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Providing safe, reliable, affordable, and sustainable service.

Timberline Village #628
ODW ID# 88388
Part B Water System Plan

Prepared By
Doug Piehl, P.E.
July 10, 2023

1230 Ruddell Rd. SE
Lacey, WA 98503
(866) 357-8783
Fax (360) 357-1172
www.thurstonpud.org

Water System Plan
Timberline Village #628
WSID: 88388

EXECUTIVE SUMMARY:

The Timberline Village #628 Water System Plan provides a long-term planning strategy for the water system over the 10-year and 20-year planning periods. The plan was prepared to update the previously approved plan in 1975, incorporate system changes, and increase the number of approved connections. The objectives of this plan are to evaluate the performance and adequacy of the water system, to determine what will be necessary to meet the infrastructure demands for the next 20 years, and to identify issues that may affect the operation of the water system. The plan was prepared in accordance with the Washington Administrative Code (WAC) 246-290-100.

The existing system supplies 286 (primarily part time) connections, which are calculated as 99 ERU (equivalent full time residential connections). The system has sufficent annual water rights to supply 189 ERU. Approval for 331 connections is requested at this time; in the unlikely event of all new connections being full time residences, this would result in a total of 144 ERU, well below the water right limitation of 189 ERU. This request is modest and conservative. Approval of these connections will allow fulfilment of the existing waiting list for connections and will also halt the resulting ongoing installation of exempt wells occurring within the Timberline Village service area. Approval of further connections may be requested in the future once additional water rights are obtained or additional history of reduced water loss is available.

Table 1 Water System Information

Connections	270 approved connections, 286 existing connections (29 full time connections, 241 part time, 12 multi-family, and 4 commercial)
ERU	99 existing
Sources	S01, Well 1, AFM952, 1965, 8" well, 120 gpm pump capacity S02, Well 2, AFM953, 1974, 8" well, 95 gpm pump capacity
Treatment	None
Storage	Reservoir 1, 1982: 2 – 30,000 reservoirs, 60,000 gallons total
Pressurization	Wells pump to distribution in the lower zone and fill a reservoir in the upper zone. Booster pumps pressurize the upper zone.
Distribution	2,400' of 1.5" pipe 8,000' of 2" pipe 900' pf 3" pipe 12,500' of 4" pipe 3,300' of 6" pipe 2,000' of 8" pipe Total: 29,000' of distribution pipe
Water Rights	G2-00887C, Qi = 160 gpm, Qa = 39 ac-ft/yr G2-22984C, Qi = 160 gpm, Qa = 19 ac-ft/yr G2-25619C, Qi = 400 gpm, Qa = 58 ac-ft/yr (non additive) Total existing certificates: Qi = 400 gpm, Qa = 58 ac-ft/yr G2-29150, New application with priority date 11/7/94, Qi = 400 gpm, non-additive, Qa = 58 ac-ft/yr additive
ADD	231 gpd/ERU
MDD	855 gpd/ERU
Current PHD	180 gpm (at current 286 connections and average DSL)
Management	PUD No. 1 of Thurston County

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Timberline Village #628

Water System Plan

Acronyms

ADD	Average Daily Demand
C	Coefficient of Friction
DSL	Distribution System Leakage
ERU	Equivalent Residential Unit
GWI	Groundwater Under the Influence of Surface Water
HGL	Hydraulic Grade Line
MCL	Maximum Contaminant Level
MDD	Maximum Daily Demand
MPA	Microscopic Particulate Analysis
NTNC	Non-Transient Non-Community
PHD	Peak Hourly Demand
ppb	Parts per Billion
ppm	Parts per Million
RSA	Retail Service Area
SMA	Satellite Management Agency
SWL	Static Water Level
SWSMP	Small Water System Management Program
UTC	Utilities and Transportation Commission
WDM	Water Distribution Manager
WFI	Water Facilities Inventory (form)
WSDM	Water System Design Manual
WSDOH	Washington State Department of Health
WSP	Water System Plan
WUE	Water Use Efficiency

Chapter 1 System Description

1.1 Ownership and Management

Timberline Village #628 Water System (WSID 88388B) is an existing Group A Community water system located 4 miles northeast of Packwood in Lewis County, Washington. The system serves full and part-time single-family residences, one condo building, and one hotel. The system has a large transient population due to the proximity to Mount Rainier National Park and White Pass Ski Area. The system is owned and operated by PUD No. 1 of Thurston County. The system is currently approved for 270 connections but has 286 connections existing. Pertinent information about the water system is summarized below:

Water System Name:	Timberline Village #628
System Type:	Group A Community
WSDOH ID Number:	88388 B
Location:	Lewis County, Washington
Sources:	2 active wells (S01, S02)
Approved Service Connections:	270
Type of Ownership:	Special District
Name of Owner:	PUD No. 1 of Thurston County
Owner Address:	1230 Ruddell Rd SE Lacey, WA 98503
Type of Management:	Owner Managed

The Thurston PUD Water System Plan Part A – Umbrella Plan will be referenced throughout this WSP. Additional information regarding ownership and management is outlined in the Thurston PUD Umbrella WSP.

1.2 System History and Background

The Thurston PUD Umbrella WSP contains information regarding the history of the PUD.

The Timberline Village #628 Water System was originally developed by Far West Industries in the 1970's. The water system was purchased by PUD No. 1 of Thurston County in 2017. Well 1 was completed in 1965 and Well 2 was completed in 1974. Since the original construction, the system has installed two 30,000 gallon reservoirs and a booster pump station to serve the upper zone.

1.2.1 Existing Facilities

The system's source of potable water is entirely from groundwater. Groundwater is withdrawn from 2 wells located in the same vicinity. Well (AFM952) is drilled to 89 feet and Well (AFM953) is drilled to 63 feet. The total pumping capacity is 215 gpm.

The system is comprised of the two wells, storage, pressure boosting pumps, and water line. There is no backup power available for the wells or booster pumps. Controls are provided by pressure controls at the wells and via telephone communication from the reservoirs.

1.3 Related Plans

The following documents were consulted in the preparation of this Water System Plan:

- *Lewis County Comprehensive Plan*, updated 2017
- *WRIA 25/26 Watershed Management Plan, Grays-Elochoman and Cowlitz River Watershed Planning,* updated 2013

Lewis County maintains a *Comprehensive Plan* which was last updated in 2017. This document was developed to comply with the State's Growth Management Act (GMA). The *Comprehensive Plan* provides guidance on which the planning and land use projections within this WSP are based.

Timberline Village #628 is within the Cowlitz River watershed (WRIA 26). The plan which addresses water quality, conservation, and environmental resource issues.

No inconsistencies or objections to the Water System Plan have been identified at the time of writing.

The nearest adjacent water system is High Valley Country Club which is approximately 0.5 miles west of Timberline Village #628's service area boundary. This water system is located across the Cowlitz River.

