HECETA WATER PEOPLE'S UTILITY DISTRICT

LANE COUNTY, OREGON

WATER MASTER PLAN

REVISED WITH OHA COMMENTS ADDRESSED

JANUARY 30, 2020

The Dyer Partnership Engineers & Planners, Inc.

Project No. 188.05

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Heceta Water
People's Utility District
Lane County, Oregon

Water Master Plan

Revised with OHA Comments Addressed
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Project No. 188.05

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

APPENDICES

SECTION 1:
EXECUTIVE SUMMARY

SECTION 1: **EXECUTIVE SUMMARY**

This Water Master Plan (WMP) was compiled to provide guidance to address the future water needs of Heceta Water People's Utility District (HWPUD). This Plan summarizes the components of the existing water distribution system, analyzes local water demand patterns, evaluates the performance of the water system with respect to critical service standards, identifies the improvements necessary to remedy system deficiencies and accommodate future growth. This Plan recommends specific projects for inclusion in the water distribution system Capital Improvement Program (CIP). A financing plan that will facilitate successful implementation of the recommended CIP was also developed.

1.1 Source of Supply and Water Supply Rights

Raw water is currently diverted from Clear Lake and treated. The District has four water rights for a total diversion of 6.25 cubic feet per second (cfs) from Clear Lake.

Water diversion from Clear Lake is limited by two easements. Both the raw water intake and Clear Lake inlet/outlet water lines travel along county easements. These easements dictate that the flow through these lines cannot exceed one million gallons per day (mgd). As a result, when system demands increase above this amount, the District will need to have the easement revised, find an alternative water supply, or construct a raw water storage tank for high demand periods.

1.2 Existing System

Since the late 1900s, potable water has been supplied to the residents of the District. Improvements have been made to satisfy demand and to maintain excellent water quality. The District's current water system consists of facilities for diversion, treatment, transmission, storage and distribution of water.

Water is drawn only from Clear Lake at the intake pump station. The raw water is conveyed to and treated at the Water Treatment Plant (WTP). The WTP consists of three pre-fabricated water treatment units each capable of producing 350 gallons per minute (gpm) of treated water. The WTP is utilized year-round and has a maximum treatment capacity of 1,050 gpm (1.51 mgd).

Distribution and Storage System

Finish water pumps convey water from the WTP to the District's distribution system. The distribution system consists of approximately 47 miles of piping ranging from 2-inch to 12-inch diameter pipe. The District has ten different pressures zones, four booster pump stations, and four potable water storage tanks ranging in capacity from 0.013 to 0.7 Million Gallons (MG).

Distribution System Modeling

The District's water distribution system was evaluated using a hydraulic computer model, with emphasis on selected vital or high fire flow areas within the District. Based on the results of this model, the following vital areas were shown to have less fire flow than those recommended by the Oregon Fire Code: Heceta Beach Area, Enchanted Valley Subdivision, Mercer Lake Road, Joshua Lane, and Sharktail Road. Proposed projects to improve fire flows within the District's distribution include installation of larger diameter mains along Heceta Beach Rd., Joshua Ln., Sharktail Rd., View Rd., Collard Lake Rd., North Mercer Lake, and Dahlin Road.

Water storage capacity within the District was evaluated and the total amount of existing storage was found to be currently sufficient. Although Clear Lake Reservoir is lacking storage for its service area, the storage in the upper tanks is available to the Clear Lake Reservoir service area via pressure reducing valves. The HWPUD has sufficient treated water storage with the existing tanks through the planning period, Year 2038.

1.3 Water Demand

The estimated population currently being served by the District's water system is approximately 4,921. Modest residential growth is expected. Population growth during the 20-year planning period is estimated to occur at an average rate of one percent per year. The population growth rate was determined using United States Census Bureau Fact Finder data. The total population was attained by multiplying the persons per household (2.265) by the number of residential connections (2,170).

System water demand was compiled for both the amount of water pumped to the District, the amount produced at the WTP, and the amount diverted from raw water sources. Current water production is calculated to be 0.377 mgd on an annual average, with a maximum month and daily demand of 0.669 mgd and 0.806 mgd, respectively. No additional WTP capacity is needed for future water demand. The average of the last two years non-account (water sold less water produced) water in the District's system is approximately 22 percent.

Future water demand was based on current water production/consumption parameters, projected growth within the District, and anticipated non-account water (15 percent). Note that the District is implementing a water loss reduction plan that is anticipated to reduce existing water losses from 22% to 15% or less. Population growth was projected using a one percent annual growth for the District over a 20-year period, which is the same rate used in the District's Water Management and Conservation Plan. The anticipated potable water use population for the Year 2038 is 5,999. The projected water demand production in the Year 2038 (assuming less than 15 percent non-account water) in terms of maximum month and daily demand are 0.76 and 0.91 mgd, respectively.

Based on the projected Maximum Daily Demand (MDD), the District's existing water rights on Clear Lake, and existing county easements, the water supply is sufficient to meet the District's demand through the planning Year 2038.

1.4 Capital Improvement Plan

A total of 12 improvement projects are recommended in the Capital Improvement Plan. The total estimated cost for installation and construction of these improvements is $25,562,000. These improvements were prioritized into four priorities.

Priority 1 Improvements include improvements to: the Water Treatment Plant (WTP), District office, distribution piping, pump station, reservoir seismic systems, and the Supervisory Control and Data Acquisition (SCADA) system. Priority 1 Improvements also include an easement/water line locate project. The total estimated cost for the Priority 1 Improvements is $5,130,000.

A summary of all project priorities and costs is located in Table 1.4.1.

TABLE 1.4.1
PROJECT PRIORITIES AND COSTS

No.	Project Description	Est. Cost ($)
	Summary of Priority 1 Water System Projects	
No.	**Project Description**	**Est. Cost ($)**
1	WTP Improvements: Project No. 1	$588,000
2	District Office and Shop Replacement: Project No. 2	$551,000
3	SCADA Improvements: Project No. 3	$96,000
4	Driftwood Shores Water Line Improvements: Project No. 4	$3,639,000
5	Enchanted Valley PS: Project No. 5	$256,000
Priority 1 Projects Total		$5,130,000
	Summary of Priority 2 Water System Projects	
No.	**Project Description**	**Est. Cost ($)**
6	AC Pipe Replacement: Project No. 6	$12,921,000
7	Hwy. 101 Water Line Improvements: Project No. 7	$224,000
8	Reservoir Improvements: Project No. 8	$1,335,000
Priority 2 Projects Total		$14,480,000
	Summary of Priority 3 Water System Projects	
No.	**Project Description**	**Est. Cost ($)**
9	View Road Improvement: Project No. 9	$270,000
10	Hydrant Replacement	$120,000
Priority 3 Projects Total		$390,000
	Summary of Priority 4 Water System Projects	
No.	**Project Description**	**Est. Cost ($)**
11	Sharktail Drive Water Line Improvements: Project No. 11	$545,000
12	Enchanted Valley PS Phase II: Project No. 12	$5,017,000
Priority 4 Projects Total		$5,562,000
Total Cost of all Priorities and All Projects		**$25,562,000**

1.5 Financing and Implementation Plan

Various funding programs were evaluated for financing the Priority I Improvements through the use of either low-interest loans or a combination of low-interest loans and grants. Projected monthly debt service ($/Equivalent Dwelling Unit (EDU)) from viable funding programs ranged from $5.00 to $10.65. Projected monthly user rates, including existing and new debt service and system Operation and Maintenance O&M costs, ranged from $45.77 to $51.42 per EDU, depending on funding structure as described in Section 11.

Recommendations for implementing the elements of this Water Master Plan include the following:

- Submit Water Master Plan to the Oregon Health Authority and Department of Water Resources for review and approval.
- Schedule and attend an "One-Stop" meeting (Funding) to discuss financing options for the proposed Phase I Improvements.
- Submit necessary applications to the funding agencies requesting loans and grants to finance the Phase I Improvements.

- Authorize the development of an Environmental Report to regulatory standards, for the proposed Phase I Improvements. (Environmental Reports are typically required by funding agencies)
- Submit system information to private funding sources for consideration of private financing.
- Following favorable review by the selected financing agencies, secure the authority to issue revenue or General Obligation Bonds in the amount needed to finance the Phase I Improvements.
- Authorize design of the recommended improvements for Phase I. Secure the necessary special use and environmental permits for construction.
- Submit completed Plans and Specifications to the Oregon Health Authority for approval.
- Advertise for Phase I Improvements construction bids.
- Receive construction bids and award contracts for Phase I Improvements.
- Complete construction of Phase I Improvements.

A tentative schedule for implementation of the Water Master Plan over the next three years is shown in Table 1.5.1.

