors.	$45,000
6	Immediate/ Near Term (2022)	Source	New Water Well – The installation of a new water well along with the necessary permitting and obtain/transfer of water rights. Project will include the necessary piping to connect the new well to the distribution system. Well to replace well at pumphouse 1 but to be located near Well 2.	$50,000
7	Near Term/ Medium Term	Source	The source meters on the system will be replaced.	$4,000 $2,000/meter
8	Near Term/ Medium Term	Distribution	Water meters throughout the system will gradually be replaced with remote read meters.	$55,000 $700/meter

TEL Company #1 (continued)				
9	Near Term/ Medium Range	Distribution	Create As-Built Record Drawings of the distribution system to allow for better planning and future maintenance of the system.	$8,000
10	Medium Range/ Long Term	Distribution	Waterline Replacement – The distribution system infrastructure is aging, and water mains should be replaced in a timely manner as leaks increase. Water mains diameter should be increasing to 6” or 8” to provide adequate flow.	$150 - $200 per foot of pipe

TEL Company #3				
1	Immediate (2020)	Distribution	Electrical Panel and Generator – Installation of a 200 amp/3-phase electrical panel to allow for the future improvements to the pumphouse and distribution system. The panel should be designed to handle the addition of a generator. The generator will be sized to allow for functioning of the booster pumps during power outages in the area. The improvements will also require the addition of a new power pole to provide the necessary service capacity.	$50,000
2	Immediate/ Near Term (2021)	Distribution	Pumphouse Building – Installation of a new building with sufficient size to store the new treatment system, booster pumps, hydropneumatics tanks, and other appurtenances.	$125,000
3	Immediate/ Near Term (2021)	Controls & Telemetry	Security fencing will be installed around the reservoirs and wells located off throughout the system. Security alarms will be added to reservoir hatches and pumphouse doors.	$25,000
4	Immediate/ Near Term (2022)	Treatment	Manganese Filtration Treatment System – Installation and design of a filtration system for the two wells on the water system. Perform testing and verification necessary to ensure performance of the new system.	$75,000
5	Near Term/ Medium Range (2024/2025)	Distribution	Individual Pressure Reducing Valves – Install individual pressure reducing valves on the back end of the service connection. Ownership of PRVs will be transferred to each individual residence.	$50,000 $2,000/each
6	Immediate/ Near Term	Source	The source meters on the system will be replaced.	$4,000 $2,000/meter
7	Immediate/ Near Term	Distribution	Water meters throughout the system will gradually be replaced with remote/touch read meters.	$17,500 $700/meter
8	Near Term/ Medium Range	Distribution	Create As-Built Record Drawings of the distribution system to allow for better planning and future maintenance of the system.	$5,000
9	Medium Range	Distribution	Booster Pump Station – Installation of a new booster pump station, hydropneumatics tanks, and other appurtenances.	$20,000

TEL Company #3 (continued)				
10	Medium Range/ Long Term	Distribution	Waterline Replacement – The distribution system infrastructure is aging, and water mains should be replaced in a timely manner as leaks increase. Water mains should be increased to 6” or 8” diameter to provide adequate flow.	$150 - $200 per foot of pipe

TEL Company #4				
1	Immediate/ Near Term (2021)	Distribution	Pressure Tank Replacement – Installation of new pressure tank(s) in the water system to support future improvements (See Item 2)	$15,000
2	Immediate/ Near Term (2022)	Distribution	Pumphouse Building with Booster Pump Station – Installation of a new building with sufficient size to store the new booster pumps, hydropneumatics tanks, and other appurtenances for the system. Includes the design and installation of a booster pump station to maintain system pressures. Along with the pumphouse security fencing will be added to the site and alarms included on pumphouse doors and reservoir hatches.	$115,000
3	Near Term/ Medium Range	Distribution / Storage	The system should be configured to incorporate a top fill line for the storage reservoir. The reservoir fill line can be configured with gate and check valves to make sure the water fills from the top providing better mixing and turnover of the stored water.	$20,000
4	Near Term/ Medium Range	Distribution	Generators for Booster Pumps – A generator will be sized and installed to allow for functioning of the booster pumps during power outages in the area.	$10,000
5	Immediate/ Near Term (2022)	Distribution	System Controls – Installation of new controls for the management of the distribution system. Includes well pumping controls and reservoir level transducers.	$15,000
6	Immediate/ Near Term	Source	The source meter on the system will be replaced.	$2,000/meter
7	Immediate/ Near Term	Distribution	Water meters throughout the system will gradually be replaced with remote/touch read meters.	$21,000 $700/meter
8	Near Term/ Medium Range	Distribution	Create As-Built Record Drawings of the distribution system to allow for better planning and future maintenance of the system.	$5,000
9	Medium Range/ Long Term	Distribution	Waterline Replacement – The distribution system infrastructure is aging, and water mains should be replaced in a timely manner as leaks increase. Water mains should be increased to 6” diameter to provide adequate flow.	$150 - $200 per foot of pipe

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Table 3-27 Prioritized Potential Group B System Improvements Needs

TEL Company #5, TEL Company 6, TEL Company 10, TEL Company 11				
#	**Prioritization**	**Component**	**Component Description**	**Cost**
1	Immediate (2020)	Distribution/ Storage	Pumphouse Building / Booster Pump Station / Reservoir - Installation of a new building with sufficient size to store the new booster pumps, hydropneumatics tanks, 2,000-gallon reservoir, and other appurtenances for the system.	$150,000
2	Immediate (2020)	Source (TEL Company 10)	New Source – The existing source has elevated nitrate levels that should be evaluated. An alternative well location is in the process of being established and permitted with the State of Washington.	$50,000
3	Immediate/ Near Term	Distribution	Generators for Booster Pumps – A generator will be sized and installed to allow for functioning of the booster pumps during power outages in the area.	$10,000
4	Immediate/ Near Term	Source	The source meter on the system will be replaced.	$2,000
5	Immediate/ Near Term	Distribution	Water meters throughout the system will gradually be replaced with touch read meters.	$700/meter
6	Near Term/ Medium Range	Treatment (TEL Company 11)	Iron & Manganese Filtration Treatment System – Installation and design of a filtration system for the water system to oxidize and filter out Fe and Mn from source water. Perform testing and verification necessary to ensure performance of the new system.	$45,000
7	Near Term/ Medium Range	Distribution	Create As-Built Record Drawings of the distribution system to allow for better planning and future maintenance of the system.	$5,000
8	Medium Range/ Long Term	Distribution	Waterline Replacement – The distribution system infrastructure is aging, and water mains should be replaced in a timely manner as leaks increase.	$150 - $200 per foot of pipe
9	Immediate/ Near Term (2021)	Controls & Telemetry	Security fencing will be installed around the reservoirs and wells located off throughout the system. Security alarms will be added to reservoir hatches and pumphouse doors.	$12,500

Mutiny Bay Waterworks				
1	Immediate	Distribution	Transfer final two (2) connections to the W&B Waterworks 1 Group A water system.	---
2	Immediate	Source	Well Connection – Connect the existing well for Mutiny Bay Waterworks to the W&B Waterworks 1 distribution system as a backup source. The controls should be updated so that the well will pump will occasionally be turned on to prevent its motor from seizing up due to lack of use.	$20,000

Table 3-28 Prioritized Potential for Universal Improvement Needs

All Systems				
#	**Prioritization**	**Component**	**Component Description**	**Cost**
1	Immediate (2020)	Distribution/ Controls	SCADA System– SCADA (Supervisory Control and Data Acquisition) system will be installed to allow a more consistent level of service for the Cascadia Water owned systems. The system will be initially configured to run pump signal relays, tank levels, and alarms for most of the Group A Water Systems. The system will be configured to allow expansion for future controls. Future improvement projects should allow for connection and communication with the SCADA system.	$100,000
2	Immediate (2020)	Distribution	Remote Read Meters – The installation and replacement of service meters with remote read meters will be evaluated. This will allow for more efficient reading of meters and ensure more accurate measurements of water loss and leakage throughout the systems.	$700 per Water Meter

4 WATER USE EFFICIENCY PROGRAM AND WATER RESOURCE ANALYSIS

4.1 Water Use Efficiency Program

Western Washington even with abundant precipitation does not have an unlimited supply of fresh potable water as highlighted by recent decisions by the Department of Ecology to close basins in Skagit and Whatcom counties from allowing new exempt wells and stopping the issuance of new water rights. In addition, Coupeville lies within the Olympic Rain Shadow which reduces the amount of precipitation in this region.

These events highlighted the need to establish measures for both short term emergency and long term systematic per capita water use reduction. Cascadia has consistently encouraged water conservation through a variety of methods and plans. These follow state legislated guidelines to do as much as possible to encourage more conservation.

A general mandate has been made by RCW 90.03.005, RCW 90.03.400, RCW 90.54.020 and RCW 90.54.180 for water use efficiencies in Washington State water systems. RCW 43.20.230 makes a specific directive to DOH to incorporate procedures and guidelines relating to the conservation of water during the approval procedures of system plans.

Cascadia recognizes that water is a valuable and essential natural resource that needs to be managed wisely. The main objectives of this water conservation program are:

- Increase awareness among water users of the importance of conserving water and of the methods available to achieve reductions in their water use.
- Reduce distribution system water loss to 10 percent or less.

The most recently available Water Use Efficiency (WUE) report for each Group A system provides the past years distribution system loss (DSL and the 3-year annual average. The following are the values for each Group A system from 2017 to 2019 with the 2019-year DSL in parentheses:

- W&B Waterworks 1 – 6.3% (8.8%)
- Sea View Water – 3.0% (3.9%)
- Beachcomber H2O – 9.0% (9.6)
- CAL Waterworks – 14.5% (11.7%)
- TEL Company 1 – 5.6% (7.3%)
- TEL Company 3 – 9.7% (8.9%)
- TEL Company 4 – 8.5%

Since CAL Waterworks exceeds the 10% objective, a Water Loss Control Action Plan (See Appendix U) has been created per WAC 246-290-820 to address the loss exceedance and create a plan for a reduction in water loss. The fundamental elements of the Water Loss Control Action Plan to be implemented by Cascadia as outlined in the Water Use Efficiency Guidebook include: Planning, Distribution system leakage standard, customer goal setting, and annual Water Use Efficiency goals reporting. The goals are discussed in Section 4.1.1.

4.1.1 Water Loss Control Action Plan

Cascadia is required to establish a water use reduction goal as part of its Water Loss Control Action Plan to address distribution system losses. The action plan to be implemented contains various aspects with the intent of obtaining accurate data, identifying real losses, and improving the system efficiency. The

water systems will implement several water use efficiency measures which are covered in the following sections:

4.1.1.1 Accurate Data Collection – Water Metering

Cascadia's sources are all metered. These source meters are read daily and are periodically tested and repaired or replaced, as needed. The capital improvement project for the system includes the replacement of source meters with new accurate master meters.