See the Thurston PUD Umbrella WSP for related plans.

1.4 Service Area, Maps, and Land Use

A map of the service area, retail service area, and water rights place of use is shown in Appendix 10.2. Detailed system maps are included in Appendix 10.3.

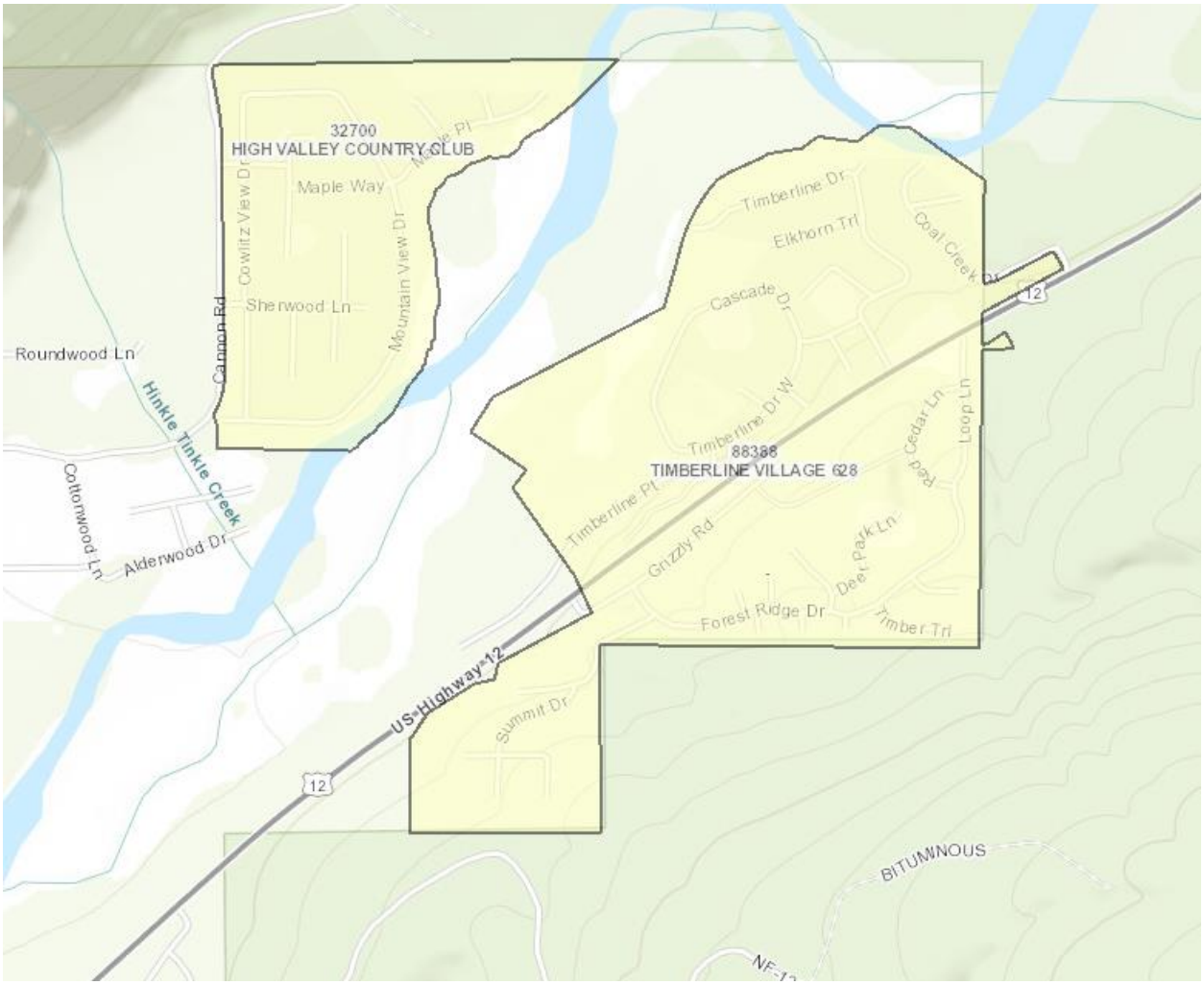

Figure 1-1 Service Area

1.4.1 Retail Service Area

The retail service area is where a municipal water supplier has a duty to serve connections under the conditions described in Section 1.6. For the Lake Limerick Water System, the retail service area is identical to the existing service area.

1.4.2 Future Service Area

No increase in the system's service area is anticipated; all future water system growth on the water system in the future is expected to be from the infill of undeveloped lots within the existing service area. The service area currently consists of 421 parcels; under existing zoning subdivision of larger existing parcels to create up to an additional 72 parcels is possible, giving a total of 493 parcels within the existing service area under the current zoning.

1.4.3 Service Area Agreements

The Thurston PUD has never formed any service area agreements with outside utilities. No competing utilities have registered service areas within the bound of the existing or future service areas proposed; therefore, no utility coordination is required.

1.4.4 Land Use and Zoning

Zoning within the Timberline Village #628 water system is shown on map prepared by Lewis County (see maps included in Appendix 10.2. The area is zoned Rural Residential Center with a density of one unit per gross acre (RRC – R1).

1.5 Service Area Policies

Service area policies are outlined in the Thurston PUD Umbrella Plan. Any new connections to the Timberline Village #628 water system will be provided on a first-come, first-serve basis.

1.6 Duty to Serve

Timberline Village #628 has a duty to serve all new connections located within its Retail Service Area, provided the following four threshold factors are met, as described in Washington Administrative Code (WAC) 246-290-106:

1. *Timberline Village #628 has sufficient capacity to provide water in a safe and reliable manner.*
   Timberline Village #628 holds a BLUE operating permit. The system is adequate for existing connections but is not allowed to add new connections. The system currently has more active connections than the approved number of connections. The goal of the WSP is to gain approval for additional connections.

2. *The service request is consistent with state and local regulations.*
   The provision of service within the Retail Service Area is considered to be consistent with the *Lewis County Comprehensive Plan*.

3. *Timberline Village #628 has sufficient water rights to provide service.*
   A capacity analysis demonstrating existing water rights are sufficent to serve additional services is in process. Pending Water Right application G2-29150 for an additional 58 acre-feet per year will add significant additional available water rights if approved.

4. *Timberline Village #628 can provide service in a timely and reasonable manner.*
   For planning purposes, “timely service” is defined as receiving water service within 120 calendar days plus construction time. If the extent of water service requested required construction of major facilities such as the replacement of installation of new storage tanks, wells, booster pumps, or distribution mains, the time associated with engineering, regulatory review and approval, and construction may be added to the 120 days.