TABLE 1.5.1
PROJECT IMPLEMENTATION SUMMARY

Item No.	Key Activity	Implementation Date
1	District Adopts the Water Master Plan	August 2019
2	Submit Plan for Review and Approval to OHA and WRD	September 2019
3	Approval of Plan by OR Health Authority & Department of Water Resources	May 2019
4	Start Environmental Evaluation/Notice	August 2019
5	Submit Application for Financing for Phase I and Associated Environmental Evaluation/Notice for Project	December 2019
6	Obtain Financing for Phase I	January 2020
7	Start Preparation of Plans, Specifications for Phase I	July 2019 - February 2020
8	Complete Design & Preparation of Plans, Specifications, & Contract	February 2020
9	Health Authority Approval of Plans & Specifications	April 2020
10	Advertise for Phase I Construction Bids	May 2020
11	Receive Construction Bids for Phase I	June 2020
12	Start Construction of Phase I	July 2020
13	Complete Construction of Phase I Improvements	November 2021

SECTION 2:

INTRODUCTION

SECTION 2: **INTRODUCTION**

2.1 Background

The planning for the Heceta Water People's Utility District (HWPUD) water system began in 1966. The Water Treatment Plant (WTP) was put into operation in 1969. This plant consisted of an intake on Clear Lake with ductile iron pipe for transmission and water distribution. In 2002 through 2003 the raw water intake system was improved, and a new Water Treatment Plant was constructed with a one million gallon per day (mgd) maximum capacity. In 2009 an additional filter unit was added to the Water Treatment Plant which increased the WTP capacity to 1.5 mgd. Throughout the years, improvements were also conducted on the existing water distribution system.

In 2008 the District's water system was evaluated in the "Heceta Water District Water Distribution System Master Plan Update", West Yost Associates, February 2008. Since the completion of this document, the District has completed many of the recommended improvement projects outlined within. The completed projects are summarized below:

- Third Package Treatment Unit Installed
- Programmable Logic Controllers Upgrades
- Mercer Lake Pump Station Improvements
- Browning to Friendly Acres Loop Improvements
- Sutton Lake Marsh Replacement Improvements
- North Mercer Lake Road/Dahlin Marsh Improvements
- Sutton Lake Bridge
- Automatic Meter Reading (Still in progress)
- Reservoir Inspections, Coatings

With the above improvements in place, the District would like to re-examine their water system, and develop new recommendations relative to the current system.

2.2 Study Objective

The purpose of the Water Master Plan is to provide the District with a comprehensive planning document that provides engineering assessment and planning guidance for the successful management of its water system over the next 20 years and beyond. This document satisfies the Oregon Health Authority (OHA) requirement for communities with 300 or more service connections to have a current master plan (Oregon Administrative Rules (OAR) 333-061-0060). The principal objectives include:

- Evaluation of the existing water system components.
- Prediction of future water demands.

- Evaluation of the capability of the existing system to meet future needs.

- Recommendations for improvements needed to meet future needs and/or address deficiencies.

The Plan outlines water system improvements necessary to comply with State and Federal standards and to provide for anticipated growth. The capital improvements are presented as projects with estimated costs to allow the District to plan and budget as needed. Supporting technical documentation is included to aid in grant and loan funding applications and meets the requirements of the Business Oregon Infrastructure Finance Authority (IFA), the Oregon Water Resource Department (WRD), Rural Development (RD), as well as the Oregon Health Authority (OHA).

2.3 Scope of Study

The overall scope of this Plan consists of: 1) an examination of the District's existing water supply sources and system; 2) a determination of the adequacy of existing water sources and need to develop new water sources for future potable water service in the District; 3) development of a Capital Improvement Plan (CIP) for updating the existing system; 4) and an assessment of various funding alternatives for completion of CIP projects.

Planning Period

The planning period for this Water Master Plan is twenty years, ending in the Year 2038. The period is short enough for current users to benefit from system improvements, yet long enough to provide reserve capacity for future growth and increased demand.

Planning Area

The HWPUD boundary is considered the Study Area in this Plan.

Work Tasks

In compliance with OHA and WRD plan elements and standards, this study provides descriptions, analysis, projections, and recommendations for the District's water system over the next twenty years. The following elements are included:

- **Executive Summary.** Provide a summary of the conclusions and recommendations from this study.

- **Study Area Characteristics.** Identify applicable Study Area characteristics, land use, population trends, and projections.

- **Regulatory Requirements.** Identify current and future regulatory requirements and regulations that affect the planning, operation and maintenance of community water systems.

- **Existing Facilities.** Description and evaluation of the existing water system including supply, treatment, storage, and distribution.

- **Water Use and Projected Demand.** Determine the District's future water demand based on current use, projected population, and economic growth.

- **Design Criteria and Cost Basis.** Outline design requirements, basis of cost estimating.

- **Analysis and Improvement Alternatives.** Provide analysis and improvement alternatives for projects and improvements within the District.

- **Seismic Risk Assessment and Mitigation Plan.** Identifies critical facilities capable of supplying key community needs: including fire suppression, health and emergency response, and community drinking water supply points. Also identifies and evaluates the likelihood and consequences of seismic failures for each critical facility. Additionally, it includes recommendations to minimize water loss from each critical facility, capital improvements, or recommendations for further study or analysis.

- **Alternatives and Capital Improvement Plan.** Identify and evaluate various alternatives for the District's water system. Select the most cost-effective program that will meet the District's water needs within the planning periods. Identify and describe a CIP for the water system with a recommended implementation schedule.

- **Improvement Phasing and Financing.** Identify various local financing mechanisms and the most applicable funding programs. Develop a financing program for proposed improvements. Financing program will include: propose monthly rate structure, implementation schedule, and System Development Charges (SDC).

2.4 Authorization

The HWPUD contracted with The Dyer Partnership, Engineers & Planners, Inc. on March, 2018 to prepare this Water Master Plan. The scope of this Plan was based on a Scope of Engineering Services that was included in the Contract with the District.

2.5 Past Studies and Reports

Documents that discuss the District's water system and facilities have been used in the preparation of and analyses in this Plan. A list of these studies and reports, with a brief summary of their conclusions, is listed below.

Heceta Water District Water Distribution System Master Plan Update – by West Yost Associates for HWPUD, February 2008.

The following is a summary of conclusions presented in this report with respect to the District's water system.

- Expansion of the existing distribution system into areas of future development.

- Replacement of existing pipe in areas of poor soil conditions.

- Upgrade of the WTP including a new Programmable Logic Controllers (PLC), solids handling system, and addition of a third treatment unit.

- An expansion of the existing Supervisory Control and Data Acquisition (SCADA) system facilitating remote control of pump stations, and relaying reservoir levels.

- Installation of an Automatic Meter Reading system (AMR).
- Initiate a Rate Study/SDC update.
- Construction of a new reservoir, and addition of seismic valves on all reservoirs. Note that seismic evaluations were not conducted for the existing reservoirs and installation of seismic valves will not make existing tanks seismically sufficient; however it is a reasonable level of effort to protect the volume of water stored as a result of piping failures downstream of the reservoirs.

Water Management and Conservation Plan – by HWPUD, July 2015

The following is a summary of conclusions and recommendations made in this report with respect to the District's water system.

Water Rights

- There are sufficient water rights to meet the projected water demands of HWPUD through the year 2287.
- An easement for the intake pipe limits the amount of water that can be conveyed through the pipe to one mgd.

System Leakage

- System leakage (non-account water) is approximately 22 percent.
- To address leakage, all meters will be replaced with a new Automatic Meter Reading system, all flow meters at the WTP will be replaced, and an effort will be made to replace all pipes that are in poor condition.

Water Conservation

- Public education pertaining to water conservation will be conducting through the District's website, brochures, and the annual Consumer Confidence Report.
- The HWPUD will continue their efforts towards implementing conservation practices through the following steps: consumer awareness, water system operations, educational information, and replacement of existing inefficient water using fixtures.

2.6 Acknowledgements

This Water Master Plan is the result of contributions made by a number of individuals and agencies. Dyer wishes to acknowledge the efforts of Carl Neville, General Manager; Vickie Kennedy, Office Manager; Jeremy Moore, Water Treatment Plant Operator; and Tony Moore, Fire Prevention Captain. The assistance of the District's Staff was invaluable in compiling information on the District's services and the community.

SECTION 3:

STUDY AREA CHARACTERISTICS

SECTION 3: **STUDY AREA CHARACTERISTICS**

3.1 Study Area

The District office and Water Treatment Plant (WTP) is located next to US Highway 101 in the west-central portion of Lane County; immediately north of Florence, Oregon, shown in Figure 3.1.1. The Heceta Water People's Utility District (HWPUD) is surrounded by lakes and forested hills to the east, sand and forest to the north and south, and the Pacific Ocean to the west. The area has a number of nearby water bodies including Clear Lake, Munsel Lake, Ackerley Lake, Mercer Lake, Sutton Lake, and the Siuslaw River.