All but 26 of Cascadia's service connections are metered. Meters should be provided for these connections. Meter readings are taken on a monthly basis, except for Sea View Water where readings are done bi-monthly and are used to determine customer water use and charges. The replacement of old/outdated meters is an on-going upgrade. Funding for providing meters for unmetered sources and meter replacement is discussed in the Capital Improvement Program in Chapter 8.

Cascadia's proposed meter replacement project will provide more accurate data for consumption, allow accurate comparison with production records, and provide capability for customers to be alerted to potential leaks on their property. Discrepancies are investigated by the operator as part of its on-going leak detection program.

4.1.1.2 Identify Real Water Losses

With the newly installed, accurate meters Cascadia will be able to identify real water losses in the system. The accurate data will allow the prioritization of proposed water line replacement projects. Accurate consumption data will also allow for large consumers of the water to be billed appropriate for their water use and encourage conservancy throughout the systems.

4.1.1.3 Leak Detection Program

Water lost through a utility's transmission and distribution system is typically referred to as "Distribution System Leakage (DSL)". A system audit compares the amount of water produced from the source to the amount of water sold to customers. Cascadia performs a monthly analysis of source water produced in comparison with water sold to detect increases in the DSL.

Cascadia's leak detection program includes monitoring for leaks in the system and quickly repairing them when identified. Cascadia promptly investigates any reports of leaks from customers and actively investigates aberrations in consumption by customers.

WUE Annual Performance Reports for each of Cascadia's systems are submitted to the state. The percentage of water loss for each of the Group A and Group B systems is summarized in Table 2-3 and Table 2-4 respectively. These WUE's indicate that CAL Waterworks is exceeding the 10% distribution system water loss objective stated in Section 4.1. Cascadia is advised to conduct leak detection analyses of these systems to identify and fix leaks. This Water System Plan includes various projects to assess and reduce potential factors contributing to the water loss in Cascadia's distribution systems including replacement of aging water lines and replacement of older meters that may no longer be functioning properly.

4.1.1.4 Water Pressure

The water pressure within Cascadia's systems must be at a minimum of 30-psi at all service connections during peak demand. Systems required to provide fire flow must maintain a minimum of 20-psi at all points throughout the distribution system during a fire suppression event. A maximum pressure of 80-psi in the distribution system is advisable to prevent water loss through over-pressurized services.

4.1.1.5 Flushing Mains

A portion of the routine maintenance performed on Cascadia's systems is to periodically flush the distribution systems. Silt and organic debris accumulate in the system over time and must be flushed out on a regular basis. Estimates on the amount of water used during flushing operations will be used to determine the DSL rate.

4.1.1.6 Informational Messages

Cascadia will include informational brochures and/or letters on the need for conservation with customer billing statements on occasion. Cascadia billing statements will also include periodic messages encouraging conservation.

Cascadia will relay information about upcoming water conservation speakers or meetings to their customers. Cascadia will strive to schedule speakers annually for a monthly membership meeting to discuss water conservation measures and benefits.

Cascadia will capitalize on studies conducted by larger water systems, such as the Snohomish County PUD and the City of Everett, and the DOH. These studies will be used to evaluate the latest water conservation techniques. These techniques will be analyzed for their applicability to the Cascadia's water systems and how they may best be implemented.

4.1.1.7 Plumbing Fixture Replacement

Cascadia, through the attachment of informational literature to the customer billing statement, can encourage the use of low water use fixtures in homes. It also plans to provide new customers with informational materials on water saving plumbing.

4.1.1.8 Water Use for Landscaping

Lawn and landscape watering are the largest uses of water during the summer months. Education on the amount of water needed to sustain healthy plant life is an effective conservation tool. Cascadia plans to provide customers with literature on lawn watering during the spring of each year. Cascadia also plans to distribute literature offering recommendations for establishing a water conserving landscape. A listing of drought tolerant plants will be provided along with suggestions for plant placement and watering.

Cascadia has also established a rate structure that encourages prudent use of water in the yard and garden.

4.1.1.9 Goals

Cascadia has two major goals with their conservation program: further reduction in distribution system leakage and the reduction of the growth adjusted maximum day demand.

The systems would like to reduce distribution system losses below 9.0% for all systems within six years. Reductions in the DSL will be accomplished though the Capital Improvements Program that proposes the replacement of aging infrastructure in the water systems based on analyzed and observed deficiencies.

The second goal is to reduce the growth adjusted maximum day demand by a minimum of 1.5% within six years. Cascadia plans on accomplishing this goal by reducing DSL as part of their first goal and as they further educate customers regarding the resource and methods for conservation.

4.2 Source of Supply Analysis

The Department of Ecology requires water systems to demonstrate serious consideration of all options prior to issuing new or expanded water rights. The purpose of a source of supply analysis is to evaluate opportunities to obtain or optimize the use of existing sources already developed and evaluate other innovative methods to meet water needs.

A source of supply analysis is required of all systems that will be pursuing water rights within 20 years of approval of their WSP as defined by the water demand forecast. Cascadia's water systems have adequate water rights at this time and are not projected to require additional rights within the 20-year planning period. Systems that are not pursuing additional water rights are also encouraged to conduct a source of supply analysis; however, it is not required.

4.2.1 *Enhanced Conservation Measures*

As discussed in Section 4.1, Cascadia has or will implement use efficiency measures with the goal of reducing MDD and DSL system wide.

4.2.2 *Water Rights Changes*

As further discussed in Section 4.3, Cascadia is not projected to pursue additional water rights within the six-year planning period. Therefore, no changes in water rights are foreseen.

4.2.3 *Interties*

Cascadia has one current intertie: CAL Waterworks has an intertie with the Goss Lakeridge Acres Association Water System. However, this intertie is not source of supply for CAL; it is intended only to allow the wholesale of water to Goss Lakeridge Acres by CAL Waterworks. Interties that allow Cascadia's systems to purchase water from other systems may be a cost-effective way of providing system redundancy in the event of line breaks or source production issues. An intertie with another water system would only be considered if:

- The water quality meets State/Federal water quality standards, and
- The water chemistry is compatible with the existing water quality of the system, and
- The hydraulic grade is higher than the Water System's or can feasibly/economically be boosted as necessary, and
- The system has adequate capacity to support the intertie, and
- Both systems are able to maintain compliance with their water rights.

A more thorough analysis of potential interties is beyond the scope of this planning document. If discussions with neighboring systems are fruitful and mutually acceptable, then a study and project report will be generated for future intertie projects.

As discussed in Section 3.3.1, Sea View Water and Whidbey West Water System have an existing intertie consisting of a 4-inch gate valve located along the norther boundary of the Sea View distribution system. According to available data, the intertie has never been employed. However, Cascadia Water isare currently in the initial phases of establishing an Intertie Agreement with Whidbey West Water System. Along with the intertie agreement Sea View will design and install a new, metered intertie connection that will protect both distribution systems in cases of emergency.

4.3 Water Right Evaluation

The following sections summarize the Cascadia's water right evaluation.

4.3.1 *Existing Water Rights*

Currently, Cascadia has several water rights associated with various systems as outlined in Table 3-9. Those water rights describe instantaneous withdrawal rates, maximum yearly withdrawal volume, and withdrawal points from a groundwater. The Certificates of Water Rights are included in APPENDIX F and are summarized in Table 3-9.

4.3.2 *Water Right Self-Assessment*

The "Water Rights Self-Assessment Form for Water System Plan" provided by the DOH has been completed for each system and are included in APPENDIX I.

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5 SOURCE WATER PROTECTION

5.1 Introduction

Protection of the source of the water supply is of utmost concern for public water systems. Cascadia's production wells have historically been free of man-made contaminants. The sources are completed in relatively deep aquifers, and typically protected by glacial till or clay confining layers. These confining layers slow the transport of potential contaminates and allow for their natural degradation.

5.2 Wellhead Restrictive Covenants

Currently W&B Waterworks 1 has Covenants for the four (4) wells located on Island County parcel 580794. CAL Waterworks also has Covenants for the two (2) wells associated with the system located on Island County Parcel 488485. There is also documentation for Restrictive Covenants associated with Well 9 (Well AGA-819) for TEL Company 1. Cascadia does not currently have records for any additional restrictive covenants. They have begun the process of locating additional documentation and evaluated the opportunity to obtain restrictive covenants for the other system wells.

Table 5-1 outline the sources associated with the Cascadia Water system addressed in this Water System Plan and which restrictive covenants have been located. For the wells without documentation for existing restrictive covenants the property owners within the 100-foot well radius is listed (with the associated Island County property identification number). Cascadia Water is committed to locating or establishing well covenants for their sources. Over the next 5-years they will establish well covenants for all system owned properties and will pursue covenants with property owners within the associated well protection radii.

Table 5-1 Cascadia Group A Sources & Restrictive Covenants

Well	DOE Tag No.	Restrictive Covenants	Other Property Owners
W&B Waterworks 1			
Well 1	AGA932	Yes	
Well 2	AGA932	Yes	
Well 3	AGA930	Yes	
Well 4	AGA929	Yes	
Sea View Water, LLC			
Well 1	AGA874	n/a	1. Brian David Zirwas (Prop ID: 383695) 2. Barbara Ann Croteau Trustee (Prop ID: 383686) 3. Steven Taichi (Prop ID: 383819)
Well 2	AGA875	n/a	
Well 3	ABR011	n/a	None (Cascadia Water controlled)
Beachcombers H20 Co.			
Well 1	AGA901	n/a	1. Edward A. Zaretzke (Prop ID: 188424) 2. Christopher Turner (Prop ID: 188282)
Well 2	AGA915	n/a	Greenbank Enterprises, LLC (Prop ID: 808785)
CAL Waterworks			
Well 1	AGA927	Yes	
Well 2	AGA928	Yes	

TEL Company 1			
Well 1	AGA903	n/a	1. John C Rabbe (Prop ID: 490999) 2. Margaret H. Misasek (Prop ID: 701930) 3. Robert S Gossler (Prop ID: 701949)
Well 8	AGA814	n/a	1. Arthur H Piehler (Prop ID: 585744) 2. Francis J & Traci Cheever (Prop ID: 585735)
Well 9	AGA819	Yes	
TEL Company 3			
Well 1	AGA858	n/a	1. Anthony James (Prop ID: 714980)
Well 2	AGA842	n/a	
TEL Company 4			
Well 1	AGA933	n/a	1. Sherman E and Joan R Wortman (Prop ID: 382927) 2. Mervin Shetler (Prop ID: 615383 & 615374) 3. Patricia H Hussey (Prop ID: 382936)
TEL Company 5			
Well 1	AKY756	n/a	1. James & Joan Lehman (Prop ID: 138853) 2. Michael W Johnson (Prop ID: 139031) 3. David K Johnson (Prop ID: 804861) 4. David A Sadler (Prop ID: 804860)
TEL Company 6			
Well 3	AKY757	n/a	1. Douglas Roraback (Prop ID: 592996) 2.Aaron Morris (Prop ID: 592987)
TEL Company 10			
Well 1	AKY755	n/a	1. Paul E Richmond (Prop ID: 64309 2. Christopher Larson (Prop ID: 643101)
TEL Company 11			
Well 3	AKY754	n/a	1. Wilkinson Trace Lot Owners (Prop ID: 651556) 2. Katherine P Rogers (Prop ID: 735538)
Mutiny Bay Waterworks			
Well 1	APH048	n/a	1. Beverly K Pearce (Prop ID: 54283) 2. Gretchen Ganz (Prop ID: 54130) 3. Wesley E Grimm (Prop ID: 54121) 4. Gretchen Granz (Prop ID: 54158 & 54201) 5. Bruce L Blakeslee (Prop ID: 54265) 6. Emily Melcher (Prop ID: 54327)

5.3 Wellhead Protection Program

Cascadia will implement a wellhead protection program. This program will incorporate the following:

- Periodic monitoring of the existing wells for nitrates and conductivity to check for any sudden change in water quality.
- Sending informational flyers out to water customers outlining proper storage and use of common household chemicals, yard and lawn fertilizers, pesticides and herbicides.
- Posting signs identifying the system source pollution control zones.
- Sending letters to property owners within the capture zones regarding the presence of the system source wells.