   The provision of new water service is “reasonable” if:

- The conditions of service are consistent with local land use plans and development regulations.
- The conditions of service and associated costs are consistent with those documented in the water system plan, and
- The conditions of service and associated costs are consistent with the water system's standard practice experienced by other applicants requesting similar water service.

If the request cannot be permitted because these criteria cannot be met, the system shall issue a denial of water service and a brief explanation of the reason that service cannot be provided. The customer and the water system may negotiate a future facilities upgrade through a developer extension agreement; however, this may require significant engineering and construction, and would not be done as a part of the Duty to Serve.

1.7 Local Government Consistency

In accordance with the Municipal Water Law, Timberline Village #628 is working on obtaining a signed consistency statement from Lewis County to document that this WSP is consistent with local area planning. A copy of the Lewis County consistency statement will be included in Appendix 10.8 of the WSP.

1.8 Watershed Plan Consistency

As discussed in Section 1.3 above, Timberline Village #628 is within the Cowlitz watershed (WRIA 26). The *WRIA 25/26 Watershed Management Plan, Grays-Elochoman and Cowlitz River Watershed Planning* was consulted in preparation of this Water System Plan. The watershed management plan addresses water quality, conservation, and environmental resource issues. No inconsistencies between the watershed management plan and this Water System Plan were identified.

1.9 Complaints

Complaints regarding water service issues may be directed to Thurston PUD.

Chapter 2 Basic Planning Data

2.1 Current Population, Service Connections, and Equivalent Residential Units (ERUs)

2.1.1 Population and Demographics

The Timberline Village #628 water system is primarily a residential community comprised of full time residences, part-time residences, and commercial services. Community buildings include a community center and pool. Commercial services include Packwood Lodge and a small restaurant.

The breakdown of services is as follows:

- Residential Connections
    - 29 Full-time
    - 241 Part-time
    - 1 Condo (12 Units)
- Non-Residential Connections
    - 1 Community Center
    - 1 Community Pool
    - 1 Restaurant
    - 1 Hotel

The 2010 census data suggests the Lewis County households have an average of 2.5 people per household. Based on this, it is estimated 73 full time residents live in the 29 full time residences. The seasonal residences tend to be occupied by visitors to White Pass Ski Area by the homeowners or short-term rentals to visitors.

2.1.2 Types of Usage

The Timberline Village #628 water system has both residential and non-residential connections as part of the water system. The non-residential connections are the community center, pool, restaurant, and hotel. In addition, the system has a large portion of part time connections. The usage types for the system will be defined as full time residential, part time residential, community, commercial, and distribution system leakage (DSL). Definitions of these connections are in **Error! Reference source not found.**.

Determination and criteria for full time versus part time residential connections is in Section 2.2.2.

2.2 Water Production and Usage

2.2.1 Meter Data

Timberline Village source and service meter data is recorded monthly. There are additional zone meters to help with leakage, these are also recorded monthly. Service and source meter data for the three year period from June 2019 to May 2023 was analyzed in this WSP.

2.2.2 System Parameters: ADD and MDD

The full-time residential users are used as the basis for the ERU analysis. Part time residential and commercial ERU's are calculated by dividing their respective per connection MDD by the full time residential MDD.

The ERU_{ADD} is the average of the monthly data between June 2019 and May 2023, or 231 gpd/ERU. The Maximum Month's Average Day Demand (MMADD) is 471 gpd/ERU which occurred in July 2021. ERU_{MDD} of 855 gpd/ERU is calculated by multiplying the MMADD by a peaking factor of 1.65 and a safety factor of 1.1.

2.2.3 Distribution System Leakage

Timberline Village records source and service meter data monthly and compares them to determine leakage. The system has significant distribution system leakage (DSL) due to a combination of poor original water line installation, a large distribution system, and low density development with low occupancy rates. The system is fully metered as of November 2019 and zone meters have been installed to analyze leakage. Additionally, Thurston PUD has been completing ongoing leak repair on known leaks and as leaks come up. This has resulted in a significant reduction is DSL.

The chart below shows total pumped water from the wells, sold water (consumption), and resulting DSL. Overall, DSL has a downward trend which reflects targeted main replacement and extensive leak detection repairs. The below plot normalizes loss from the 2022 fire and ensuing transmission main rupture.

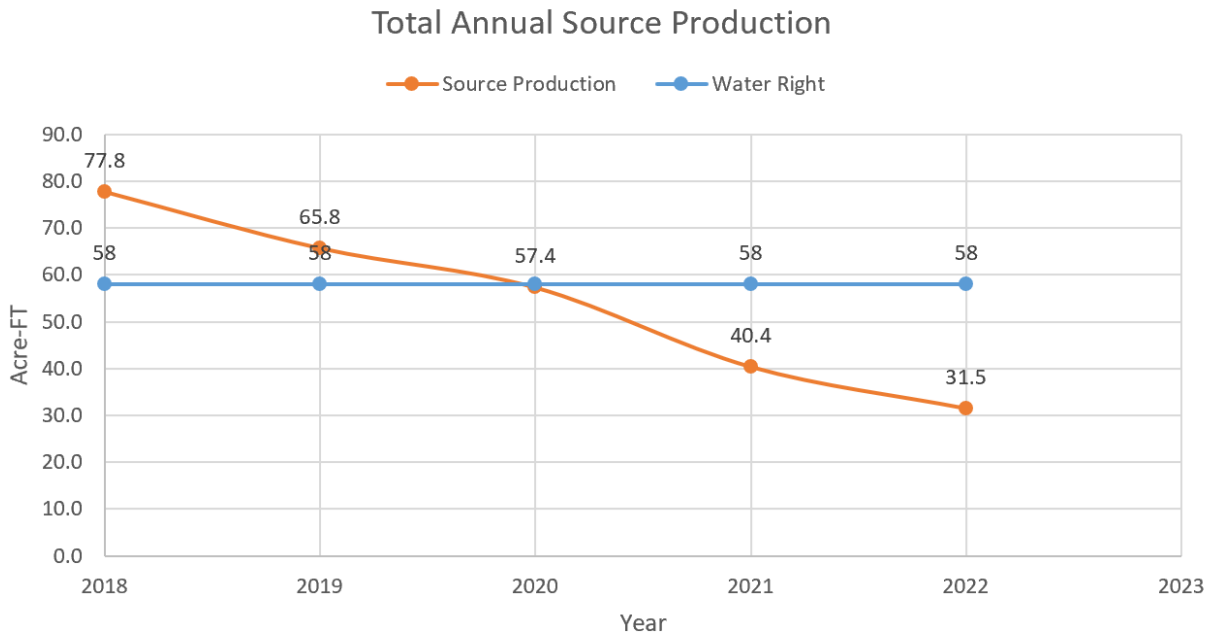

Figure 2-1 Water Consumption, Acre-Feet per Year

2.3 Water Supply Characteristics

The Timberline Village water system is supplied from 2 groundwater wells, drilled in 1965 and 1974. The wells appear to be finished in different aquifers. The well have been in continuous use since drilling and there have not been any problems with availability of water from the sources. This indicates a high level of sustainability. Several leaks have recently been repaired throughout the distribution system, reducing the overall distribution system leakage, and therefore lowering demand on the sources of supply.