The area encompassed within the District boundaries is approximately eleven square miles. The southern portion of the HWPUD is within the City of Florence Urban Growth Boundary (UGB). The northern boundary surrounds small subdivisions north of Sutton Lake. The west boundary is the Pacific Ocean, while the east boundary lies on the eastern outskirts of Mercer Lake. The Study Area for this Water Master Plan (WMP) includes the District Limits and their existing water source as shown on Figure 3.1.2.

3.2 Physical Environment

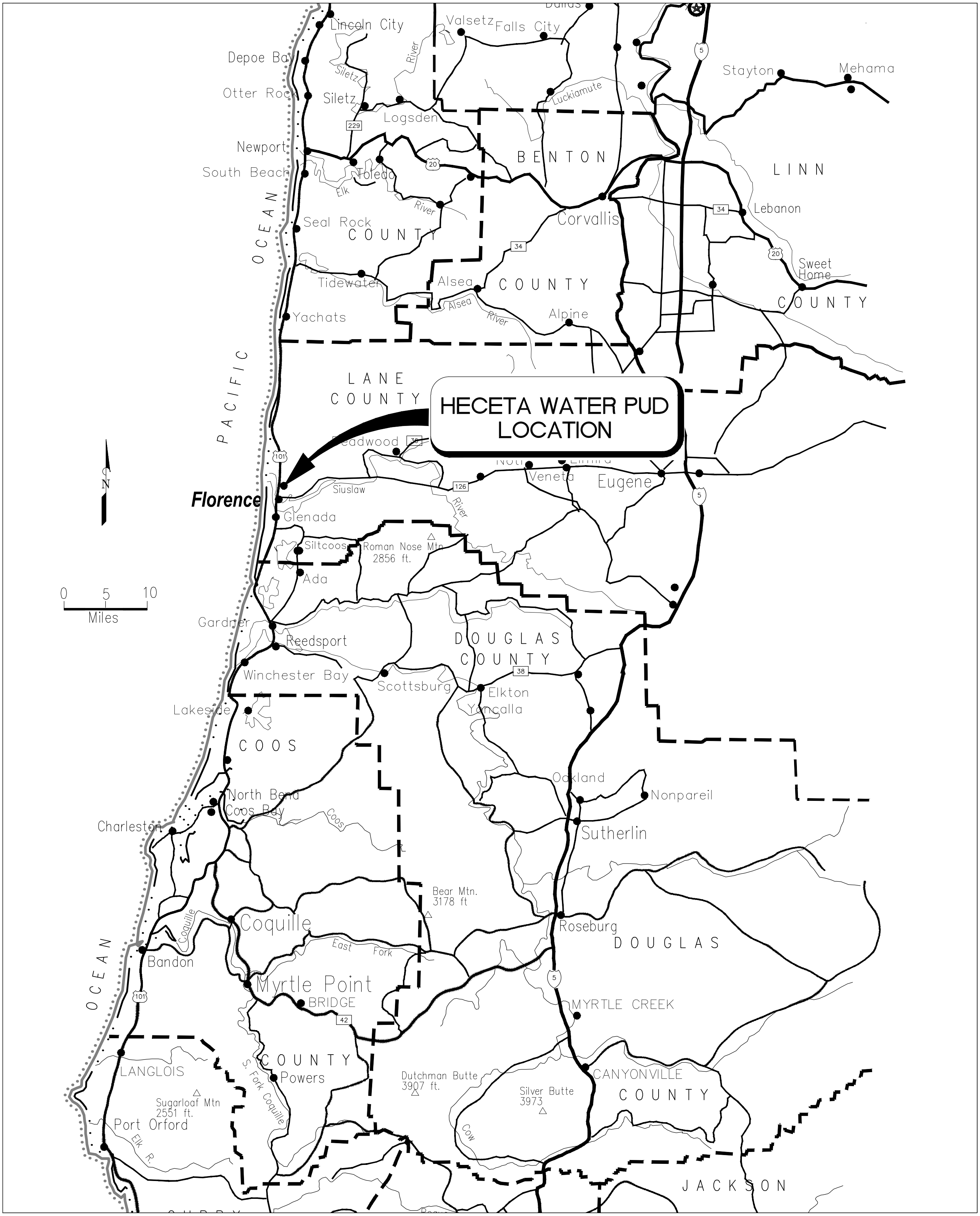
The following provides information about the physical environment in and around the District.

Climate

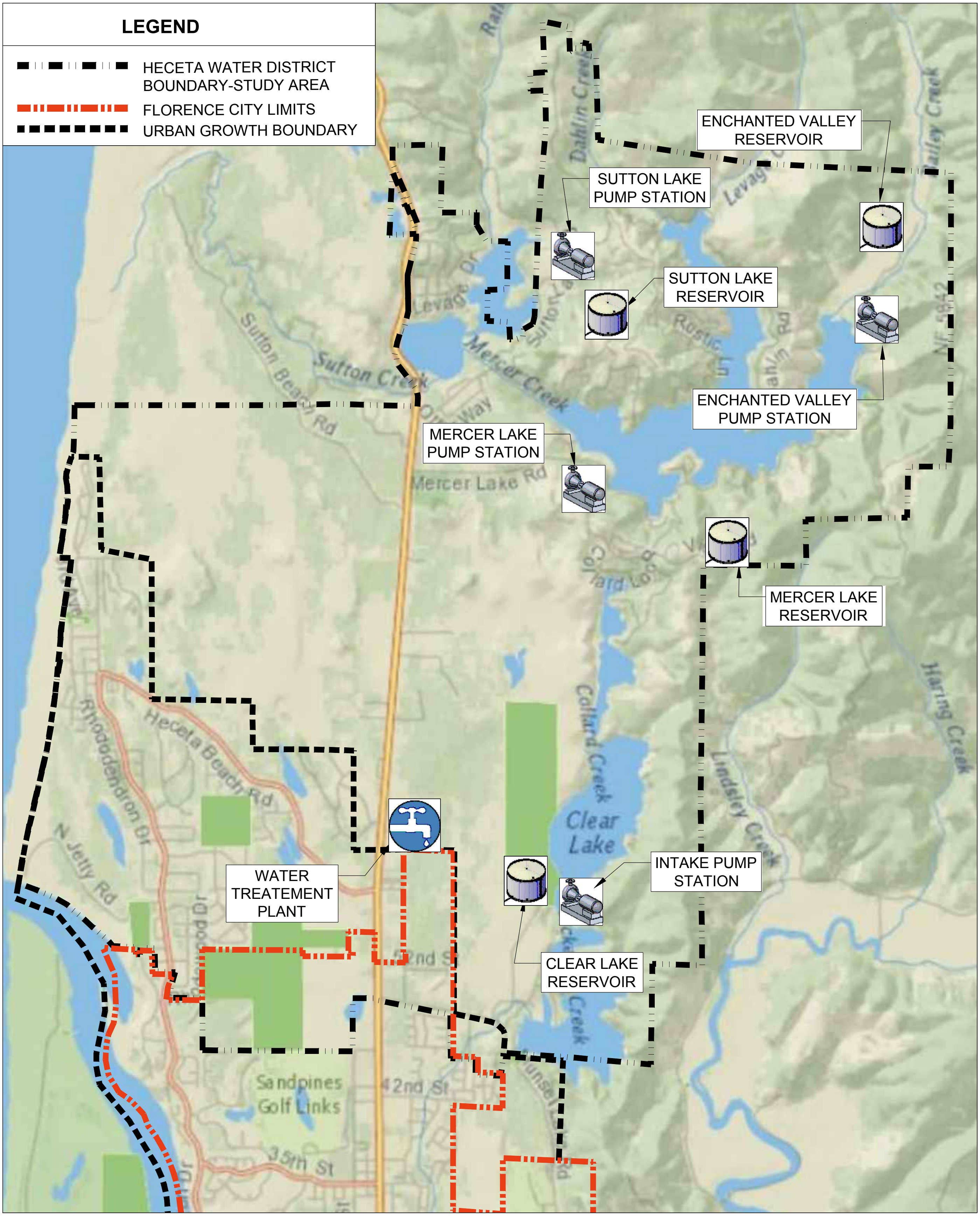
The HWPUD has a climate similar to much of the coast; moderate temperatures year-round with little precipitation during summer months and heavy precipitation between late fall and early spring. Due to marine influence, few temperature extremes are observed in the area. The average daily temperatures in the months of December and January include highs in the upper 40s and lows in the upper 30s. The summer months typically have high temperatures averaging in the high 60s to middle 70s and lows from in the 40s. Extreme temperatures range from 12°F to 99°F. Figure 3.2.1 summarizes the average maximum and minimum temperatures in the District.