Cascadia's source water is from groundwater wells. The wells physical parameters are discussed in Section 3.3.3. The Water System's Wellhead Protection Program is attached in APPENDIX J.

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6 OPERATION AND MAINTENANCE PROGRAM

Each of Cascadia's water systems has an Operation and Maintenance Program Manual (O&M Manual) that is intended to be used as a standalone document. A copy of these O&M Manuals shall be maintained on site at each system as well as Cascadia offices. The O&M Manual includes pertinent contact information, worksheets, and operational procedures. The O&M Manual also includes the Water Shortage Plan, Emergency Response Plan, and the Cross-Connection Control Plan.

6.1 Water System Management and Personnel

Cascadia Water hires knowledgeable and certified staff to operate and maintain their owned systems. Cascadia Water is a wholly owned subsidiary of NW Natural Water Company, LLC. Cascadia staff consists of a qualified system manager, certified operators and maintenance staff. These staff are responsible for the day to day operation and maintenance of Cascadia's water systems.

6.2 Operator Certification

The duties of certified waterworks operators are defined in WAC 246-292. Table 6-1 lists the titles and certifications for positions in Cascadia's staff. Staff should continually maintain certifications through continuing education as required by each individual certification.

Table 6-1 Water System Staff Certifications

Operator	Position	Certifications
Culley Lehman	General Manager	*
Adam Lehman	System Operator	CCS, WDM 3, WDS, WTPO 1
Jeff Breilein	System Operator	-
Dale Metzger	System Operator	-
Andrew Mathis	Field Technician	-

* WDM 2 Certification is currently is process

** WDM-IT 1 Certification is currently is process

6.3 Routine Operating Procedures and Preventative Maintenance

Cascadia plans to develop Standard Operating Procedures in the near term for the operation and maintenance of all the water systems under their jurisdiction. New employees will be trained to implement the SOPs. Currently, periodic maintenance of all components of Cascadia's water systems is completed to ensure continuous, uninterrupted service. General maintenance of many items may include checking set-points, security and screens, painting exposed surfaces, lubricating moving parts, cleaning, rebuilding, and assessing overall operation for major repairs or replacement. Such maintenance should involve a minimum of the following:

- All valves should be periodically operated to ensure proper working order and a record kept on each valve.
- The reservoir should be routinely checked or water level, along with the functioning of probes or level indicators.
- Fire hydrants should receive maintenance service each year and a record kept on each hydrant.
- Continuous monitoring of water systems for leaks and a record of leaks maintained.
- Chemical and bacteriological samples should be properly collected, analyzed, and the results submitted to the DOH.
- As-Built records should be kept on installed facility and distribution system piping in the system.

- The source meters should be read and recorded each day.
- The pump facilities should be checked at least weekly and the pumps and motors inspected and maintained in accordance with the manufacturer's recommendations. Electrical contacts in the pump control systems should be tightened once a year.
- Water service meters should be maintained, repaired, and replaced as needed to ensure accuracy and to protect water revenues.
- All existing backflow prevention devices should be inspected annually and periodically surveyed to determine the need for replacement or new installations.
- Dead-end mains are flushed every two months.

If the system has received approval of a comprehensive plan or abbreviated water system plan by the DOH and has submitted and received approval of standard construction specifications, then detailed plans and specifications for distribution mains need not be submitted individually for approval. If such approval is obtained, only alterations to the plan need be submitted to the DOH.

The DOH also requires bacteriological samples to be taken and that chemical analyses of the Cascadia's supply sources be made often enough to assure compliance. Water quality requirements are listed in detail in Section 3.1.1. It's good practice to have paper cards on file or an electronic database with information that includes the type of meter and its serial number, date of installation, and maintenance performed. In addition, operators have found that a service record for each resident is valuable for maintaining a complete system record. This record can be valuable when attempting to repair or locate service lines or when attempting to see if breakage or leaks follow a pattern.

6.4 Water Quality Sampling Procedures & Program

The Water Quality Monitoring requirements are set forth in WAC 246-290-300 and were discussed in Chapter 3 of this plan. The regulations cover sampling frequencies for bacteriological, inorganic chemical and organic chemical samples as well as radionuclides, volatile organic compounds (VOC), and secondary chemical and physical contaminants.

Samples must be analyzed in laboratories approved by the DOH. A minimum of one bacteriological sample per month is required. For a groundwater supply, one inorganic chemical sample is required every three years. Organic and VOC samples are necessary only when required by the DOH. Radionuclides must be sampled during four consecutive quarters, once every four years. Sampling for secondary chemical and physical contaminants must occur once every three years.

The MCL's for the various substances are listed in Section 3.3.3. If these levels are exceeded at any time, the procedures in Section 6.4.2 must be followed. (These procedures are described in more detail in the State Board of Health Drinking Water Regulations).

6.4.1 *Routine Monitoring of Bacteriology*

Cascadia should follow the Source Water Chemical Sampling Schedule prepared for its use by the DOH. Bacteriological samples will be collected in accordance with the Coliform Monitoring Plan included in the Management and Operations Manual for each system.

6.4.2 *Required Steps for MCL Exceedance*

Inorganic and Physical: If a primary MCL is exceeded, the DOH shall be notified within 48 hours and corrective action taken. The public shall also be notified. If a secondary MCL is exceeded, the DOH shall be notified and corrective action taken. For parameters exceeding secondary MCLs, public notification is left to the discretion of the DOH.

Radionuclides: When the average of all samples taken during the 12-month period exceeds the MCL, the DOH shall be notified within 48 hours. Public notification is also required.

Volatile Organic Chemicals: Notify the DOH within fourteen days of receipt of test results showing an exceeded MCL. The public shall be notified per WAC 246-290-330, including mandatory health effects language. Public notification must be provided when a *primary maximum contaminant level* is exceeded and should consist of the following four items:

1. A newspaper notice within fourteen days of the violation.
2. A direct mail notice or hand delivery to all permanent residents served by the system within forty-five days of the violation.
3. A notice to a radio and/or television station serving the area within seventy-two hours of violation of a Nitrate MCL or other acute violation as determined by the DOH.
4. Repeat mail or hand delivery every three months until the violation is corrected.

6.5 Coliform Monitoring Program

Group A public water systems are required to develop a written coliform monitoring plan and to collect samples according to that plan. The plan consists of a map of sampling locations and a description of sampling procedures. The DOH has put together two manuals; “Preparation of a Coliform Monitoring Plan” and “Coliform Monitoring.” These manuals provide guidance for preparation of a coliform monitoring plan and the required frequency of sample collection. The samples must be received and analyzed by a laboratory within 30 hours from the time collected. When any sample results in a coliform presence, a “set” of repeat samples must be collected within 24 hours of notification. For a system that collects one routine sample per month, three repeat samples are required. The following procedure should be followed in collecting the three repeat samples:

- Collect the first “repeat” sample from the same location as the previous coliform presence sample was taken.
- Collect a second “repeat” sample at a site within five service connections in either direction down the distribution pipeline from the previously mentioned coliform presence location.
- Collect a third “repeat” sample from a site within five service connections down the distribution pipeline in the opposite direction (starting from the first repeat sample location).

6.6 Emergency Program

The ability of a water system to sustain operations during emergency events and/or respond to emergency situations is important. The goal is to quickly react to emergency conditions, adjust the system to maintain safe and adequate service to the greatest extent feasible, and to return the system to entirely normal operations as rapidly as possible. Depending upon the nature and severity of an emergency event, certain components of the system are going to be more vulnerable and subject to failure that others. This plan addresses the operation of Cascadia’s water systems under such conditions. Cascadia must also be prepared to notify the potentially affected public if an emergency arises. Depending upon the urgency, the affected public may be notified through any of one or a combination of methods such as the following:

- Posted notices at publicly visible locations.
- Public notices in newspapers circulating in the local vicinity.
- Announcements over local radio and television stations.
- Police loudspeaker - roaming system.

- Door-to-door delivery of announcements and personal contact.
- E-mail to community residents.

All announcements should inform the public what situation has occurred, what intermediate measures must be taken by them (i.e., conservation methods, where to go for water, or what to do with their water prior to consumption) and when they can expect to see the system return to normal operation.

If there is an outage over 24-hours in duration notify the Northwest Drinking Water Operations Office of the DOH. In case of emergency the DOH may order Cascadia to provide notification by newspaper and to radio and television stations where such notice is required to protect the public health. Cascadia shall keep detailed and complete records of all public notification occurrences to document compliance with this section.

Table 6-2 Emergency Contact List

Emergency Contact	Contact Information
Culley Lehman, Manager Cascadia Water, LLC	Cell: 360-661-7781
Whidbey Telecom 24-Hour Repair Services	360-321-8324
Buried Cable Locations	1-800-424-5555
Jeff Tasoff, PE	Office: 360-331-4131 ext. 203 Cell: 360-914-0682
DOH After Hours Hotline	1-877-481-4901
DOE Spill Response	1-800-424-8802
Island County Public Health	360-679-7350
Fire/Police/Medical Emergencies	911

6.7 Cross-Connection Control Program

Cascadia Water has previously developed a cross-connection control program as required under WAC 246-290-100 and outlined under WAC 246-290-490. A copy of the Cross-Connection Control Program is included in APPENDIX K.

Cascadia's responsibility for cross-connection control shall begin with its water supply sources, include all Cascadia water treatment, storage, and distribution facilities, and end at the point of delivery to each customer's water system, which is the water meter. Cascadia's plan is outlined below. The rules and regulations provided in the tariff for Cascadia (Appendix P) outline requirements for cross-connection control. Cascadia is in the process of surveying consumers their water systems to determine the potential cross-connection devices currently connected to the system. This process should be completed by the end of 2021 for the systems in this plan.

6.7.1 *Procedures for Hazard Evaluations*

As a condition of new connections to the water system, an initial evaluation to assess the degree of cross-connection hazard posed by the consumer's premises to Cascadia's distribution systems shall be conducted by Cascadia. Cascadia shall determine the method of backflow protection required, if any. The required method of backflow protection shall be installed and a satisfactory test result by a qualified backflow assembly tester shall be provided by the consumer to Cascadia before water service is provided.