2.4 Water Supply Reliability Evaluation

The community is served from two sources. In addition the community has 60,000 gallons of reservoir capacity allocated for standby storage. The community does not have backup power at the well sites or the booster pumphouse. A generator transfer switch has recently been installed at the well pumphouse. Interties. No interties with other systems exist or are proposed for the Timberline Village Water System.

2.5 Future Population Projections and Land Use

2.5.1 Land Use and Zoning

The Timberline Village service area contains 421 existing parcels and is zoned RRC-R1 which corresponds to an area designated one unit per acre. Based on current zoning up to 72 additional lots may be possible, for a total of 493 lots possible under current zoning.

2.6 Future Growth and Water Demand

The Lewis county comprehensive plan's mid-range county wide population growth estimate is approximately 11% over the next 20 years. A similar growth rate is anticipated for Timberline Village, representing approximately 30 conections added over this time. This does not include significant pent up growth accumulated over past years due to the lack of water service availability, much of which is expected to build out once water availability letters can be issued. There are currently 32 parcels on the waiting list for water service, therefore a combined increase of approximately 60 connections is anticipated over the next 20 years.

Chapter 3 System Inventory and Analysis

3.1 System Design Standards

All design and future construction shall be completed in accordance with the Washington State Department of Health Water System Design Manual (Design Manual). The following is a brief summary of relevant standards set forth in the Design Manual:

Water Demand	Chapter	3
PHD	Equation	3-1
Capacity Analysis	Chapter	4
Distribution System	Chapter	6
Hydraulic Analysis	Section	6.1

Over the next 20 years the system does not anticipate growing beyond its existing service area. There are various sizes and types of waterline in service today.

3.2 System Inventory and Asset Condition Assessment

3.2.1 Overview

The water system is served water by infrastructure located at two sites and the distribution system. The two sites are the well house (both wells are located here) and the reservoirs and booster pumphouse. Table 3-1 lists the sites and associated components:

Table 3-1: Summary of Sites

Site	Well(s)	DOH Source Number	Reservoirs	Booster Pumps
1	Well 1 and Well 2	SO1, S02	None	None
2	None	N/A	2 – 30,000 gallons ea.	4- Grundfos CR8, 5 HP

The distribution system consists of 1.5”, 2”, 3”, 4”, 6”, and 8” waterlines. Water lines are looped on the north side of the highway with and span across Highway 12 to serve the south side and the upper summit zone. A summary of pipe sizes and quantities in service are shown in Table 3-2.

Table 3-2: Pipe Inventory

Nominal Pipe Size	Installed Length (feet)
1.5”	2,400
2”	8,000
3”	900
4”	12,500
6”	3,300
8”	2,000
Total	**29,000 feet**

The wells and service connections are all metered and are read monthly. The PUD has also installed three zone meters which are known as: Ghost Town, Elkhorn, Fill Line, and Upper Zone. The zone meters have helped determine where leaks are occurring. Additionally, if the PUD observes a spike in a service meter reading, the property owner is contacted to determine if there is a leak present.

3.2.2 Sources

Timberline Village #628 has two wells. The well logs are in Appendix 10-5. A summary of the well is shown in Table 3-3.

Table 3-3: Summary of Sources

Well	Well Tag	Elevation (ft)	Well Depth (ft)	Static Water Level[1] (ft)	Capacity (gpm)	Installed Pump Capacity (gpm)	Pumps To	Controlled By
1	AFM952	1186	89	36	125	95	Distribution /Tanks	Pressure/ Telephone
2	AFM953	1186	63	30	240	120	Distribution /Tanks	Pressure/ Telephone

The combined source capacity for the system is approximately 365 gpm, however, the current installed pumps limit the pumping capacity to 215 gpm. The system needs to replace the well 2 pump in order to increase the pumping capacity.

3.2.3 Water Rights and Capacity

Table 3-4 summarizes the system's water rights; there is an additional pending water right permit with a priority date of 1994 for an additional 58 acre-feet per year. Due to the length of time in waiting for processing of the application the PUD is now pursuing cost reimbursement processing and hopes to receive a permit by late 2023 or early 2024. The water rights self-assessment tables and copies of the water right certificates can be found in Appendix 10-6.

[1] Static water level measurements from well logs

Table 3-4: Water Rights and Pumping Capacities

Certificate Number	Priority Date	Qi[1] (gpm)	Qa[2] (acft/yr)
G2-00887 C	11/19/1968	160	39
G2-22984	7/15/1974	160	19
G2-25619	6/13/1980	400	58
Total		400	58

3.2.4 Storage

The system has two 30,000 gallon reservoirs which were built in 1982. The tanks are both horizontal steel tank each with a common inlet and outlet. The wells are called to fill the reservoirs via telephone communication from floats in the reservoirs. The reservoirs have vents but no overflows. The inlet/outlet piping is exposed. Each tank is approximately 12' in diameter and 36' in length. The tank volumes were modeled in AutoCAD due to their horizontal configuration.

Table 3-5: Storage Summary

Tank Name	Dimensions (Feet)		Volumes (Gallons)				
	Length	Diameter	Volume	Dead Storage (1.5' at top)	Operational Storage (1.5' vertical)	Dead Storage (1' at bottom)	Remaining Volume
Tank 1	36	12	30,000	1,800	3,000	1,000	24,200
Tank 3	36	12	30,000	1,800	3,000	1,000	24,200
Total			**60,000**	**3,600**	**6,000**	**2,000**	**48,400**

3.2.5 Booster Pumps

Timberline Village #628 has four identical 5-HP booster pumps with variable speed control which supply the upper pressure zone. The pumps are programmed to a setpoint of 70 psi. At 70 psi each pump can provide 65 gpm. The combined flow rate of these pumps is 260 gpm. There is no generator to provide power to the booster pumps. During a power outage the upper pressure zone (1/3 of the system) is without water.

3.2.6 Buildings

Timberline Village #628 has two buildings which house water system components. These buildings are summarized in Table 3-6.

[1] Qi is defined as the maximum instantaneous withdrawal rate allowed by water rights.
[2] Qa is defined as the maximum annual withdrawal allowed by water rights

Table 3-6: Summary of Buildings

Site	Building Size	Year Constructed	Notes
1	12'x16'	2021	Well 1, source meters
2	24'x14'	1992	Booster Pumps

The well pumphouse was replaced in 2021 including a new foundation and electrical panel after the previous pumphouse was damaged in a flood.