Precipitation data indicates that HWPUD receives a range from 48 to 93 inches of precipitation per year. Nearly all precipitation occurs as rainfall, with the majority (approximately 69 percent) falling between the months of November and March. Rainfall amounts for November, December, and January average approximately 11 inches per month. The wettest month is December with a historic average of approximately 14 inches of rainfall. The driest month is July with an average of less than one inch of rainfall. Records show that the average maximum 24-hour rainfall is 5.76 inches. A maximum mean 24-hour rainfall of 8.22 inches is recorded for the month of January. The largest average amount of rainfall experienced in a 24-hour period is the maximum mean 24-hour rainfall. Precipitation data is available from NOAA at *http://nimbo.wrh.noaa.gov.*

Figure 3.2.2 summarizes the average monthly precipitation for the HWPUD area.

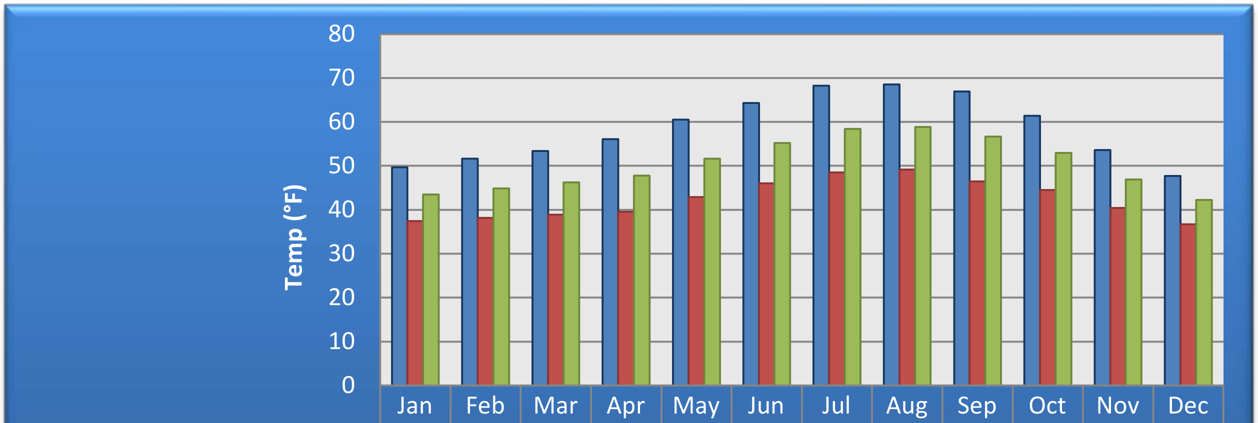


THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	**HECETA WATER PUBLIC UTILITY DISTRICT WATER MASTER PLAN**	FIGURE NO.
DATE: JULY, 2019 PROJECT NO.: 188.05	**LOCATION MAP**	**3.1.1**



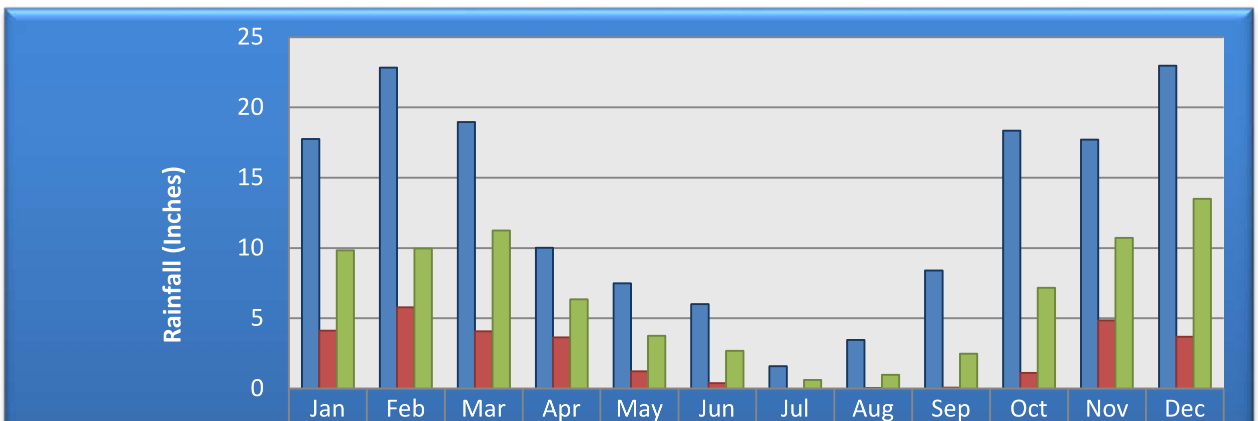
THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	***HECETA WATER PUBLIC UTILITY DISTRICT WATER MASTER PLAN***	FIGURE NO. ***3.1.2***
DATE: JULY, 2019 PROJECT NO.: 188.05	***STUDY AREA***	

FIGURE 3.2.1
MONTHLY TEMPERATURE SUMMARY



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Max Temperature	49.69	51.61	53.41	56.1	60.49	64.29	68.21	68.51	66.91	61.4	53.64	47.74
Average Min. Temperature	37.46	38.19	38.9	39.57	42.93	46.04	48.53	49.17	46.45	44.52	40.45	36.74
Mean Temperature	43.5	44.86	46.26	47.77	51.66	55.17	58.38	58.84	56.68	52.94	46.87	42.24

FIGURE 3.2.2
MONTHLY PRECIPITATION SUMMARY



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max Precipitation	17.75	22.83	18.96	10.02	7.48	6.02	1.6	3.47	8.41	18.35	17.7	22.97
Min. Precipitation	4.13	5.79	4.08	3.65	1.22	0.38	0	0.04	0.06	1.11	4.86	3.7
MeanPrecipitation	9.84	9.96	11.24	6.35	3.76	2.68	0.62	0.98	2.49	7.16	10.73	13.5

Soils

There are many general classifications of surficial geologic formations found in the local HWPUD area. A map showing these formations (Natural Resource Conservation Service 2005) is included in Appendix A. The formations are described as follows.

- **Astoria Series.** The Astoria series consists of deep and very deep, well drained soils that formed in colluvium and residuum weathered mostly from shale and siltstone. Astoria soils are on mountains and have slopes of zero to 90 percent.

- **Bohannon Series.** The Bohannon series consists of moderately deep, well drained soils that formed in loamy colluvium and residuum derived from arkosic sandstone. Bohannon soils occur on summits, shoulder slopes, and backslopes of mountains. Slopes are two to 90 percent.

- **Brallier Series.** The Brallier series consists of very poorly drained, very deep organic soils formed in partially decomposed herbaceous plant materials. Brallier soils are in depressional areas between coastal dunes and along major coastal streams. Slopes range from zero to one percent.

- **Bullards Series.** The Bullards series consists of very deep, well drained soils that formed in mixed eolian marine deposits. Bullards soils are on terraces and have slopes of zero to 60 percent.

- **Lint Series.** The Lint series consists of very deep, well drained soils that formed in mixed alluvium. These soils are on marine terraces and have slopes of zero to 40 percent.

- **Meda Series.** The Meda series consists of very deep, well drained soils that formed in loamy alluvium and colluvium from sedimentary and igneous rock types. Meda soils occur on alluvial fans and stream terraces. Slopes are two to 20 percent.

- **Nestucca Series.** The Nestucca series consists of very deep, somewhat poorly drained soils that formed in recent alluvium. Nestucca soils are on flood plains and have slopes of zero to three percent.

- **Preacher Series.** The Preacher series consists of deep and very deep, well drained soils that formed in loamy colluvium and residuum weathered from sandstone and other sedimentary rock types. Preacher soils occur on summits, footslopes, and toeslopes of mountains. Slopes range from zero to 90 percent.

- **Slickrock Series. T**he Slickrock series consists of deep and very deep, well drained soils that formed in more recent loamy colluvium overlying older loamy colluvium and residuum in ancient landslide deposits weathered from sandstone and other sedimentary rock types. Slickrock soils occur on footslopes, toeslopes, and summits of mountains. Slopes are zero to 75 percent.

- **Waldport Series.** The Waldport series consists of very deep, excessively drained soils formed in mixed eolian sand. They are on stabilized dunes and have slopes of zero to 70 percent.