As a condition of continued water service, annual evaluation should be conducted on existing connections with water use characteristics that pose potential hazardous cross-connection conditions to Cascadia's distribution systems. These potential uses can include, but are limited to:

- Outdoor pools
- Livestock storage
- Sprinkler systems
- Premises with heat exchangers and/or solar potable hot water systems
- Premises with fire systems using chemicals

As a condition of continued water service, Cascadia will evaluate connections that have had a potential change in use.

6.7.2 *Eliminating or Controlling Cross-Connections*

When cross-connections cannot be eliminated they shall be controlled by installation of approved backflow prevention devices commensurate with the degree of hazard.

Cascadia's Cross-Connection Control Program shall consist of premises isolation at or near the service connection or an alternative location acceptable to the Cascadia between the service connection and the first point of any hazard. Cascadia shall ensure that an approved reduced pressure backflow assembly (or reduced pressure detector assembly) is installed for all premises posing a high degree of cross-connection hazard, including those listed in Section 6.7.1.

Cascadia shall require at a minimum, a double check valve assembly (or double check detector assembly) installed in accordance with WAC 51-46-0603 of the Unified Plumbing Code for premises posing a low degree of cross-connection hazards.

Cascadia prohibits interconnection of any private water supply with Cascadia's distribution systems. Cascadia policy requires that the owner of a property or any person residing thereon receiving water service from Cascadia shall not connect, directly or indirectly, the water service line, or any part of the plumbing of such structure receiving water service from Cascadia, with any other water source, water system, plumbing or any utility line whatsoever.

6.7.3 *Backflow Preventer Inspection, Testing, and Repairs*

All backflow prevention assemblies are subject to annual inspection and testing by a DOH certified backflow assembly tester.

As a condition of continued water service, customers shall make their premises, to which water is supplied, accessible to a state certified backflow assembly tester for inspection and testing annually to determine whether backflow prevention assemblies are properly installed, maintained and are operational. Cascadia may deny or discontinue water service to any customer failing to cooperate in the installation, inspection, testing, maintenance or repair of approved backflow prevention devices pursuant to WAC 246-290-490.

Cascadia will promptly notify property owners with known potential cross-connections. Cascadia shall also notify on an annual basis all customers with approved backflow prevention devices of the need for an annual inspection.

6.7.4 *Quality Assurance Program*

Cascadia shall require backflow prevention assemblies to be models included on the current list of backflow prevention assemblies approved for use in Washington State. Existing backflow prevention

assemblies installed on the system not on the current list of backflow prevention assemblies approved for use in Washington State may be allowed by Cascadia if the following applies:

- The backflow prevention assembly was included on the list of backflow prevention assemblies approved for use in Washington State and/or Uniform Building Code list of approved backflow prevention assemblies at the time of installation;
- The backflow prevention assembly has been properly maintained;
- The backflow prevention assembly is commensurate with Cascadia's assessed degree of hazard as determined by Cascadia in its sole discretion; and
- The backflow prevention assembly has been inspected and tested annually and has successfully passed the annual tests.

Cascadia shall require that an unlisted backflow prevention assembly be replaced by an approved assembly commensurate with the degree of hazard, when the unlisted assembly:

- Is moved; or
- Cannot be repaired using spare parts from the original manufacturer.

6.7.5 *Responding to Backflow Incidents*

In the case of a backflow incident in one of Cascadia's distribution systems, Cascadia's water system administrator shall notify the Board of Commissioners and the local Department of Health as soon as possible, but no later than the end of the next business day, when a backflow incident is known to have:

- Contaminated Cascadia's public water system.
- Occurred within the premises of a customer served by Cascadia.

6.8 Record Keeping and Reporting

Record keeping and reporting requirements are given in WAC 246-290-480 for all public water systems. All files are retained at the offices of Cascadia Water. Customer complaints are maintained by Cascadia and are brought to the monthly meetings of the elected water boards for review.

6.9 Summary of O&M Deficiencies

Cascadia continually strives to improve O&M procedures. Currently there are no specific improvements planned that need to be addressed at this time.

7 DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS

7.1 Introduction

Cascadia's design and construction standards are attached as APPENDIX N. Cascadia is requesting continuation of the design submittal exception for distribution projects. Project plans initiated by developers for extensions or other infrastructure improvements will be reviewed by Cascadia and their engineer to ensure the proposed plans meet the water systems goals for future growth and are consistent with the water system plan. Main replacement plans initiated by the system will be designed to comply with these requirements.

Upon project completion, record drawings sealed by an engineer licensed in Washington State and Construction Certification Forms will be completed by the design/project engineer. The drawings and forms will be submitted to DOH and to Cascadia.

Cascadia is responsible for ensuring the proper operation and maintenance of the water system. Outside parties performing work on Cascadia's water systems must provide prior notification to Cascadia of any construction or repairs. Cascadia must receive a copy of a passing bacteriological sample prior to any system component, water service or main being placed into service.

7.2 Facility Improvement Policies

All new water service applications should follow Cascadia's Adopted Policies and Procedures.

The required steps for implementation are as follows:

1. Water service desired by property owner or developer.
2. Applicant completes Water Service Application form and submits to Cascadia.
3. Cascadia reviews application and determines if water main extension is required:
    a. If main is needed go to step 4.
    b. If no extension required go to step 11.
4. The applicant then is subject to the Facility Improvement and Extension Policy and completes and executes the Facility Extension Contract and pays a retainer for engineering review services.
5. The applicant selects the licensed professional engineer for preparation of plans.
6. The water main extension plans are prepared in accordance with the Cascadia's Construction Standards.
7. Cascadia's engineer reviews the plans. The engineer makes recommendations for acceptance to the Cascadia Board.
8. The applicant selects contractor and submits name with references to the Board for review. The applicant and contractor sign the Contractor Agreement.
9. New water main extension construction performed.
10. At the end of construction, a Bill of Sale and Recovery Contract (if any) are signed, and the Board transmits the letter of terms and conditions.
11. Applicant signs relevant Cascadia agreements and pays meter and hookup fees.
12. The final connection of water service is made.

7.3 Construction and Design Standards

Cascadia has adopted previous technical specifications which are included in APPENDIX N. Any construction or design plans should abide by those standards. Any items not directly addressed by the technical specifications should comply with the following codes and standards:

- Water system construction work shall be performed in accordance with all applicable State and County codes and with the "Standard Specifications for Municipal Public Works Construction", as prepared by the Washington State Chapter of the American Public Works Association (APWA), current edition or as otherwise revised or superseded, and with the "Standard Specifications for Water Main Installation" provided in APPENDIX N;
- Design, construction, maintenance, and operation shall be in accordance with the requirements of Washington Administrative Code (WAC) 246-290, "Group A Public Water Supplies", as now existing or hereafter amended, and also with Chapter 13.03A of the Island County Code (ICC), as now existing or hereafter amended.
- Materials, components, and installation of facilities shall be in accordance with the recommendations of the American Water Works Association (AWWA) as specified in Chapter 7 and the Technical Specification in APPENDIX N.

7.3.1 *Scheduled Improvements*

Improvements that have been identified in the WSP will be prepared by a Washington State licensed professional engineer and include construction plans, specifications, and a cost estimate. No DOH review is required for water main construction and/or improvements that are listed in an Approved WSP. However, DOH review is required for water storage, pumping, and/or water treatment facilities and other improvements.

7.3.2 *Unscheduled Improvements*

Improvements that have not been identified in the WSP will be prepared as outlined above for Scheduled Improvements and will require DOH review.

Payment of the DOH review fees and expenses will be the developer's responsibility when the developer initiates water system improvements. After construction is complete, and accepted by Cascadia, Cascadia will submit the following to the DOH:

- Certification by the professional engineer of record that construction complied with Cascadia's Standards, State standards, and any additional requirements developed during review.
- Documentation of the passing pressure tests, disinfection procedures, coliform test and water quality sample results must be obtained before placing the new main into service.

7.4 Performance Standards

Cascadia Water's performance standards are as follows:

- Flow – Meet peak hour demands (PHDs) with pipeline velocities less than 8 feet/second.
- Pressure – Minimum 30-psi at peak hour, max 90-psi at minimum demand period.
- Fire Flow – Residential service 500-gpm for one-hour duration, sustain distribution main residual pressures with 20-psi minimum and pipeline velocities less than 10 feet/second.

Water Mains – Minimum 6-inch diameter. Fire hydrants with single pumper port, 2-1/2-inch hose ports, 5-inch minimum valve opening. Provide hydrant markings as specified in NFPA 291 – Chapter 2. Out of

service fire hydrants shall be marked by bagging. When existing water mains are replaced, replacement mains shall be sized to meet minimum fire flow requirements of the Island County Code.

7.5 Construction Procedures

New Developer construction will be carried out according to the following procedures:

- Design Review: All construction plans and specifications will be reviewed by Cascadia's engineer prior to release for construction. If DOH review is required, the developer must obtain review and approval before construction may begin.
- Construction: Inspection may be required by Cascadia and is to be provided at the developers cost. Inspections shall be conducted by qualified inspector personnel using either county staff, Cascadia's consultant engineer, or other technical staff approved by Cascadia.
- Flushing, Pressure Testing, and Water Quality: Testing and water main tie-ins will be performed under the supervision of Cascadia staff or its consultant engineer. Upon approval by Cascadia, the new facility shall be put in service.
- Record Drawings: Record drawings are required with field revisions noted on the documents. Record Drawings will be prepared on bond paper and signed and dated by the Engineer of Record. Signed drawings and a copy of the AutoCAD drawings will be conveyed to Cascadia.

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8 IMPROVEMENT PROGRAM

The purpose of this chapter is to incorporate the needs of each water system, as identified in previous chapters, into an improvement program. The Capital Improvement Plan (CIP) presented in this chapter has been developed in accordance with the requirements identified in WAC 246-290-100.

The development of a comprehensive plan and improvement program provide orderly maintenance and improvement of each water system. Population and water demand forecasts and existing system analyses, discussed in previous chapters, were used to formulate the following Capital Improvement Plan. Each water system's design criteria were included in the formation of the plan.

The existing piping systems were also reviewed to determine the necessity of replacing older water mains. Considerations included material condition, size, and capacity. The following sections summarize Cascadia's Improvement Program which is organized in two basic elements: 1) Prioritizing Improvement Projects, and 2) Improvement Schedule.

Planning Phase 1 (6 years; 2020 - 2026)

Some existing system deficiencies and known operational issues have been identified Some of the water systems are currently approved for additional connections according to documents from the DOH. It is anticipated that the Group A water systems combined will serve approximately 1,100 connections by the end of 2026. For WB Waterworks 1, Sea View Water, LLC, and CAL Waterworks, the anticipated needs at 2026 are greater than the current number of DOH approved connections. To meet current and future demands, specific infrastructure improvements to increase system capacity are required during this planning horizon. Each water system has projects identified to improve distribution system efficiencies, treatment, and redundancy needs. Other capital projects will consist of maintenance, repair and replacement of the existing facilities, and providing treatment. For some systems, it will be necessary to provide an additional source of water, or water main replacement in future phases. The owners should be aware of those future needs to ensure that sufficient funding is available to address necessary repairs/replacements to aging infrastructure that are needed in future phases.