3.3 Capacity Analysis

The existing system supplies 286 connections, which are calculated as 99 ERU (equivalent full time residential connections). The system has sufficent annual water rights to supply 189 ERU. Approval for 331 connections are requested at this time; in the unlikely event of all new connections being full time residences, this would result in a total of 144 ERU, well below the water right limitation of 189 ERU.
See worksheet 4-1 on the following page, and current system limits in Table 3-7 below:

Table 3-7: System Capacity Summary

Limitation	**Maximum ERU**
Water Rights, Instantaneous withdrawal	288
Water Rights, Annual withdrawal	189
Total Source Production	255
Booster Pumps	N/A[1]
Reservoirs	242
Distribution System	283
Most Limiting Factor: Annual Water Rights	**189**

[1] – Booster pumps supply upper pressure zone only

Worksheet 4-1 --ERU Capacity Summary

6/1/2021

Specific Single Family Residential Connection Criteria (measured or estimated demands.)

Average Day Demand (ADD) 231 gpd/ERU

Maximum Day Demand (MDD) 855 gpd/ERU

Water System Connections Correlated to ERUs			
Service Classification	**Total MDD for the classification, gpd**	**Total # Connections in the classification**	**ERUs**
Residential			
Single-family	24795	29	29
Multifamily		12	2.1
Nonresidential			
Industrial			
Commercial	11115	4	13
Governmental			
Agricultural			
Recreational	35854	241	41.9
Other (specify)			
DSL	11,190		13
Other (identify)			
Total existing ERUS (Residential + Nonresidential + DSL + Other) =			99.0

Service Capacity as ERUs and Gallons Per Day			
Water System Component (Facility)	**ERU Capacity for Each Component**	**GPD Capacity for Each Component**	**Notes**
Source(s)	255	438000	
Treatment	N/A	N/A	
Equalizing Storage	N/A	N/A	(source exceeds PHD)
Standby Storage	242	48,400	
Transmission	283	568800	
Water Rights (Qa)	189	51779	
Water Rights (Qi)	288	576000	
Other (specify)			
Water System Service Capacity (ERUs) =			189
(Based on the limiting water system component shown above.)			

Note: For the purposes of capacity analysis and water system plans, this form needs to be accompanied by the calculations that were used to come up with the ERU capacity figures.

- Capacity determinations are only for existing facilities that are operational for the water system
- Not shown above are distribution system limitations (Section 4.5.4) on ERUs because these are location-specific within the distribution system. These limits are not expected to limit the ERU capacity of the entire water system.

Capacity Analysis Calculations

Average Day Demand (ADD)	231	gpd/ERU
Maximum Day Demand (MDD)	855	gpd/ERU
Current Peak Hourly Demand (PHD)	179.8	gpm

Table 3-1

Number of ERUs (N)	C	F
15-50	3.0	0
51-100	2.5	25
101-250	2.0	75
251-500	1.8	125
>500	1.6	225

Source Capacity

Total Non-Emergency System Source Capacity	365	gpm
With Equalizing Storage (Must supply system MDD in 20 hours, Equ. 4-3)	512	ERU
Without Equalizing Storage (Must supply system PHD per Equ. 3-1)	255	ERU

Treatment (must supply system MDD in 24 hr less backwash)	N/A	ERU

Total Installed Storage:	60000	gallons
Operational Storage (OS)	6,000	gallons
Dead Storage (DS)	5,600	gallons
Fire Flow Storage (FFS) (Nested with Standby Storage)	15000	gallons
Available Equalizing Storage (ES) volume:	N/A	gallons
ES Capacity per Equ. 4-5	N/A	ERU
Available Standby Storage (SB)	48,400	gallons
SB Capacity per Equ. 4-7, 200 gallons per ERU	242	ERU

Distribution Capacity (based on hydraulic analysis)	395	gpm
Distribution Capacity (Must supply system PHD per Equ. 3-1)	283	ERU

Annual water right	58	ac-ft/yr
Average Daily limit:	51779	gpd
Annual water right capacity	189	ERU

DSL_{ERU} + (Avg Daily Limit-Daily DSL)/ADD_{ERU})

Instantaneous water right	400	gpm
Max daily limit	576000	gpd
Instantaneous water right capacity (without equalizing storage)	288	ERU

3.4 Distribution System Analysis

A hydraulic analysis was performed by Northwest Water (see Appendix 10.3). Model results show that the system exhibits minor friction losses, with pressure differences largely driven by elevation. The results demonstrate the existing distribution system is limited to a flow rate of 395 gpm, well in excess of the existing PHD of 180 gpm.

3.5 Summary of System Deficiencies

There were no significant deficiencies found during the latest sanitary survey.

Washington State Department of Health recommends backup power for water systems without gravity supplied standby storage, which would include the upper pressure zone at Timberline. However, it is Thurston PUD's policy per resolution 22-39 to allow water system residents to elect to install backup power generation; residents of the Timberline water system have not chosen to pursue backup power installation at this time.

Chapter 4 Water Use Efficiency Program

4.1.1 Current Program

The Thurston PUD Board of Commissioners recognizes that water is a valuable commodity and the wise and efficient use of water is a goal that is in the best interests of its constituents.

4.1.2 Goals

State regulation (WAC 246-290-830) requires the governing body of the municipal water system to develop the water use efficiency goals through a public process. The current WUE goal was considered in a public meeting held on October 19, 2020. The current goal for years 2021 through 2030 is to reduce and/or maintain the annual average demand per connection, for all Group A systems, to no more than 250 gallons per day. The Timberline water system is currently meeting this goal.

4.1.3 Measures

As part of a water system plan, DOH regulations also require the implementation of a specified number of water use efficiency measures. WAC 246-290-810 identifies the minimum number of water use efficiency measures that must be evaluated based on system size. Thurston PUD has less than 9,999 connections and therefore must evaluate or implement six supplementary water use efficiency measures in addition to the mandatory measures. Please see Part A WSP, chapter 3.4 for Water Use Efficiency Measures.

In addition to water efficiency measures identified in the Part A WSP, Thurston PUD currently offers customers the following efficiency related devices and incentives:

- Shower Timers -first come first serve basis
- Soil Moisture Meters -first come first serve basis
- Irrigation Timers -first come first serve basis
- High Efficiency toilet rebate ($50.00)

4.1.4 Reclaimed Water

Systems serving more than 1,000 connections are required to evaluate reclaimed water opportunities. The Webster Hill system is comprised of properties that have private septic systems, and therefore would not be able to implement a sewer treatment plant for reclaimed water use. With fewer than 1,000 connections, Timberline is not requred to further evaluate reclaimed water opportunities.