- **Willanch Series.** The Willanch series consists of very deep, poorly drained soils that formed in mixed alluvium. These soils are in depressions on flood plains and have slopes of zero to three percent.

- **Yaquina Series.** The Yaquina series consists of very deep, somewhat poorly drained soils that formed in mixed alluvium. These soils are on terraces and have slopes of zero to five percent.

Geologic Hazards

There are several areas within the HWPUD that are susceptible to geologic hazards. These hazards include river flooding, earthquakes, high groundwater and erosion. A discussion of each hazard and expected locations are discussed below. Specific hazard maps are included in Appendix A.

- **Flooding**. The Federal Emergency Management Agency (FEMA) has not fully developed flood plain information for the area within the HWPUD. All areas within its boundaries have been designated Zone A, D, or X. Zone A is an area where no base flood elevations have been determined. Zone D is an area in which flood hazards are undetermined. Zone X is an area determined to be outside the 500-year flood plain.

The land area adjacent to a river, stream, lake, estuary, or other water body that is subject to flooding is referred to as a floodplain. The floodplain consists of two main sections: floodway and flood fringe. Floodways are defined as the channel of a river or stream, and the over bank areas adjacent to the channel. The floodway carries the bulk of the floodwater downstream and is usually the area where water velocities and forces are the greatest. The floodway area is reserved to conduct water of a 100-year flood out of the area. Within the floodway, no fill or structure is allowed that would cause any rise in the base flood elevation. The flood fringe refers to the outer portion of the floodplain, which begins at the edge of the floodway and continues outward. The flood fringe is characterized by shallow flooding usually consisting of standing or slow moving water. Residential buildings within the flood fringe need to be constructed above the base flood elevation. Other buildings may be flood-proofed.

Portions of the District adjacent to the Pacific Ocean, Clear Lake, Mercer Lake, Sutton Lake, and Riley Creek are within the 100-year floodplain. The extent of the floodplain within the Study Area is presented in Appendix A, Figure A.4. New development within the flood boundaries shown must be in accordance with the minimum standards of the Flood Insurance Act.

Ocean flooding due to winter storm surges and tsunamis is a threat to beaches and built-up sand areas. Ocean flooding and seasonal rain causes ponding on areas of accreted sand. Construction of the jetty system has caused accretions of sand north and south of the Siuslaw River, with cyclical building and depletion caused by ocean currents and wave action.

- **Earthquakes**. Earthquakes are the products of deep-seated geologic faulting and the subsequent release of large amounts of energy. The relative earthquake hazard includes factors such as earthquake induced landslides, liquefaction, and shaking amplification.

  The HWPUD is vulnerable to earthquake hazards because of: its proximity to the Cascadia Subduction Zone (CSZ), its regional seismicity topography, bedrock geology, and local soil profiles.

  The CSZ is off the Oregon Coast and presents the potential for an earthquake of magnitude 9.0 or higher. An event of such magnitude would result in buildings and infrastructure suffering varying amounts of damage. Large portions of US Highway 101 and roads across the Coast Range would be impassable. Many of the buildings were constructed on soil that would be subject to liquefaction while experiencing a severe ground shaking event. Additionally, principal roads that provide ingress and egress to the HWPUD are susceptible to earthquake induced landslides.

- **High Groundwater.** High groundwater or ponding can lead to: flooding of below-grade structures, flotation or damage to buoyant structures such as pipelines and tanks, differential settling of structures, and complications in the installation of underground facilities. In addition, high groundwater may result in shrink-swell related damage as the soil responds to changing levels of the water table and threats to water quality in areas of waste disposal. Within the Study Area, two soil types (Brallier and Willanch) are considered to have moderate to high potential for ponding and perched water tables. High groundwater conditions are likely to exist near water bodies (e.g. rivers, creeks) within the Study Area.

- **Wave Movement.** Wave movement in the form of tsunamis is considered the greatest hazard within the Study Area. Tsunamis are large ocean waves generated at sea by large earthquakes in the ocean floor. Tsunamis are difficult to detect at sea, having wavelengths of a hundred miles or more and amplitudes seldom exceeding a foot or so. As tsunamis approach land, the shallower depth causes the water to pile upon itself, thus increasing the height of the wave. The resulting wave(s) can be tens of feet high, can arrive several hours apart, and can cause a great deal of damage. The Oregon Department of Geology and Mineral Industries completed maps showing potentially areas impacted by a tsunami. In their simulation the tsunami was caused by a 9.2 earthquake within the Cascadia Subduction Zone. With the exception of a few residences, HWPUD is out of the area of inundation.

- **Erosion and Deposition.** Natural erosion occurs mainly along the ocean beaches and along the banks of the Munsel, Mercer, and Sutton Creek. Areas of sand have built up north and south of the mouth of the Siuslaw River since the construction of the jetty. Most areas of the coastline in the vicinity of HWPUD are subject to sand accretion; however, beach erosion has been noted in some areas in the UGB. Undercutting and caving of stream banks is confined to the floodplain of the waterway, primarily at the outside curve of river bends, and may cause damage to adjacent structures. Sediments carried downstream by river currents contribute to sand accumulations on beaches.

- **Landslides.** Landslides pose a significant risk within the study area. They can cause property and road damage, personal injury and death, and water source contamination. The steep terrain around Mercer Lake, and portions of Sutton and Collard Lake increase the landslide risk associated with their respective areas. A Landslide Hazard Map can be found in Appendix A, Figure A.1.

Water Resources

Water resources within the Study Area include only surface water.

Surface Waters

The HWPUD draws all of its domestic drinking water from Clear Lake. The Clear Lake Watershed is located north of Florence, within the 50-mile North Florence Dunal Aquifer, which was designated a 'sole source aquifer' by the Environmental Protection Agency on October 7, 1981. This designation names Clear Lake as the sole or principal drinking water source for the area.

Clear Lake is a lake with a limited supply of nutrients; therefore it is biologically unproductive with very transparent waters which are fully saturated with dissolved oxygen.

The flushing rate in the lake occurs about once every 500 days. In the winter, when the lake flushes the most rapidly, it is well oxygenated. Under these conditions, phosphorus is likely to be bound to the sediment at the bottom of the lake and not susceptible to being washed out of the lake. Significant phosphorus build up could reduce the levels of oxygen in the water, and create an excess of algae in the water source.

In recent years blue-green algae blooms (cyanobacteria) have been observed in some of Oregon's surface waters. The algae can create major issues for water supplies. The District should monitor drought conditions, algae blooms, warming water trends, and updated information from the Oregon Health Authority regarding these algae blooms.

Ground Waters

There are currently no permitted existing or proposed ground water sources within the District. In the recent Water Management and Conservation Plan, HWPUD, July, 2015, the current water rights for Clear Lake were predicted to be sufficient through the year 2287.

Environmentally Sensitive Areas

The combination of forests, dunes, rangeland, pasture and other wetlands provide a unique environment for the District and should be considered and protected in facilities planning. A discussion of environmentally sensitive areas and environmental topics pertinent to public facilities planning is presented below.

Wetlands

There are a number of significant wetland areas within the District. These areas are shown in Appendix A. The majority of the wetland areas can be found in the lowland areas east and west of US Highway 101 between Heceta Beach Road and Sutton Lake Road. Several wetland areas also surround Sutton Lake.

Riparian Zones

The transition zone between creeks and uplands are also sensitive. The habitat should be protected with erosion control, provide cover for animals, and shading for reducing water temperatures. In addition to exceeding the physical tolerance levels of fish, high temperatures lower the oxygen concentrations, increase disease potential for aquatic life, and produce conditions favorable to invasive species.

Lane County has implemented setback requirement for all structures located near the bank of identified perennial and intermittent water sources. The County requires all residential structural development to have a 50-foot setback and forest/farmland to have a 100-foot setback from the streambank unless Oregon Department of Fish and Wildlife (ODFW) staff agree that this setback is unnecessary or a reduction in the setback would not jeopardize streambank, stability, water quality, or other conditions.

Special Bird Habitats

The natural surroundings in Lane County support a wide range of bird habitats. Within the Study Area, there are two protected bird areas.

Coastal Important Bird Area is a protected area overseen by the Portland Audubon Society that includes the Ten Mile Creek Sanctuary, Pine Tree Conservatory, Rock Creek and Cummins Creek Wilderness areas, and Siuslaw National Forest.

Heceta Bank Important Bird Area includes Heceta Bank, Perpetua Bank, Stonewall Bank, and surrounding waters. This area is important to a variety of seabirds as the ocean upwellings bring food to the surface.

To assist in the protection of bird habitats, for activities not regulated by the Forests Practice Act (FPA), Lane County has designated 'sensitive bird habitats', in which developers must abide by the County's requirements. Within these zones, the County will manage the special bird habitats through consultation with ODFW. The designated areas for sensitive bird habitat can be found in the Rural Comprehensive Plan Flora and Fauna Policy 18 and LM 11.400.