Planning Phase 2 (20-year horizon; 2026 - 2040)

It is anticipated that the Group A water systems combined will serve approximately 1,400 connections by the end of 2040. For W&B Waterworks 1, Sea View Water, LLC, Beachcomber H_20 Company, CAL Waterworks, and TEL Company #4 the anticipated needs at 2040 are greater than the current number of DOH approved connections.

Furthermore, at projected growth rates, in 2040 W&B Waterworks 1's demand is estimated to exceed its physical capacity as limited by water rights and source capacity. For expansion to continue, the system will need to obtain additional water rights and source(s) or reduce water usage to stay within the water right limitations.

In Phase 2 of the planning cycle (2026-2040), water systems will continue to investigate the development, or complete the development, of additional water source(s) as many existing sources will have been in service in excess of 50-years during this planning phase. In addition, replacing/upgrading the distribution system is anticipated to be a priority. Due to the large costs associated with main replacement, it is important to initiate the financial plans in Phase 1 that will enable these projects to be completed during Phase 2. The CIP will be re-evaluated during future WSP updates and the CIP can be adjusted at that time.

Planning Phase 3 (20+ years, 2040 and beyond)

As indicated above, build-out for many of the water systems is estimated to occur during Phase 2. As the systems continue to grow in phase 3, the primary challenge may be developing additional sources of supply. In Phase 3, replacement/upgrade of the remaining distribution system is anticipated.

8.1 Prioritizing Projects

A three-step process was used to develop the Cascadia CIP. These steps are identification of potential system improvements, evaluation of the alternatives, and selection of alternatives. Potential system improvements/needs are identified in Section 3.5 and summarized in Table 3-26 and Table 3-26. This Section summarizes projects addressing the potential system improvements/needs, evaluation of the improvements alternatives, and selection of improvements.

8.2 Identification of System Improvements Projects

Section 3.5 identifies the potential system needs categorized by system functional group (or component). Each aspect of the water system was analyzed, and a draft list of potential improvements was developed to address existing or anticipated system deficiencies. When applicable, alternative improvements were developed for each deficiency. The alternatives were determined in consideration of meeting DOH and specific water system standards, improving reliability of the water system, and minimizing capital and operating costs. The following sections summarize potential improvement projects addressing the needs in each of the system functional groups.

8.2.1 *Source*

Multiple source needs are identified for supporting system growth, replacing aging sources, reducing treatment needs, and to provide redundancy within specific systems. The evaluation of source needs includes evaluating locations for alternative well sites and analyzing existing wells to determine the potential for rehabilitation. Source treatment may also impact the need for additional well development. Installation of treatment may allow an existing well to return to service or optimizing treatment may decrease overall water usage.

Installation of New Wells

New source needs were identified for W&B Waterworks 1, CAL Waterworks, Sea View Water LLC, and TEL Company 1, and possibly TEL Company 10. For many of the new sources, a pumphouse will be built to support the installation of treatment on the new source. In addition, any necessary permitting and obtaining/transfer of water rights will be completed for new sources. Well installation will include necessary piping to connect new wells to the distribution system.

- W&B Waterworks 1 has four existing wells These wells are aging and will need to be replaced in the medium term to ensure the long-term viability of the system. Furthermore, it is estimated that this system will exceed its source capacity during Planning Phase 2. Additional sources will allow the system to continue to expand and support a growing number of connections.
- Cal Waterworks has two existing wells (Well #1 and Well #2). Both wells are functioning, but their rate of production is deteriorating because of age. To provide redundancy for the CAL Waterworks water system and develop a suitable source prior to the loss of one or both existing well, the installation of an additional well is recommended.

- Sea View Water, LLC's Well #1 was constructed in 1962 and is nearing the end of its life expectancy. This well should be replaced to ensure the long-term viability of the system's water supply. Well #3 needs frequent rehabilitation due to iron bacteria growth plugging the well screen. This well frequently must be taken out of service for repair. A replacement well is recommended approximately 100-feet east of the existing well.
- TEL Company 1's Well #1 needs replacement because of age deterioration. The new well will be installed near the location of Well #2.
- A new well is in process for TEL Company 10. The existing source has elevated levels of nitrate and lacks a confining layer. A new deeper well is desired to provide a potentially higher quality water source.

Source Meter Replacement– Current Planning Period

Source meters on each system's well will be evaluated for performance. Source meters will be replaced with a new meter as needed.

Connection of Backup Well– Current Planning Period

Mutiny Bay Waterworks system is currently served by W&B Waterworks 1 wells and no longer uses its original well. It recommended to connect Mutiny Bay Waterworks' original well to the W&B Waterworks 1 system to provide redundancy.

Analysis of Wells– Current Planning Period

Wells should be analyzed to determine their efficacy compared to when the well was originally installed and tested. If a well's performance is diminishing, then rehabilitation or replacement will be considered.

Emergency Generator for Well Field – Current Planning Period

Emergency generators can provide power to booster pumps during power outages. Most systems have adequate storage, but extended power outages raise concern regarding the ability to replenish the source water in the reservoirs. A generator should be installed on the larger water system to allow at least one of the system's wells to be active in case of an extended power outage. The generator switch should meet all applicable electrical codes. The generator fuel supply should meet all applicable codes, especially spill control measures in the vicinity of the well field. Typically, a propane fired generator is preferred due to spill concerns within the well radii.

8.2.2 *Treatment*

Treatment facilities improve the quality of water distributed to customers and can reduce flushing and reservoir cleaning needs. Limited treatment is currently installed on the Cascadia owned water systems. Each water system's treatment capacity should be sized to meet current and potential future demand. The existing treatment systems on Sea View Water LLC should be analyzed for removal effectiveness to determine if the existing system can be optimized or needs to be replaced.

It is recommended that water systems without treatment install treatment systems to address iron, manages and primary contaminant concerns, such as arsenic and nitrate. Treatment system will require a pumphouse/treatment building and the optimal configuration is to treat the source water prior to filling the reservoir. Below are treatment-related recommendations for the water systems.

New Treatment System Installation – Current Planning Period

Each treatment system shall be designed to meet current and future demands of the specific water system. Treatment methods will be selected based on the water quality of raw source water. Treatment methods include chlorination, iron and manganese removal, nitrate treatment, and arsenic treatment. The following water systems shall install treatment in the current planning period:

- W&B Waterworks 1 (250-gpm Iron and Manganese Filtration Treatment System for all wells)
- Cal Waterworks (90-gpm Manganese Filtration Treatment System for all wells)
- TEL Company 1 (50-gpm Arsenic Treatment System for Well #8 and 40-gpm Manganese System for Well #1)
- TEL Company 3 (80-gpm Manganese Filtration Treatment System for all Wells)
- TEL Company 10 (10-gpm Nitrate Treatment for Single Source, if current well remains)
- TEL Company 11 (20-gpm Iron and Manganese Filtration Treatment System)

Treatment System Functionality and Capacity Analysis – Current Planning Period

The capacity of existing treatment systems should be analyzed to ensure they have capacity to meet future demands of the system. Treatment systems should be evaluated to ensure efficacy and efficiency including:

- Sea View Water, LLC (Iron and Manganese Filtration Treatment System)

Pumphouse Treatment Building Design– Current Planning Period

All Group B water systems and the following Group A water systems are in need of a new pumphouse/treatment building:

- W&B Waterworks 1
- Sea View Water, LLC
- Cal Waterworks
- TEL Company 1
- TEL Company 3
- TEL Company 4

Pumphouses will be designed to be of a sufficient size to store new treatment/filtration systems, booster pumps, hydropneumatics tanks, and other appurtenances as applicable. If chlorination

equipment is present, a separate well-ventilated room for this equipment should be provided to minimize rusting and deterioration of other system components. The components within a pumphouse shall be appropriately sized and designed for the specific water system's needs. Common equipment should be used where feasible to reduce the spare parts inventory and provide a consistent operational profile. The Group B pumphouses will need to be sized to allow the installation of either a 2,000-gallon or 5,000-gallon reservoir. Reservoir sizes for each Group B system are indicated in Section 8.2.3.

Pumphouse Treatment Building Design and Piping – Current Planning Period

Existing pumphouses may have experienced leaking and deterioration of piping in past years. Piping runs and manifolds within the pumphouses should be assessed and a replacement program scheduled to ensure continued service throughout each system. Replacement pipe should be designed to withstand the damp environment typically experienced in a pumphouse and treatment building. The Management and Operations manual should be updated to provide measures for continued assessment and repair of deteriorating pipes.

Treatment System Backflush Water Disposal – Current Planning Period

A method for disposal of water used to flush the filter media should be incorporated as part of the treatment system design to provide a long-term solution for each applicable water system.

8.2.3 *Storage*

The existing storage capacity for many of the water systems does not provide the recommended standby storage volumes. The following Group A systems would benefit from additional storage capacity:

- W&B Waterworks 1 (estimated 200,000-gallon reservoir)
- Sea View Water, LLC (estimated 60,000-gallon reservoir)
- Beachcomber H_2O Company (estimated 35,000-gallon reservoir)
- Cal Waterworks (estimated 60,000-gallon reservoir)
- TEL Company 1 (estimated 70,000-gallon reservoir)

Storage volume increase will be added by building additional reservoirs with reservoir pipping as applicable. Adequate storage will allow the water systems to meet current and future water demands. Additionally, storage may be able to provide increased standby storage and possible fire suppression storage.

The following Group B systems require the storage improvements indicated:

- TEL Company 5 (estimated 2,000-gallon reservoir inside a new pump house)
- TEL Company 6 (estimated 2,000-gallon reservoir inside a new pump house)
- TEL Company 10 (estimated 5,000-gallon reservoir inside a new pump house)
- TEL Company 11 (estimated 5,000-gallon reservoir inside a new pump house)

8.2.4 *Distribution*

The following projects address the potential distribution needs.