4.1.5 Consumer Education Program

Thurston PUD sends out seasonal water conservation tips to customers at least bi-annually within our monthly newsletter. Conservation is also included in our annual consumer confidence reports. Newsletters can be found online at http://www.thurstonpud.org/pud-news-newsletters.htm

4.1.6 Annual Reports

The annual report provided to DOH by July 1 must include:

- Total system production and system wide consumption
- Distribution system leakage in percentage and volume
- Goal description, schedule, and progress toward meeting goals

Thurston PUD submits the annual WUE report on DOH's SENTRY database system, https://fortress.wa.gov/doh/eh/portal/odw/si/Disclaimer.aspx?Page=FindWaterSystem.aspx, before July 1 every year and adds a copy of the report to the website at http://www.thurstonpud.org/water-systems-ccr-2017_copy(1).htm. Additionally, the District reports this information to each customer on the annual Consumer Confidence Reports (CCR), example included in the Part A Water System Plan, Appendix J . The CCR provides each individual water system the current goal, total water produced and what the average household used for that water system.

4.1.7 Water Rates

Please see Water System Plan Part A, Section 6-6 and 6-7 for discussion and evaluation of current and future rates. Please see Thurston PUD website for current rates and fees http://thurstonpud.org/our-rates.htm.

4.2 Demand Forecast

See Sections **Error! Reference source not found.** and **Error! Reference source not found.** for population and demand forecasting.

4.3 Water Use Efficiency Savings

Since acquiring Timberline, Thurston PUD has reduced leak loss from approximately 40 gpm to 8 gpm. Thurston PUD has a significant successful history of improving water use efficiency of acquired systems. See WSP Part A section 3.8 for additional history of WUE Program success at Thurston PUD water systems.

4.4 DSL Exemption for Water Systems under 500 Connections

Timberline Village 628 serves less than 500 connections. Since acquiring the system Thurston PUD has taken significant measures to reduce leak loss, reducing DSL from over 40 gpm in 2018 to around 8 gpm. It is unlikely that leak rate can be further reduced given the current limitations in leak detection technology. Thurston PUD requests exemption to operate under the 20% leak loss limit, as there are no feasible means by which Thurston PUD may further reduce DSL.

4.5 Source and Service Metering

4.5.1 Source Meters

All sources are metered. Any additional sources developed in the future will be metered when installed. Source meters are read monthly.

4.5.2 Service Meters

The system became fully metered as of November 2019. Any new connections will be metered prior to connection to the water system. Service meters are read monthly.

4.6 Distribution System Leakage

If a system's distribution system leakage exceeds 10 percent, the conservation program must also provide an implementation program that includes leak detection and repair, and other measures to reduce water loss. Timberline Village's distribution leakage has exceeded 10% due to numerous leaks in the distribution system and very low system usage. The system was not fully metered until November 2019, so the DSL prior to this is not accurate. Below is a summary of the distribution system leakage as reported on the Water Use Efficiency Reports:

Year	Distribution Leakage %	Percentage of metered connections
2019	74.9 %	100 % (as of November)
2020	63.32 %	100 %
2021	40.3 %	100 %
2022	60.1 %	100 %

Thurston PUD has employed an aggressive leak detection program and has successfully found and fixed leaks, however a system wide bassline loss of 5 to 8 gpm remains due to micro leaks which are too small to detect. DSL resulting from this low baseline loss apears artificially inflated due to low system use. Because of the number of part time homes, average day demand on a per connection basis is only 69 gpd, which is only about one third the state average. Further, though the distribution system is fully built out, the service area is only approximately halfway developed. The combination of the above and relatively large lot size results in a very low usage per foot of distribution system and therefor even minor leakage shows up as high DSL on a percentage basis. Overall, leakage per foot of distribution system is lower than average for water systems in Washington State.

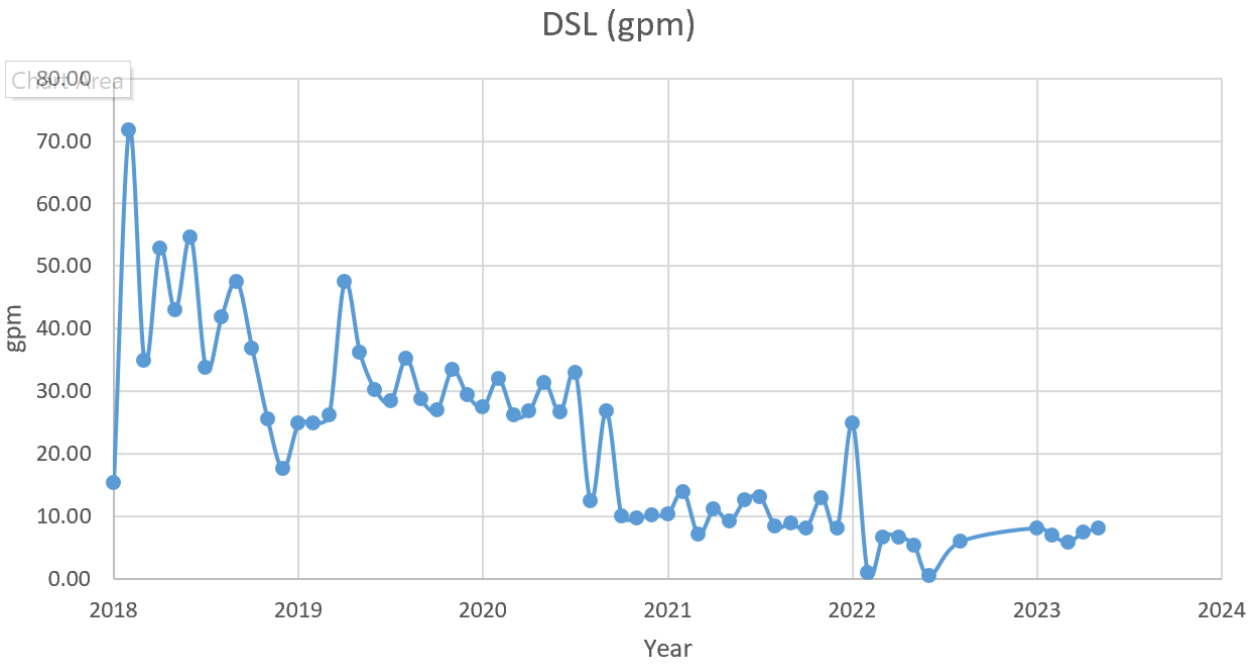

Figure 4-1 DSL in Total GPM

4.7 Water Loss Action Control Plan

See Part A WSP Appendix G.

Chapter 5 Source Water Protection

5.1 Wellhead Protection

The wellhead protection program has been developed in conjunction with the WSP. The following susceptibility assessment, protection area, and contamination source inventory will provide the necessary documentation to make educated management and land use decisions to prevent aquifer contamination.

5.1.1 Susceptibility Assessment

Ground Water Contamination Susceptibility Assessment forms for each source for the Timberline Village water system are included in Appendix 10-7. The results of the assessment are summarized in this Chapter.