Natural Areas

Within their Comprehensive Plan, Lane County (2010) has identified natural areas to assist in protecting ecologically distinct ecosystems, habitats, and organisms. Much of the area around the Siuslaw River just south of the Study Area has been identified as a natural area.

The Siuslaw River is about 110 miles long, that flows to the Pacific Ocean coast of Oregon in the United States. It drains an area of about 773 square miles in the Central Oregon Coastal Range southwest of the Willamette Valley and north of the Umpqua River Watershed. It rises in the mountains of southwestern Lane County, about ten miles west of Cottage Grove. It flows generally west-northwest through the mountains, past Swisshome, entering the Pacific Ocean at Florence. The head of tidewater is 26 miles upstream.

The river has historically been a spawning ground for Chinook and coho salmon. Although the Chinook salmon population is substantial, coho salmon numbers have declined from an annual average of 209,000 salmon in the 1890s to just over 3,000 salmon in the 1990s.

The estuary of the Siuslaw River is surrounded by extensive wetlands that are a significant habitat for migratory birds along the coast.

The Siuslaw River is one of the very few western Oregon rivers where all major forks are undammed.

Air Quality and Noise

The federal Clean Air Act has established several classifications for allowable air quality according to land uses, designations, and conditions. Air pollutants in the Study Area consist primarily of emissions from automobile and motorboat exhaust, residential fireplaces, wood stoves, forestry slash burning, and backyard burning. The most concentrated source of vehicle exhaust is highway traffic along US Highway 101, but traffic is not concentrated enough to cause a localized air pollution problem. Slash burning of logging debris on local forestlands during fall days with low wind conditions is probably the main source of visible air pollution. Air quality in the area is expected to be in compliance with Federal and State standards for all criteria pollutants.

Energy Production and Consumption

Major energy resources identified in the Study Area are wood, wood by-products, and wind. Wood and wood by-products are both in good supply and are used locally for heating wood burning stoves. Other sources of energy are transported into the Study Area. Natural gas distribution is not available within the Study Area.

Solar energy is a potential source of energy for area residents depending upon access to southern exposure. Wind power may also be a viable future energy source for the Study Area due to high prevailing winds near the Study Area.

Residential, recreation, and transportation use comprises the majority of the energy consumption within the Study Area. Energy consumption is expected to increase within the Study Area due to population growth during the planning period. Central Lincoln Public Utility District serves the Study Area with electrical power.

Rare, Threatened and Endangered Species

A number of rare, threatened, and endangered species are known to reside near or within the Study Area. A list of these species within the Study Area is provided in Table 3.2.1. This list is based on information obtained from the Oregon Natural Heritage Information Center (March 2016) and the ODFW.

TABLE 3.2.1
LIST OF THREATENED AND ENDANGERED SPECIES IN THE STUDY AREA

Common Name	Scientific Name	Status (Federal/State)[1]
Oregon Coast Coho Salmon	Oncorhynchus kisutch	LT
Marbled Murrelet	Brachyramphus marmoratus	LT
Northern Spotted Owl	Strix occidentalis caurina	LT
Western Snowy Plover	Charadrius nivosus nivosus	LT

(1) Federal: LT

Wild and Scenic River System

There are no Wild and Scenic Rivers within the Study Area.

Historic Sites

Within HWPUD, there is only one structure listed in the National Register of Historic Places: the Heceta Head Lighthouse and Keepers Quarters.

3.3 Socioeconomic Environment

The future need for water service and facilities within HWPUD depends upon the socioeconomic conditions within the District and surrounding area. In this sub-section, the local economic conditions, trends, population, land use, and public facilities will be discussed.

Economic Conditions and Trends

Regional economic conditions and trends will likely affect population growth and future water consumption in the District. The main industries are tourism, agriculture, commercial fishing, and sport fishing. The largest employer is comprised of District, City, County, State, and Federal governments. The leading industries in the Study Area are tourism, retail trade, accommodation, food services, and forestry. Lane County employment growth rate for 2017 to 2018 was 1.2 percent. This growth rate is lower than the average for Oregon counties, but is near the average for the Country. Tourism or residential development can create a large, immediate demand for water and sewer services. Immigration to the area slowed in 2008, but has been increasing since 2010. The District's economy is thriving on this growth.

Based on US Census Bureau data, the Median Household Income (MHI) level in Florence for 2017 was $33,821. The MHI for Lane County was $47,710. The District boundary is primarily within the County boundary, but also extends into the City Limits.

Population

Since the District's beginning in 1966, the service population has risen from a handful to approximately 4,921 people. As there is no census data for the HWPUD, the current population was estimated by assuming there were 2.266 people per service connections (Census data estimated 2016 value for Lane County) and 2,172 total residential connections. Economic conditions were difficult in the early 1980s due to the decline of the forest products industry, and some uncertainty remains. The District's livability characteristics, however, especially for retired persons and those enjoying outdoor recreation, have attracted a long-term growing populace; regardless of the local economic climate.

There are several alternatives that can be used to project the population growth over the planning period. According to the "Office of Economic Analysis, Department of Administrative Services, State of Oregon", the average growth rate for Lane County for the years 2015 to 2035 is 0.77 percent, while Portland State University predicts a population growth rate of 0.82 percent for the County. The average growth over the last few years within the District has been approximately one percent. This is also the growth rate used in the previous Water Management and Curtailment Plan. Therefore, a one percent growth rate has been used for this Water Master Plan. Given this population growth rate, the population projection is shown in Table 3.3.1.

TABLE 3.3.1
CURRENT POPULATION ESTIMATE AND POPULATION PROJECTIONS

Year	2018	2023	2028	2033	2038
Residential Population	4,921	5,172	5,435	5,713	6,004
Population Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%

Land Use

Land use within HWPUD is categorized into four general categories: residential, commercial, industrial, and public facilities. There is an estimated five square miles within the current Florence UGB. The HWPUD zoning map is shown in Figure 3.3.1. The five land use categories are briefly discussed below.

Residential Lands

The HWPUD residential lands are throughout the community and on each side of US Highway 101. Residential lands occupy the elevated surrounding hills on the north side of the UGB and new subdivisions are being constructed in the areas surrounding Florence, Oregon. Residential land use ranges from single-family dwellings to multi-family dwellings, to bed and breakfasts. Detailed descriptions of each residential land use zone are described below.

1. **Suburban Residential District (RA District).** The RA District can house residential dwellings, non-profit entities such as schools, hospitals and churches, agricultural endeavors, home businesses, and transportation facilities. The residential lots must be larger than 6,000 square feet. The RA District is intended to support the growth of a suburban community.

2. **Suburban Residential/Mobile Home District (RA/MH District).**The RA/MH District combines the Suburban Residential District zoning requirements and that of the Mobile Home District. In addition to the developments allowed in the RA District, mobile homes can be built one per lot. If the property houses a mobile home park, numerous mobile homes are allowed at one site.

3. **Rural Residential District (RR District).** The RR District is intended to implement the policies of the Lane County Rural Comprehensive Plan (RCP) pertaining to developed and committed lands. This district does not include lands designated by the RCP as non-resource lands; promote a compatible and safe rural residential living environment by limiting allowed uses and development to primary and accessory rural residential uses and to other rural uses compatible with rural residential uses and the uses of nearby lands; and provide protective measures for riparian vegetation along Class I streams designated as significant in the RCP.

   This district is subdivided into RR1, RR2, and RR5 which sets the minimum lots size to one acre, two, and five acres respectively.

Commercial Lands

The commercial properties are clustered around Highway 101. Commercial activities generally include retail and tourist related services. Small shops and restaurants catering to the tourist market make up the majority of the commercial properties in the District.

1. **Rural Commercial District (RC District).** The purposes of the Rural Commercial Zone (RC, RCP) are: to implement the policies of the Lane County RCP, to allow commercial uses and development that are consistent with Goal 14 and that are for the retail trade of products or services needed by rural residents or by persons traveling through the rural area, and to provide protective measures for riparian vegetation along Class I streams designated as significant in the Rural Comprehensive Plan.

Industrial Lands

There is one property zoned industrial within the District on the west side of Hwy. 101. It lies between the Heceta Beach area, and Mercer Lake Road.

1. **Rural Industrial District (RI District).** The purposes of the Rural Industrial Zone (RI, RCP) are: to implement the policies of the Lane County Rural Comprehensive Plan (RCP); to allow industrial uses and development that are consistent with Goal 14 that include areas for small scale industrial uses and for industries that rely on a rural location in order to process rural resources.