Group A- Watermain Replacement– Current Planning Period/Future Planning Period

The water systems have aging distribution system piping that needs replacing. The majority water systems distribution piping is not currently adequate to meet fire flow standards. Waterline replacement project will include upsizing to meet fire flow requirements and current code requirements. As-built drawings should be created or updated to show existing and new piping installations. Watermain replacements will be an ongoing improvement over several years. Specifics of each system's water main replacements are below:

- W&B Waterworks 1:
  - Replace watermains along Bay Road and Ebb Tide Lane. Increase line size and add fire hydrants where necessary to meet Island County fire flow requirements, replace old valves, and install new service meters.
  - Replace watermains along Wahl Road toward Ebb Tide Lane. Increase line size, as necessary, and replace aging infrastructure. Replace fire hydrants, valves, and install new service meters.
  - Replace watermains along Mutiny Bay Road. Extend a new water main from the reservoirs at Wahl Road up to and down Mutiny Bay Road to serve the northern portion of the system. Increase line size, as necessary, and replace aging infrastructure. Replace fire hydrants, valves, and install new service meters.
  - Install new waterline creek crossing near the intersection of Lancaster Road and Wahl Road, likely by horizontal directional drilling.
  - Replace pressure reducing vaults to reduce pressure within lower elevations zones.
  - Install combination air release and air vacuum valves every 2,000 to 2,500-feet along the main distribution line.
- Sea View Water, LLC:
  - Install new water line from the reservoir west along Fort Nugent Road to loop the system at West Beach Road.
  - Replacement of the waterline located in the easement along the south property line of lots 25 and 36-3 connecting Peacock Lane and Island View Rd.
  - Replace other aging water lines as necessary with the addition of fire hydrants. Line size should be increased to meet Island County fire flow requirements.
- Beachcomber H_20 Company:
  - Reconfigure piping at reservoir sites to allow the pressure and gravity portions of the system to function jointly.
  - Replace aging water mains as necessary as leaks increase. Consider upsizing existing 4-inch water mains to 8-inch to provide adequate flow.
- CAL Waterworks:
  - Installing approximately 150-feet of 8-inch water main to close the loop in water main along East Harbor road between Beachwood Drive and Harbor Sands Lane. This will address the immediate concerns with low service pressures along the north side of the distribution system.

- Install new water line from the pump house along the west side of East Harbor Road with an 8-inch line to existing 6-inch watermain installed between Harbor Sands Land and Beachwood Drive. This will provide adequate service throughout the water system including the Goss Lakeridge Acres intertie.
- Replace existing water lines on Harbor Sands Lane and Beachwood Drive with 6-inch lines to provide better service and prepare the system to provide sufficient fire flow and relocate meters to the road right of way.
- Replace aging water mains as necessary as leaks increase.

- TEL Company 1:
  - Replace aging water mains as necessary as identified by leak detection. Consider upsizing existing 4-inch water mains to 8-inch to provide adequate flow.
- TEL Company 3:
  - Replace aging watermains as identified by leak detection. Consider upsizing existing 4-inch water mains to 8-inch to provide adequate flow.
- TEL Company 4:
  - Replace aging water mains as identified by leak detection. Consider upsizing existing 4-inch water mains to 6-inch to provide adequate flow.

Group B- Watermain Replacement– Current Planning Period/Future Planning Period

The Group B water systems, except Mutiny Bay Waterworks, are anticipated to replace their distribution system piping over the next several years. Pipe failures, exposed mains, and undersized piping may prioritize the replacement schedule. As-built drawings should be updated to show existing and new piping installations.

Group A Pump House Replacement – Current Planning Period

Installation of new pump house buildings are required for the following systems to provide sufficient space to store new treatment systems, booster pumps, hydropneumatic tanks, and other appurtenances:

- W&B Waterworks
- Sea View Water, LLC
- CAL Waterworks
- TEL Company 1
- TEL Company 3
- TEL Company 4

Group A Booster Pump Station Replacement – Current Planning Period

Installation of new booster pump stations are necessary to maintain adequate system pressure for the following systems:

- W&B Waterworks
- Sea View Water, LLC
- Beachcomber H_20 Company:
- CAL Waterworks
- TEL Company 1
- TEL Company 3
- TEL Company 4

Group B Pump House and Booster Pump System Replacement – Current Planning Period

All Group B water systems, expect for Mutiny Bay Waterworks, require construction of new pump houses to house new booster pump stations and storage reservoirs. See section 8.2.3 for reservoir size.

Pressure Tank Replacement – Current Planning Period

TEL Company 4 requires installation of new pressure tank(s) that will be adequately sized for the installation of a new booster pump station to be installed later.

Pressure Reducing Valve Replacements – Current Planning Period

Pressure reducing valves (PRVs) in some locations need replacement because they are no longer functioning. Individual PRVs for meter connections must be installed in other locations. The following systems need PRVs replaced or installed:

- W&B Waterworks 1 (replace 3 PRVs)
- TEL Company 3 (install individual PRVs on existing metered connections)

Meter Replacement – Current Planning Period

A system wide replacement of existing service meters with remote read meters is recommended to ensure accurate consumption data, decrease labor costs, provide real time tracking of consumption, and the ability to spot leaks and system problems. An evaluation of remote read meters is currently underway to understand infrastructure requirements and system capabilities. The goal would be to replace all system meters. Some smaller system may need touch read meters to minimize infrastructure costs. This will ensure that each system is able to accurately track water usage and charge their customers based on actual water used.

Booster Pump Generators – Current Planning Period

Generators should be properly sized for booster pumps to ensure operations during power outages are needed for all systems.

As-Built Drawings – Current Planning Period

Accurate as-built drawings should be prepared for each water system, where they do not exist, to allow for better planning and to improve efficiency of maintenance and repair operations.

Mutiny Bay Waterworks

Transfer final two (2) connections to the W&B Waterworks 1 Group A water system.

8.2.5 *Controls*

Dedicated fill lines, with associated controls and electrical components, should be installed from wells to the reservoir sites of each water system. Some systems are controlled via reservoir float levels which communicate to a control box and eventually the wells. Some system controls need to be replaced. Reservoir control will be switched to pressure transducer to support the installation of a system wide SCADA network. The pressure transducer will allow for actual current reservoir fill volumes to be displayed on the SCADA system. Reservoir operational profiles may also be modified by a SCADA system to increase water turnover in the lower water use periods. The following projects address potential improvements to the control systems:

TEL Company 1 & 3 Electrical Panel Replacement – Current Planning Period

The electrical panel which receives the reservoir control signal and controls the wells needs to be replaced. Current panels are 100-amp and need to be upgraded to 200-amp panels. Additionally, a generator needs to be added to ensure system operations during power outages.

TEL Company 4 Controls Replacement-Current Planning Period

The controls for the TEL Company 4 need replacement. Controls may include reservoir floats, well flow switches, an electrical control box, and communication wires. The type of controls to be replaced will be determined based on the current and future operations of the system.

Security Controls (All Systems) – Current Planning Period

Security improvements will be installed on the individual systems. These projects mostly be scheduled for completion with the installation of new pumphouses and reservoirs. Group B improvements will be scheduled in the medium term. The security improvements include site fencing around pumphouses and reservoirs, intrusion alarms on storage tanks, reservoir hatches, and pumphouse doors.

Upgrading to a SCADA/Control System – Future Planning Period

An analysis should be performed to assess the benefits and cost involved in the installation of a Supervisory Control and Data Acquisition (SCADA) system with associated data logging, reporting, and alarms to monitor the source, treatment reservoir, booster pumps and distribution system of each water system. Cascadia should determine the long-range system functionality to ensure system upgrades support the desired SCADA system.

8.2.6 *Capital Improvements from Previous WSP*

Projects identified in previous WSPs are shown below:

W&B Waterworks 1

1. Construct 79,300-gallon concrete reservoir.
2. Building for booster pumps and treatment, pumping system.
3. Electrical generator for booster pumps/wells.
4. Treatment system for iron, manganese, and arsenic.
5. Upgrade three pressure regulating valve stations.
6. Replace 21,935 feet of glued-joint pipe with C900 PVC.
7. Replace 40,065 feet of glued-joint pipe with C900 PVC.
8. Two emergency interties in north service area (allowance).
9. Install air release valve and blow-off assemblies (allowance).

Items 1, 2, 3, 4, 5, 8, and 9 have not been completed to date. Items 1, 2, 3, 4, 5, and 9 are listed as items to be carried as part of this Water System Plan. Item 8 has been identified as an unnecessary improvement and has been removed from the capital improvements plan. Portions of the main replacement identified as items 6 and 7 have been completed and the uncompleted section has been carried over as work to be completed.

Sea View Water, LLC

1. Build and install gauge for storage tank at Source 01.
2. Reset approximately 40 meters.
3. Construct and install cabinets and sink in pumphouse at Source 01 and 02.
4. Rejuvenate Well #1, Well #2, and Well #3- replace pump and appurtenances
5. Replace filter media in the pump house at Source 01 and 02.
6. Pumphouse improvements: paint exterior, recoat roofs.

The items listed above have not been completed to date. Items 1, 3, and 6 have been identified as unnecessary improvements and have been removed from the capital improvements plan because the existing reservoirs and pump houses are to be replaced under this Water System Plan. Items 2, 4, and 5 are addressed in this water system plan with minor modifications.

Beachcomber H_2O Company

Improvement items for Beachcomber H_2O Company were taken from a 1986 engineering report as no water system plan was available.

1. 34,000-gallon storage tank.
2. Booster pump system.
3. Construct/restore various components of the pressure distribution piping system.
4. Construct/restore various components of the gravity distribution piping system.

Items 1 and 2 have been completed. Progress on items 3 and 4 is ongoing and these items are included in this plan.

Cal Waterworks

1. Add 37,000-gallon reservoir. *
2. Replace booster pump station with pumps for fire flow and emergency generator.
3. Install hypo-chlorinator.
4. Replace the yard piping in vicinity of storage reservoir to provide dedicated inlet and outlet pipes.
5. Add one 452-gallon hydropneumatic tank to low pressure zone. *
6. Add one 436-gallon hydropneumatic tank to high pressure zone. *
7. Replace water mains for fire flow- East Harbor Road, Beachwood Dr., Ravenridge Dr.
8. Install curb-side sample stations.
9. Install air-release valves at high points.
10. Replace glued joint 2-inch and 3-inch PVC water mains.

*Items identified in the 1995 WSP that have yet to be addressed. Other items were identified in the 2009 WSP.

The above items have not been completed to date. Items 1, 2, 4, 5, 6, and 7 are listed as items to be carried as part of this Water System Plan. Items 1 and 4 will be included with the new reservoir design. Items 2, 5, and 6 are included as booster pump system upgrade project. Item 3 will be installed as part of the proposed iron and manganese treatment system. Items 8, 9 and 10 are included as part of the water line replacements projects included in this plan.

TEL Company 1

1. Replacement of well pumps.
2. Install additional 5 hp booster pump.
3. Installation of 3,500 LF of water main.

Items 1, 2, and 3 have been completed.

TEL Companies 3 & 4
Previous WSPs were not available for TEL Companies 3 and 4.

Group B Systems
The Group B water systems do not have a previous capital improvement plan.

8.2.7 *Developer Extensions*

Developer extensions are listed in the CIP to identify major water main improvements above and beyond normal looped water main improvements that land developments typically construct for the direct benefit of their project. These specific improvements should be incorporated into future land development activities along property frontage or within land development itself. Alignment for these improvements may be adjusted to local topography and land use.

No developer extensions have been identified for the current planning period. However, the system is interested in a potential expansion of the water systems and would entertain and support developer extensions when feasible.