5.1.2 Wellhead Protection Area

A map showing the 100-foot protected radii and the 6-month, 1-year, 5-year, and 10-year ground water travel radii is shown in Figure 5-1 below. The well protection radii are calculated using the formula found in the susceptibility assessment as provided by the WSDOH.

5.1.3 Contamination Source Inventory

The following are potential sources of contamination within the 10-year travel time radii:

1. Residential Septic Systems
2. Residential Chemical Applications (Pesticides, herbicides, etc)
3. The Cowlitz River

Since land use and zoning throughout the service area is unlikely to change, changes in, or addition of, sources of contamination are unlikely.

5.1.4 Notification of Findings

The following agencies will be provided with a letter (see Appendix 10-7 for a copy of the notification letter) requesting information about any potential sources of contamination within the Wellhead Protection Radii:

Lewis County Health Department
Lewis County Department of Community Development
Emergency Services (911)

All the homeowners with lots within the 10-year radii will also be sent a notification letter. See Appendix 10 for copies of the notification letters.

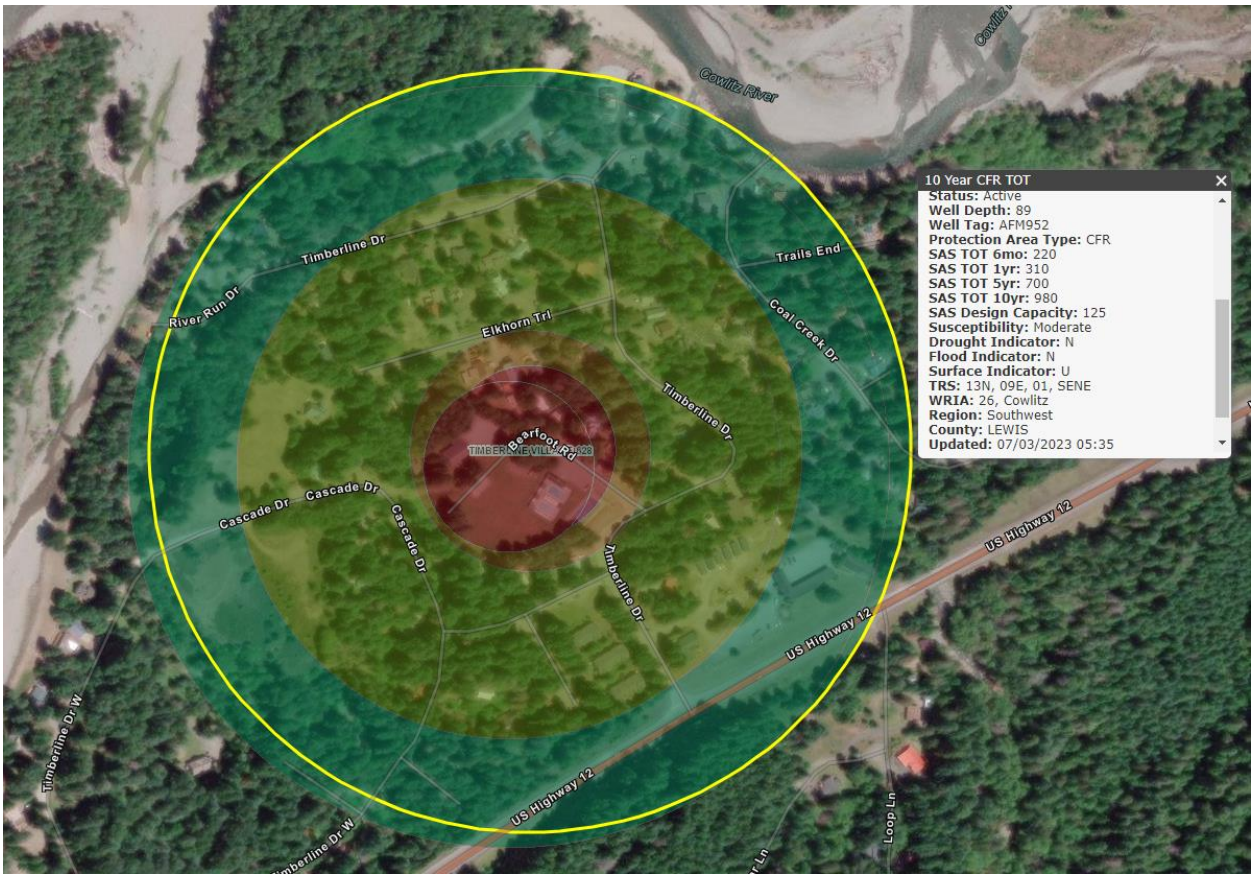

Figure 5-1: Wellhead Protection Areas

5.1.5 Contingency Planning

The system has some redundancy given that they have 2 permanent sources, though these sources are located adjacent to each other. Based on the well logs and water quality, the wells appear to draw from the same aquifer. In the unlikely event that the aquifer becomes contaminated, and the groundwater is inaccessible to the community, a boil water notification would be used on a short interim basis while long term treatment or another water source are pursued.

5.2 Water Quality Analysis

5.2.1 Asbestos

The system does not have any asbestos cement pipes, therefore, asbestos testing is not required.

5.2.2 Bacteriological Testing

The systems tests one sample from the distribution system for coliform bacteria each month. In the past 10 years, there have been 0 coliform violations. The Coliform Monitoring Plan is included in Appendix 10-7.

5.2.3 Inorganic Chemicals (IOC)

IOC samples have been taken from each source on the system over the past 5 years. No EPA-regulated primary contaminant has exceeded the states Maximum Contaminant Level (MCL). Well 1 exceeded the manganese MCL in 1996, however, subsequent samples have been below the MCL.

5.2.4 Lead and Copper

The system performs routine lead and copper sampling every 3 years from the distribution system. Lead and copper have been present in the samples above the minimum detection limits; however, none have exceeded the action level of the Lead/Copper rule so no treatment is required. The Lead and Copper Monitoring Plan is included in Appendix 10-7.

5.2.5 Nitrates

Annual Nitrate testing is performed at each of the systems sources. As of the most recent sampling in 2023 both wells had nitrate levels less than the lower limit of lab detection.

5.2.6 Radionuclides

Radionuclides samples were collected in 2021 from both sources, the Radium or Alpha particles emission for each well was less than the State Reporting Limit (SRL) of 1 mg/L and 3 mg/L, respectively.

5.2.7 VOCs and SOCs

Samples for volatile organic compounds (VOCs) and synthetic organic compounds (SOCs) were last collected in 2022 and all results were less than the SRL's.

Chapter 6 Operations and Maintenance

6.1 Water System Management, Personnel, and Certifications

See Thurston PUD WSP Part A, Sections 5.1 and 5.2.