Public Facilities Lands

Public lands consist of those required for government offices, schools, hospital, transportation facilities, parks, and recreation areas. The Water Treatment Plant and District shops are included within the public facilities lands.

1. **Public Reserve District (PR District) –** The PR District provides an area for the development of single-family homes, public facilities, and commercial structures. The residential lots are medium density (8,000 square feet per lot), while the commercial and public land must exceed one acre. Structures are not to cover more than thirty percent of the lot area, thus preserving a more rural appearance to the developed areas.

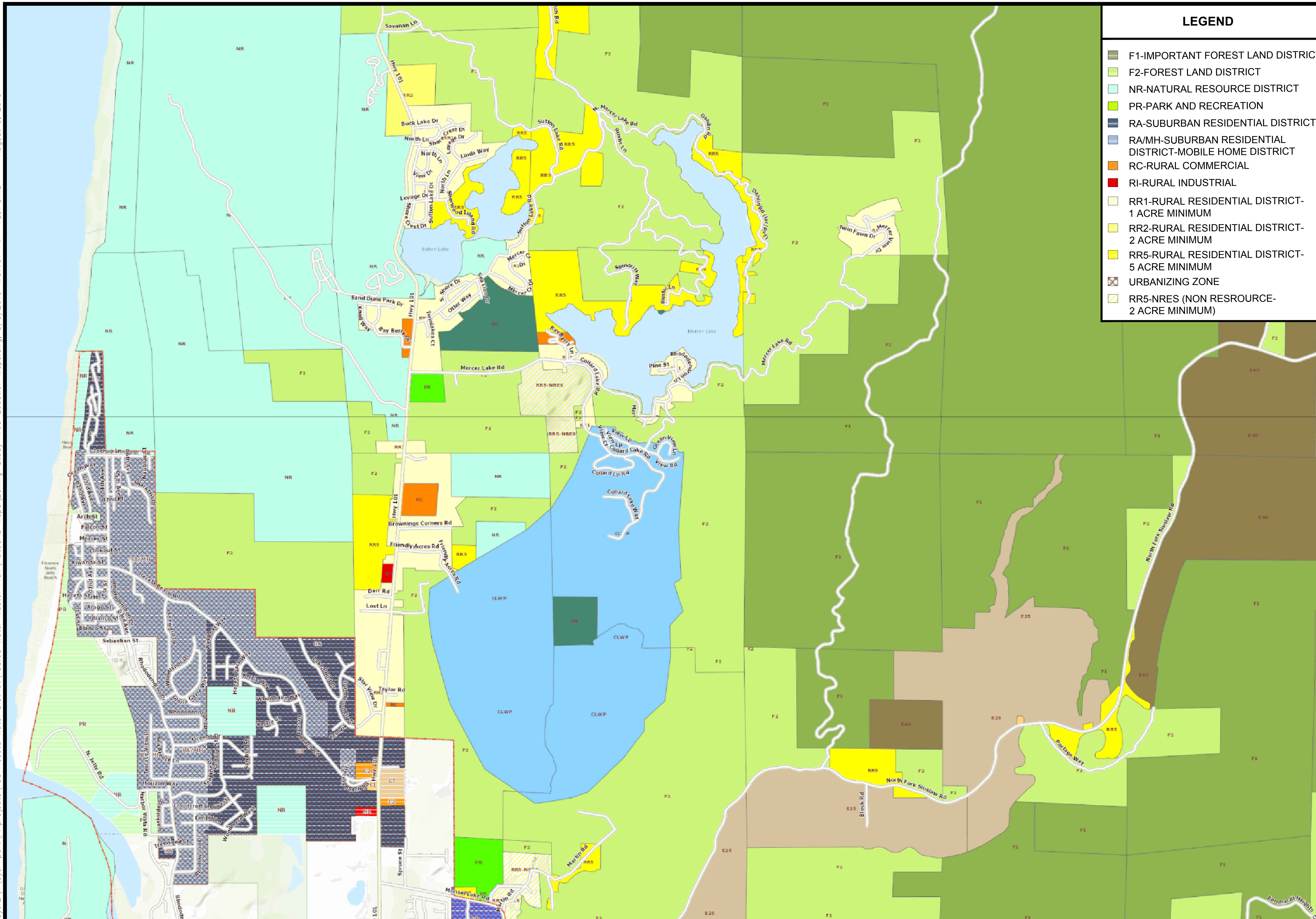


FIGURE NO. 3.3.1

HECETA WATER PUD WATER MASTER PLAN

DISTRICT ZONING MAP

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

\\dyer2\h\dyer-part\AAprojects\188 Heceta Water District\188.05 Water Master Plan\AutoCAD Maps\Zoning-Study Area-Location Maps.dwg, 8/8/2019 4:57:07 PM PLOT DATE August 9, 2019

SECTION 4:

REGULATORY ENVIRONMENT

SECTION 4: **REGULATORY ENVIRONMENT**

4.1 Municipal Water Management Plans

The Oregon Water Resources Department has developed rules that govern water management planning (Water Management and Conservation Plans; Oregon Administrative Rules (OAR) Chapter 690, Division 86). Included in the rules are groundwater management, hydroelectric power development, instream flow protection, interstate cooperation, water resources protection on public riparian lands, conservation and efficient water use, water allocation, and water storage. The Water Resources Commission has adopted a statewide policy on Conservation and Efficient Water Use (Statewide Water Resource Management; OAR 690-410). The policy requires major water users and suppliers to prepare water management plans. Municipal water suppliers are encouraged to prepare water management plans, and are required to do so if a Plan is prescribed by a condition of a water use permit. The following elements are to be included in the Plan: description of the water system, a water conservation element, a water curtailment element, and a long-range water supply element.

Description of the Water Management and Conservation Plan

The Management and Conservation Plan shall include sources of water, storage, regulation facilities, transfer and exchange agreements, and intergovernmental cooperation agreements. System capacity, limitations and opportunities for expansion under existing water rights are to be included. Water use shall be discussed including current average annual water use, peak seasonal demand, average and peak day demands, and quantities of water used from a source. Customer information is required such as estimated numbers and general water use characteristics of residences, commercial, industrial, and other users. A schematic of the system which shows the sources of water, storage facilities, treatment facilities, major transmission and distribution lines, pump stations, interconnections with other municipal supply systems, and the service area, is required.

4.2 Public Water System Regulations

Drinking water regulations were established in 1974 with the signing of the Safe Drinking Water Act (SDWA). The SDWA and subsequent regulations were the first to apply to all public water systems in the United States. The Environmental Protection Agency (EPA) was authorized to set standards and implement the Act. With the enactment of the Oregon Drinking Water Quality Act in 1981, the State of Oregon accepted primary enforcement responsibility for all drinking water regulations within the State. Requirements are detailed in OAR Chapter 333, Division 61. Since its inception, the SDWA and associated regulations have been amended a number of times, with the most recent amendments in August 2016.

One of the main elements of these drinking water regulations is the establishment of Maximum Contaminant Levels (MCLs) for inorganic, organic, microbiological, radionuclide contaminants, and turbidity. A MCL is the maximum allowable level of a contaminant in water delivered to the users of a public water system. Concentrations above the MCL for a contaminant are considered violations and require the water supplier to perform immediate corrective action and notify the public of such violations.

Surface Water Treatment Rule (SWTR)

The Surface Water Treatment Rule (SWTR) is one amendment to the Safe Drinking Water Act (SDWA). This rule affects all public water systems using surface water sources and established, among other requirements, that water must be treated through filtration and disinfection. This rule is required for all water providers using a surface water source unless certain water quality criteria and site-specific requirements are met. Treatment requirements, performance standards and MCLs are generally summarized as follows (excluding MCLs for inorganic materials, radioactive substances, and secondary contaminants) for a water system:

- For conventional filtration treatment, the turbidity level of representative samples of filtered water must at no time exceed one Nephelometric Turbidity Units (NTU), measured as specified in OAR 333-061-0030(3)(b). That is to say, zero percent of the turbidity measurements can exceed 1 NTU. Turbidity is monitored continuously with results reported every four hours.

- For conventional filtration treatment, the turbidity level of representative samples of filtered water must be less than or equal to 0.3 NTU in at least 95 percent of the measurement taken each month, measured as specified in OAR 333-061-0030(3)(b). The turbidity levels can rise above 0.3 NTU no more than five percent of the time.

- Total coliform-positive (coliform present) samples shall not exceed more than one sample collected during a month. Two monthly samples are required. A set of at least three repeat samples are required for each positive sample. Repeat sampling continues until the MCL is exceeded or a set of repeat samples with negative results (coliform absent) is obtained. Confirmed presence of fecal coliform or *E. coli* requires immediate notification of the public.