8.2.8 *Non-Facility Improvements*

Potential non-facility improvements include continued promotion of conservation policies, clarification of the systems Water Rights, and updates to each water system's procedures and policies to ensure that the integrity of the water distribution systems are maintained. The following items have been identified for the WSP planning periods:

Water Rights Clarification – Current Planning Period

Mutiny Bay is no longer using Well 1 as a source of water for the system. The existing water rights or water right exemption should be reviewed with an attorney and the DOE to determine if water rights may be transferred to W&B Waterworks 1 water system to increase their water right capacity. The system also has the possibility of incorporating the Del Bay Water System into the distribution system. The water rights from Del Bay would need to be transferred to provide long term support of this area. Adequate water rights are essential to ensuring the long-term viability of the system.

8.3 Selection of Alternatives

The discussions of projects for supply, storage and distribution are contained within Chapter 3 and summarized in Section 8.2 above. The sequence and scheduling of projects was developed by following a general priority outline balanced with the review of the current and projected financial resources of each water system. These financial resources are further detailed in Chapter 9. The considerations in selecting projects included:

- Health Standards
- Land Use
- Quantity
- Reliability
- Costs
- Regional Benefit
- Environmental Effects
- Flexibility
- Implementation
- Life Expectancy
- Risk

8.4 Improvement Schedule

WAC 246-290-100 specifies that the WSP shall plan improvements for at least 20 years into the future with an annual schedule of improvements at least 6 years into the future. The DOH Planning Handbook states that the improvement schedule should be based on one or more of the following schedule considerations:

- Identified Deficiencies
- Growth
- Fixed Dates Financial Priority
- Milestones
- Ongoing Programs
- Availability of Outside Funding
- Major Facilities
- Critical Facilities
- Distribution Facilities
- Non-Facilities
- Timing of Improvements
- Location of Improvements

The improvement projects shown in Tables 3-25 and 3-26 were developed based on the above factors and the prioritization system presented in Section 3.5.

8.5 Improvement Project Funding

As further detailed in Chapter 9, it is projected that all planned capital improvement projects scheduled for the next 20 years may be funded by projected cash reserves.

9 FINANCIAL PROGRAM

This Chapter summarizes the Cascadia Water Company's financial program. Cascadia owns and operates multiple water systems on Whidbey Island that are included in this Unified Water System Plan, all of which are approved in the State of Washington. Cascadia Water is a rate supported Investor-Owned Utility (IOU) incorporated in the State of Washington. The Water Company's revenue is derived from monthly service charges, new customer connection charges, and miscellaneous fees and charges relating to new connections. All charges and fees are established in the Cascadia Water Company Tariff (Tariff) submitted to the Washington Utilities and Transportation Commission (UTC). A copy of the Tariff is provided in APPENDIX P. Budgets will be adjusted annually to better reflect current operational cost and revenue streams. The Water System's projected budget and financial status for the next ten years is attached in APPENDIX P

9.1 Past Financial Status

Cascadia's operating budget is shown in Table 9-1. Cascadia is an approved Satellite Management Agency authorized by the DOH to manage and operate the water systems it owns. Cascadia provides each of these systems with the experienced staff necessary to conduct the water system operations, maintenance, billing, and accounting functions needed to provide for their efficient operation. Typically, water systems that are regulated by the UTC are required to include 3-years of past budget information in the WSP, however, the budget information from 2018 was not included because Cascadia Water was not formed until November of 2018. Therefore, budget information from November and December of 2018 is not representative of Cascadia's normal operating budget.

Table 9-1 Operating Budget

	2019	2020
REVENUES		
Operating Revenue	$506,741	$625,572
Misc. Revenue Accounts	-	-
Other Revenue Accounts	-	-
Other Income	-	-
Total Income	**$506,741**	**$625,572**
EXPENSES		
Operating Expense Accounts	$399,095	$530,876
Depreciation Expense	$11,986	$33,837
Amortization Expense	-	-
Other Tax & License	$47,061	$61,390
Federal Income Taxes	$9,169	-($141)
Total Operating Expenses	**$467,311**	**$625,962**
NET		
Total Income	**$506,741**	**$625,572**
Total Expenses	**$467,311**	**$625,962**
Net Operating Income	**$39,430**	**-($390)**

In the development of the water financial plan, it was assumed that the utility must be financially self-sufficient with adequate funding. As a result, the financial plan developed herein assumes the necessary funding needed to operate and maintain the water system on a financially sound and prudent basis. The financial information provided in Table 9-1 comes from the latest rate case approved by the UTC. A copy of the rate case financial information is provided in APPENDIX P.

9.2 Development of Financial Plan

The long-term financial viability of Cascadia and its future budgeting will be based on its net income and regulation placed by the UTC. Recent yearly operating budgets can indicate whether current levels of income are sufficient to meet anticipated future expenses. These expenses will be determined by previous yearly operating expenses, projected future operating expenses and projected capital improvements to Cascadia's various water systems. Additionally, a set amount of money should be set aside each year for unexpected costs that may arise due to system component maintenance or failure.

If it is determined that current levels of income are not sufficient to meet the above identified expenses, a revaluation of Cascadia's rate structure should be performed in order raise additional income.

9.2.1 *Revenues*

The first component of the financial plan is a review of the sources of revenues for Cascadia Water. The revenues received from operations are water sales to customers. Projections for future year revenues were developed by applying a projected growth rate of the current number of connections based on recent yearly data and projections in this report.

Total revenues are projected to be approximately $638,000 in 2021. Cascadia's rate revenues come from sales to system customers and wholesale to the Goss Lakeridge Acres system. The total revenues are projected to increase to approximately $762,500 in 2030 based on the current rate structure. The 6-year projected revenues and expenses are provided in Table 9-3. An anticipated 10-year budget is included in Appendix P.

9.2.2 *Expenses*

The second component of the financial plan is a review of annual Operating in capital expenses. In developing the financial forecast, five main cost components were reviewed:

1. Operating Expense Accounts
2. Depreciation Expense
3. Amortization Expense
4. Other Tax & License
5. Federal Income Tax

Operating Expense Accounts

Operating expenses include all expenses required to operate the water systems, including operation and maintenance, repairs, services, etc.

Depreciation Expense

Estimated depreciation of Cascadia's assets. The estimated yearly depreciation is shown budget sheets in Appendix P. The depreciation expenses are not expected to increase from year to year.

Amortization Expense
Amortization expenses include the repayment of loans. Cascadia currently has no loans payments.

Other Tax & License
Other taxes include taxes that are not federal income tax. For example, Cascadia has tax obligation in the form of sales tax, property taxes, and excise taxes. Costs of licensing are also included in this expense.

Federal Income Taxes
The federal income tax is based upon system profits. Projected taxes rates are assumed to be constant for over the projected time period with the amount paid based upon profits, revenue, and income.

9.3 Potential Methods of Improving Financing

Cascadia's capital improvements projects are to be initiated and paid for by each system's water connection fees and reserves currently on hand. In addition, NW Natural, the parent company to Cascadia Water, plans on investing significant funding in the coming years to bring the systems up to the expected levels of service. The 10-year budget (Appendix P) provides a budget for the improvements outlined in Chapter 8. Those proposed improvements will allow the systems to function more efficiently, provide an increased level of service, and reduce potential liabilities throughout the distribution system. These proposed investments are evaluated in the proposed budgets as they are intended to allow the systems to function more efficiently and provide greater reliability in the future phases of the planning periods. The major projects initiated by Cascadia for this planning term will primarily consist of new treatment system installation, pumphouse and treatment building upgrades, watermain replacement, meter replacement, and reservoir float controls replacement. Additional system reserves should start to be established now for these future expenses.

The 10-Year Capital Improvements Plan (CIP) was developed based upon Cascadia's predicted cash flow, construction cost estimates, and projected investment from their parent company. Due to increased investment into each of the systems Cascadia Water has initiated communication with the UTC to evaluate plans for system improvements and to more accurately assess reasonable water rates to support the systems into the future planning periods. If revised rates are issued by the UTC those rates should be incorporated into the budget provided in Table 9-3.

9.4 Financial Viability and Feasibility

The DOH and UTC have developed four tests to determine the Financial Viability of an IOU and the Financial Plan Feasibility of an IOU's financial program. IOU Financial Viability is defined as the ability of an IOU to obtain sufficient funds, on a continuing basis, to cover the total costs of developing, constructing, operating, and maintaining a company in compliance with federal, state, and local drinking water requirements. Financial Plan Feasibility is defined as the company's ability to provide sufficient quantity and quality of water service for the planning period. The financial viability tests are summarized below:

Test 1 – Positive Annual Income

Financial Viability:
To be determined financially viable per Test 1, the company's income sheets must result in positive annual income for two out of the last three years. If the income sheets result in a negative income for more than one out of the last three years, a company may still be determined financially viable if the

company has a sound history, and the cause of the deficit is explained and corrected. Cascadia Water was not formed until November of 2018; therefore, the system only has two years of financial history. As shown in Table 9-1, the System had net positive income for one of the past two years. Cascadia is projected to have a positive net income in 2021; therefore, it will be considered financially viable per Test if the projection is correct.

Financial Plan Feasibility:
To be determined financially feasible per Test 1, the projected budget must demonstrate positive annual income for the future planning period. An exception to this requirement may be allowed if the cause is justifiable and correctable. The projected budget, as shown in APPENDIX P, shows a net positive income for all years within the 10-year financial planning period. Therefore, Test 1 indicates that the financial plan is feasible.

Test 2 – Positive Retained Earnings

Financial Viability:
To be determined financially viable per Test 2, the company must have positive retained earnings for two out of the three years of balance sheet information submitted to be determined viable. Retained earnings is a summation of past annual income/loss of a company. Cascadia's retained earnings are positive for two of the three years. Therefore, the System is considered financially viable per Test 2.

Financial Plan Feasibility:
To be determined financially feasible per Test 2, if a company demonstrates positive annual income for the planning period, the retained earnings should also reflect positive results. The 10-yr projected, shown in Table 9-3, shows that the System is expected to have positive net earnings through the year 2030.

Test 3 – No Outstanding Agency Orders

Financial Viability:
According to this viability test the company must not have any outstanding agency departmental orders or unresolved notice of violations for the last three years of operation. The System is currently operating under a green operational status and does not have any outstanding departmental orders or notices of violations, and therefore, is considered financially viable per this test.

Financial Plan Feasibility:
A company is considered to be financially feasible in the future unless there is an outstanding departmental order or notice of violation. The company will lose its feasibility status if a departmental order or notice of violation is issued.

Test 4 – Capital/Asset Ratio

Financial Viability:
A company is considered to be financially viable if, in the company's last balance sheet, its capital asset ratio is equal to or greater than 30%.

$$Capital\ Asset\ Ratio = (TA - (CP + AD))/TA$$

Where: *TA* = Total Asset
CP = Contributed Plant
AD – Accumulated Depreciation

The value for TA was found to be $45,618,000 (see Appendix P). The System does not have any CP, and the AD was estimated to be about $31,733,000. Therefore, the resulting Capital Asset Ratio was found to be 30%, which meets the requirements per Test 2.

Financial Plan Feasibility:
A company is considered to be feasible in the future if, 1) they continue to maintain the 30% capital asset ratio, or 2) they are making progress towards achieving the minimum 30% capital asset ratio. With the planned capital improvements, the System will replace infrastructure and assets that have significantly depreciated. Therefore, the System is expected to maintain its Capital Asset Ratio above 30%.