6.2 Operations and Preventative Maintenance

The routine operation and preventative maintenance schedule for the system infrastructure is outlined in the WSP Part A in Chapter 5, Table 5-2, and further detailed in Appendix M. O & M procedures are fully detailed in Appendix N of the WSP Part A.

6.3 Comprehensive Water Quality Monitoring

Water quality sampling for each system is taken in accordance with the Water Quality Monitoring Schedule (WQMS). If any water quality testing exceeds the standards set forth in WAC 246-290-310, the DOH will be notified immediately. The current WQMS Report (Appendix 10.7) provides the sample schedule, which is summarized below in Table 6-1.

Table 6-1: Sampling Schedule

Monitoring Group	Test Panel	Sample Location	Schedule/Status
Coliform	Coli	Distribution	Monthly
Asbestos	ASB	Distribution	9 year
Lead and Copper	LCR	Distribution	3 year
Nitrate	NIT	All Sources	Annual
Complete Inorganic Chemicals	IOC	All Sources	Waiver – 9 year
Manganese	IOC	S01	3 year
Volatile Organic Contaminants	VOC	All Sources	Waiver – 6 year
Herbicides	Herb	All Sources	Waiver – 9 year
Pesticides	Pest	All Sources	Waiver – 3 year
PFAS	PFAS	All Sources	3 year
Soil Fumigants	Fumigant	All Sources	Waiver – 3 year
Radionuclide / Gross Alpha	RAD 228	All Sources	6 year

6.3.1 Coliform Monitoring Plan and Map

The coliform monitoring plan was prepared by Thurston PUD. The coliform monitoring plan can be found in Appendix 10-7. The system takes one routine samples per month from distribution. If there are any failures, repeat distribution samples and a source sample are taken per this plan. See the Coliform Monitoring Plan for details.

6.3.2 Lead and Copper Monitoring

The Lead and Copper Monitoring plan can be found in Appendix 10.7.

6.4 Emergency Response Program

The Emergency Response Plan is found in the WSP Part A, Appendix P.

6.5 Cross Connection Control

The cross-connection control policy and program are located in the WSP Part A, Appendix R. A list of the cross connection control device and testing dates is included in Appendix 10.10.

6.6 Sanitary Survey Findings

The latest sanitary survey was performed in 2021. There were no significant deficiencies or significant findings identified during the survey. An observation was made that the bladder tank in the upper pumphouse is not protected by a pressure relief valve (PRV). Another observation was made that the reservoirs do not have overflows and that vent screens are partially clogged. Addition of a PRV and a reservoir overflow and new vent screens have been added to the list of improvements in Chapter 8. The complete sanitary survey is included in Appendix 10.1.

6.7 Record Keeping, Reporting, and Customer Complaint Program

See WSP Part A, Section 5.9

6.8 Customer Complaint Response Procedures

See WSP Part A, Section 5.10

Chapter 7 Distribution Facilities Design and Construction Standards

The Timberline Village water system requests exemption from project report and construction document submittal per WAC 246-290-125 for distribution main projects. The distribution design and construction standards are outlined in the Thurston PUD WSP Part A, Appendix A. A map of the distribution system is included in Appendix 10.3.

Chapter 8 Capital Improvement Program

8.1 Prioritization Criteria

Improvements are prioritized according to the following criteria listed from highest to lowest in importance:

1. Public Health Risks
2. Adequate Supply
3. WSDOH Operation and Design Standards
4. Achieving Conservation Goals
5. Regularly Scheduled Improvements
6. Aesthetic and Optional Improvements

8.2 Prioritized List of Improvements

The system has no significant public health risks, has more than adequate supply, and meets or exceeds all WSDOH guidelines for operation and design standards. Therefore, the highest three prioritization criteria are already met and the following improvements are prioritized based on the remaining criteria (4-6) as well as project scope and cost.

1. Cellular source metering and large leak alarm system
2. Obtain Additional Water Rights
3. Distribution system replacement
4. Replace Booster Station
5. Sanitary Survey Recommendations

8.3 Assessment of Improvements

8.3.1 Cellular source metering and large leak alarm system

Thurston PUD reads source and service meters on a monthly basis and also employs zone metering to identify leakage. Installation of a cellular enabled source meter monitor with alarm thresholds allows detection of development of large leaks in a more timely basis than monthly meter reading alone.

8.3.2 Obtain Additional Water Rights

Thurston PUD is pursuing an additional water right for 58 acre-feet per year through the cost reimbursement program. The original application has a priority date of 1994. Issuance of a permit is anticipated in early 2024.

8.3.3 Replace Distribution System

Thurston PUD has completed targeted replacement of improperly installed sections of the distribution system. The remainder of the existing distribution system is primarily under 50 years of age and not due for replacement. However, installation quality of the original distribution system was poor, therefore Thurston PUD plans to initiate further targeted replacements of the distribution system over the current

10-year planning period, and targets completing replacement of the entire distribution system within the next 20 years.

8.3.4 Replace Booster Station

The booster station building was installed in 1974 and requires replacement, including the electrical system and pump controls. The pumps and plumbing have remaining useful life and will be retained.

8.3.5 Sanitary Survey Recommendations

Observations at the most recent sanitary survey included installation of a pressure relief valve on the booster station bladder tank, installation of reservoir overflows, and replacement of reservoir vent screens.

8.4 Improvement Program Summary and Schedule

The community will perform all of the upgrades proposed in section 8.3. The improvements are anticipated within the next 10 years. Table 8-1 provides an overview of the likely schedule for capital improvements projects.

Table 8-1: Improvement Schedule

Improvement	Estimated Cost (2023 dollars)	Schedule	Source of Funds
1. Online source meter/alarm system	$3,000	2023	Reserves
2. Obtain Additional Water Rights	$30,000	2023	Reserves
3. Replace Distribution System/Upgrade Distribution to Support Fire Flow	$6,300,000	2024 - 2043	Loan or Grant
4. Booster Station building, electrical, and controls	$73,000	2024	Reserves
5. Sanitary Survey Recommendations	$3,000	2024	Reserves

Chapter 9 Financial Program

See WSP Part A, Section 6. Thurston PUD's current Asset Management Program incorporates planning for all 273 Thurston PUD systems can be downloaded from the Thurston PUD website or made available upon request.

Chapter 10 Appendices and Supporting Documents

10.1 WFI, Operating Permit, Sanitary Survey
10.2 Vicinity and Zoning Maps
10.3 Distribution System Maps and Hydraulic Analysis
10.4 Meter Data
10.5 Well Logs and Pumps
10.6 Water Rights, WRSA
10.7 Water Quality Monitoring & Consumer Confidence Report
10.8 Local Government Consistency and Susceptibility Assessments and Correspondence
10.9 Cross Connection Control Program
10.10 WSP Adoption and Minutes