9.5 Rates and Charges Structure Analysis

Cascadia's current rate/fee system is summarized in the following sections.

9.5.1 *Water Rates*

UTC regulates rate setting for private, investor-owned public water systems over a certain size, such as Cascadia Water. As such, the UTC sets the water rates for the water systems based upon a rate audit of the systems expenses and incomes. The latest tariff provided by UTC is included in APPENDIX P. The a rates are separated between non-metered services, metered services, and ready-to-serve services. The latest Meters are read and billed on a bi-monthly basis. Table 9-2 provides the monthly rates approved by the UTC.

As Table 9-2 indicates, the basic rate increases in relationship to the meter size. The conceptual rate review undertaken indicates that the utility's rates attempt to capture the cost differential to serve customers with varying usage characteristics and facility requirements. Completion of a up to date comprehensive rate study will assist the utility to identify if any rate structure changes are warranted based on the utility's goals, objectives and the manner in which costs are incurred.

Table 9-2 Current System Fees

Meter Size	Base Rate[1]	1st Block (cu.ft.)	1st Block Rate[2]	2nd Block (cu.ft.)	2nd Block Rate[2]	3rd Block (cu.ft.)	3rd Block Rate[2]
Metered Connections							
5/8-inch	$17.50	0 - 500	$0.75	501 - 1,500	$1.80	Over 1,500	$4.00
3/4-inch	$26.25	0 - 750	$0.75	751 - 2,250	$1.80	Over 2,250	$4.00
1-inch	$43.75	0 - 1250	$0.75	1,251 - 3,750	$1.80	Over 3,750	$4.00
1.5-inch	$87.50	0 - 2500	$0.75	2,501 - 7,500	$1.80	Over 7,500	$4.00
2-inch	$140.00	0 - 4000	$0.75	4,001 - 12,000	$1.80	Over 12,000	$4.00
Unmetered Connections							
n/a	$26.74	---	---	---	---	---	---
Ready-to-Serve Connections							
n/a	$17.50	---	---	---	---	---	---

* All rates are plus state utility tax

1 All metered rate service(s) have zero allowance for water usage in base rates.

2 The usage rate(s) are based on consumption per 100 cubic feet.

9.5.2 *Main Extensions and Connection Charges*

The cost and construction of main extensions are typically the responsibility of the developer. Cascadia would complete recovery contracts for most main extensions fronting properties that are not connecting to the extended main. When the property applies for service, a recovery fee may be collected by Cascadia for its benefit and/or the benefit of the private party who paid for the main extension.

9.6 Future Financial Planning

As noted in the development of the capital improvement funding, a key aspect of maintaining a financially healthy utility is providing adequate funding through rates for renewal and replacement items. In addition to adequate renewal and replacement funding, two other prudent financial planning criteria are reviewed to determine the financial health and viability of the utility. These are debt service coverage ratios and minimum reserve levels.

Meeting debt service coverage requirements is an important financial indicator for well managed utilities. Debt service coverage is a financial measurement of an entity's ability to repay debt. A debt service coverage ratio is a comparison of net income before debt service payments to the total debt service on revenue bonds. As previously notes, a unique aspect of Cascadia's funding for their immediate and near-term capital improvement projects is funding and investments from a parent company. Therefore, the improvements for Cascadia as a private water company and capital funding outside of rates is funded through commercial loans, intercompany loans, or loans from the parent company. Therefore, no debt service coverage ratio is calculated Cascadia in the analysis.

While no recommendation or funding of reserves has been included within the development of this plan, DOH recommends, for small water systems, a balance for operating reserves of US of O&M expenses, repair and replacement reserves of 1/20 of total assets, and emergency replacement reserves of 10% of revenues. In addition, industry standards (American Waterworks Association - AWWA) recommend that utilities maintain working capital reserves at a level adequate to handle unexpected occurrences, including unexpected cash flow fluctuations. Again, target reserve levels are not included within the analysis or rates, as they have not typically been recognized by the UTC or included within rates to fund a reserve account.

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Table 9-3 Future Six-Year Operating Budget

Expenses	2021	2022	2023	2024	2025	2026
Operations						
Employees	$108,600.00	$110,250.00	$111,900.00	$113,580.00	$115,290.00	$117,020.00
Employee Benefits	$55,000.00	$55,830.00	$56,670.00	$57,530.00	$58,400.00	$59,280.00
Facilities - Power	$40,000.00	$40,600.00	$41,210.00	$41,830.00	$42,460.00	$43,100.00
Chemicals & Testing	$4,500.00	$4,590.00	$4,690.00	$4,790.00	$4,890.00	$4,990.00
Materials and Supplies	$6,000.00	$6,000.00	$6,000.00	$6,000.00	$6,000.00	$6,000.00
Repairs and Maintenance	$25,000.00	$25,000.00	$25,000.00	$25,000.00	$25,000.00	$25,000.00
Total	**$239,100.00**	**$242,270.00**	**$245,470.00**	**$248,730.00**	**$252,040.00**	**$255,390.00**
Administration						
Transportation	$14,250.00	$14,610.00	$14,980.00	$15,360.00	$15,750.00	$16,150.00
Insurance/General	$3,600.00	$3,680.00	$3,760.00	$3,840.00	$3,920.00	$4,000.00
Regulatory Expenses	$1,500.00	$1,500.00	$1,500.00	$1,500.00	$1,500.00	$1,500.00
Travel and Education	$15,000.00	$15,000.00	$15,000.00	$15,000.00	$15,000.00	$15,000.00
Utility Excise Tax	$26,000.00	$26,390.00	$26,780.00	$27,180.00	$27,690.00	$28,100.00
Property Tax	$10,000.00	$10,150.00	$10,310.00	$10,470.00	$10,630.00	$10,790.00
Payroll Tax	$35,000.00	$35,000.00	$35,000.00	$35,000.00	$35,000.00	$35,000.00
Other Taxes & Fees	$5,000.00	$5,000.00	$5,000.00	$5,000.00	$5,000.00	$5,000.00
Total	**$110,350.00**	**$111,330.00**	**$112,330.00**	**$113,350.00**	**$114,490.00**	**$115,540.00**
Total Operations	**$349,450.00**	**$353,600.00**	**$357,800.00**	**$362,080.00**	**$366,530.00**	**$370,930.00**

Capital Projects						
PRV (W&B)	$60,000.00	$0.00	$0.00	$0.00	$0.00	$0.00
Pumphouse (W&B)	$0.00	$0.00	$75,000.00	$50,000.00	$0.00	$0.00
Fe&Mn (W&B)	$0.00	$0.00	$75,000.00	$50,000.00	$0.00	$0.00
Reservoir (W&B)	$0.00	$0.00	$100,000.00	$100,000.00	$100,000.00	$100,000.00
Source (W&B)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Source (Sea View)	$0.00	$50,000.00	$0.00	$0.00	$0.00	$0.00
Intertie (Sea View)	$0.00	$50,000.00	$0.00	$0.00	$0.00	$0.00
Pumphouse (SeaView)	$0.00	$0.00	$0.00	$0.00	$75,000.00	$80,000.00
Fe & Mn (Sea View)	$0.00	$0.00	$0.00	$0.00	$40,000.00	$40,000.00
Reservoir (Sea View)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Reservoir (BC H20))	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Pumps (BC H20))	$0.00	$25,000.00	$0.00	$0.00	$0.00	$0.00
PRV (BC H20))	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Loop Repair (CAL)	$25,000.00	$0.00	$0.00	$0.00	$0.00	$0.00
Pumphouse (CAL)	$175,000.00	$0.00	$0.00	$0.00	$0.00	$0.00
Reservoir (CAL)	$0.00	$100,000.00	$0.00	$0.00	$0.00	$0.00
Source (CAL)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Pumphouse (TEL 1)	$0.00	$0.00	$0.00	$50,000.00	$50,000.00	$0.00
As & Mn (TEL 1)	$0.00	$0.00	$0.00	$0.00	$60,000.00	$60,000.00
Reservoir (TEL 1)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Source (TEL 1)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Pumphouse (TEL 3)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Mn Filtration (TEL 3)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Booster Pumps (TEL 3)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Pumphouse (TEL 4)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Res. Repairs (TEL 4)	$20,000.00	$0.00	$0.00	$0.00	$0.00	$0.00
Controls (TEL 4)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Group B Repairs						
Pumphouses	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$50,000.00	$50,000.00
Fe & Mn (TEL 11)	$0.00	$0.00	$0.00	$0.00	$0.00	$45,000.00
Universal System Repairs						
Generators	$10,000.00	$10,000.00	$10,000.00	$10,000.00	$10,000.00	$10,000.00
Source Meters	$2,000.00	$2,000.00	$2,000.00	$2,000.00	$2,000.00	$2,000.00
Water Mains	$0.00	$50,000.00	$0.00	$0.00	$50,000.00	$0.00
Total Improvements	**$342,000.00**	**$337,000.00**	**$312,000.00**	**$312,000.00**	**$437,000.00**	**$387,000.00**

Revenue						
Water Revenue	$645,000.00	$654,675.00	$664,495.13	$674,462.55	$684,579.49	$694,848.18
New Services	$5,000.00	$5,000.00	$5,000.00	$5,000.00	$7,500.00	$7,500.00
Total Revenue	**$650,000.00**	**$659,675.00**	**$669,495.13**	**$679,462.55**	**$692,079.49**	**$702,348.18**
Total Expenses	**$691,450.00**	**$690,600.00**	**$669,800.00**	**$674,080.00**	**$803,530.00**	**$757,930.00**
VARIANCE	**$ (41,450)**	**$ (30,925)**	**$ (305)**	**$ 5,383**	**$ (111,451)**	**$ (55,582)**

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10 MISCELLANEOUS DOCUMENTS

This Chapter summarizes supportive documents and agreements that are not otherwise discussed in other sections of the Water System Plan.

10.1 County/Adjacent Utility Correspondence

Island County was notified of the Cascadia updated Water System Plan. In addition to Island County, the following adjacent Utilities were also notified:

- City of Langley (45950W)
- Freeland Water and Sewer District (264508)
- Whidbey West Water Association (363146)
- Ledgewood Beach Water District (46650K)
- Vistaire Water System (57414E)
- Mutiny Sands Club (57900R)
- Maple Glen Community Association (511156)
- Ridgeview Estates Community Association (267916)
- Norcliffe Water Association (84566T)
- Goss Lakeridge Acres Association (220700)
- Whidbey Institute (05235X)

Correspondence that supports the updating of the Plan is provided in APPENDIX T.

10.2 State Environmental Policy Act (SEPA) Determination

A State Environmental Policy Act (SEPA) checklist is not required as each of Cascadia's systems serve less than 1,000 connections. Therefore, the documentation has not been included with the Plan.

10.3 Agreements

A copy of Cascadia's Service Area Agreement is attached in APPENDIX A. APPENDIX A also includes the Water Systems' Franchise Agreements provided by Island County