- At least 99.9 percent (3-log) inactivation and/or removal of *Giardia lamblia* cysts at a point downstream at or before the first customer.

- At least 99.99 percent (4-log) inactivation and/or removal of viruses at a point downstream at or before the first customer.

- A free chlorine residual of 0.2 mg/L after 30 minutes of contact time shall be achieved under all flow conditions before the first customer. 333-061-0050(5)(c)(B)

- The residual disinfectant concentration in the distribution system, measured as total chlorine, combined chlorine, or chlorine dioxide, as specified in OAR 333-061-0032(3)(d) cannot be undetectable in more than five percent of the samples each month, for any two consecutive months.

The adoption of the 1989 SWTR has improved the quality of drinking water and greatly reduced the number of infections caused by water borne pathogens. The SWTR set standards to reduce water concentration of *Giardia* and viruses, with a goal to reduce the risk of infection to less than one in 10,000 people per year. However, some water sources have a high concentration of pathogens that, even when treated to the levels required by the rule, do not meet the health goal. Specifically, the rule does not specifically control the protozoan *Cryptosporidium*, which has been linked to at least 50 deaths of *Cryptosporidium*-caused illness outbreaks in Milwaukee, Nevada, Oregon, and Georgia. Although the public health benefits of disinfection are significant and well recognized, it has been found that the Disinfection Byproducts (DBP) also pose health risks at certain levels. The SDWA Amendments, signed by President Clinton in August 1996, mandated the establishment of a series of new drinking water regulations in response to these and other concerns. Since the enactment of the Amendments, Environmental Protection Agency (EPA) has been busy developing, proposing, and finalizing regulatory actions. Some of the recent regulatory actions are summarized below.

Long Term 1 Enhanced Surface Water Treatment Rule

One of the first rules developed by EPA under the SDWA amendments was the Interim Enhanced Surface Water Treatment Rule (IESWTR). The IESWTR was promulgated to address health risks from microbial contaminants without significantly increasing the potential risks from chemical contaminants. This rule applies to public water systems that use surface water or Ground Water under the Direct Influence of Surface Water (GWUDI) and serves at least 10,000 people. For water systems with a population of less than 10,000, the Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) was adopted. This rule was adopted in January 2002 and includes the following provisions:

- Maximum Contaminant Level Goal (MCLG) is set at zero.
- Filtered systems must comply with strengthened Combined Filter Effluent (CFE) turbidity performance requirements to assure 2-log removal of *Cryptosporidium*.
- Conventional and direct filtration systems must continuously monitor the turbidity of individual filters and comply with follow-up activities based on this monitoring.
- Specific CFE turbidity requirements depend on the type of filtration. For conventional and direct filtration, the CFE shall be less than 0.3 NTU 95 percent of the time, and at no time higher than one NTU.
- Perform CFE turbidity monitoring at least every four hours; record continuous Individual Turbidity Effluent (IFE) measurements (at least every 15 minutes).
- Disinfection profiling and benchmarking provisions to ensure continued microbial protection.
- Requirements for covers on new finished water reservoirs.

The District currently complies with all LT1ESWTR requirements, and has had only one violation related to late/non-reporting in 2014.

Long Term 2 Enhanced Surface Water Treatment Rule

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) was proposed and reviewed by a Federal Advisory Committee at the same time as the Stage 2 Disinfection Byproduct Rule (DBPR). The requirements of this rule would pertain to all public water systems that use surface waters or GWUDI. The rule would incorporate system specific treatment requirements for one of four categories or "bins" depending upon the results of source water *Cryptosporidium* monitoring. Treatment requirements for each system would depend on system's existing treatment equipment and removal capabilities. To comply with additional treatment requirements, water providers would choose technologies from a "toolbox" of options. Proposed treatment requirements for average *Cryptosporidium* are presented in Table 4.2.1.

TABLE 4.2.1
PROPOSED TREATMENT REQUIREMENTS FOR AVERAGE *CRYPTOSPORIDIUM* CONCENTRATIONS

Bin No.	Ave. Cryptosporidium Concentration	Additional Treatment Requirements[1]
1	< 0.075/ liter	No action
2	0.075/ liter < x < 1.0/ liter	1-log treatment (any technology or technologies)
3	1.0/ liter < x < 3.0/ liter	2.0 log treatment (must achieve at least 1-log of treatment using specific technology [2]
4	> 3.0/ liter	2.5 log treatment (must achieve at least 1-log treatment using specific technology [2]

(1) For systems with conventional treatment that are in full compliance with IESWTR.
(2) Acceptable technologies include ozone, chlorine dioxide, ultraviolet, membranes, bag/cartridge filters, or in-bank filtration.

For small systems monitoring requirements, it is anticipated that source water *E. coli* concentrations would be utilized for *Cryptosporidium* monitoring. Observed *E. coli* concentrations above certain levels would trigger *Cryptosporidium* monitoring. The recommended *E. coli* monitoring for small systems would begin two and a half years after rule promulgation and would include 24 samples over one year. After six years of the system characterization, a second round of monitoring is proposed.

This rule only applies to public water systems serving populations greater than 10,000; therefore the District is not currently required to monitor *Cryptosporidium.* In the future, this rule may expand its reach and begin to impact the District's existing treatment and monitoring processes.

In summary, the rules are getting tougher with increased treatment standards, lower MCLs, and more regulated substances. Water suppliers must stay informed of upcoming standards and requirements to ensure that their system will stay in compliance. Proper preparation is critical. When upcoming MCLs are established, a supplier should begin to test for these materials to determine if compliance will be a problem. Advanced planning will allow a utility more time to make necessary modifications to treatment techniques. Additional information on recent and pending regulations can be found at www.epa.gov/safewater/standards.html.

Stage 1 Disinfectants/Disinfection Byproducts Rule

Stage 1 DBPR was published along with the IESWTR to control disinfectants and formation of their harmful byproducts. This rule establishes Maximum Residual Disinfectant Level Goals (MRDLGs) and Maximum Residual Disinfectant Levels (MRDLs) for three disinfectants: chlorine (4.0 mg/l), chloramines (4.0 mg/l), and chlorine dioxide (0.8 mg/l). The rule also establishes MCLGs and MCLs for specific disinfection byproducts as given in Table 4.2.2.

TABLE 4.2.2
MCLGS AND MCLS FOR STAGE 1 DISINFECTANTS

Disinfection By-Product	MCLG (mg/l)	MCL (mg/l)	Time Period
Total Trihalomethanes (TTHM)	N/A	0.08	Annual Average
Bromodichloromethane	0	0.08	Annual Average
Dibromochloromethane	0.06	0.08	Annual Average
Bromoform	0	0.08	Annual Average
Haloacectic acids (HAA5)	N/A	0.06	Annual Average
Dichloroacetic acid	0	0.06	Annual Average
Trichloroacetic acid	0.02	0.06	Annual Average
Chlorite	0.8	1	Monthly Average
Bromate	0	0.01	Annual Average

Water system providers must monitor and control the use of disinfectants and meet the requirements for Total Trihalomethanes (TTHM) and the sum of five Haloacetic Acids (HAA5). In addition, water systems that use surface water or GWUDI and use conventional filtration treatment are required to also remove a specified percentage of organic materials, measured as Total Organic Carbon (TOC) that may react with disinfectants to form disinfection byproducts.

Furthermore, Oregon's decision to join the EPA Region 10 and the states of Utah and Washington in participation in the Area Wide Optimization Program (AWOP) is anticipated to create more stringent treatment standards which the existing Nonpareil Water Treatment Plant can now meet only under ideal conditions. The AWOP performance goals are listed below in Table 4.2.3.

TABLE 4.2.3
AWOP PERFORMANCE GOALS

Sedimentation	Turbidity	Criteria
Settled water	Less than 2 NTU, 95% of the time	Avg. annual raw water turbidity > 10 NTU
Settled water	Less than 1 NTU, 95% of the time	Avg. annual raw water turbidity ≤ 10 NTU
Filtration	**Turbidity**	**Criteria**
Filtered water	< 0.1 NTU, 95% of the time	Based on 4-hour incremental max valves
		(15 min. period following backwash excluded)
Filtered water	Max. 0.3 NTU following backwash	Return to < 0.1 NTU < 15 minute of backwash

The objective of AWOP is to achieve "performance goals" without major capital expenditures. While these goals are not currently tied to regulatory compliance requirements, it is anticipated that they will be in time. Statements by the State such as "to achieve optimized treatment and provide maximum protection of public health, you must achieve the described AWOP performance goals" suggests that these goals would better protect the public, and therefore should not be ignored.

Stage 2 Disinfection Byproduct Rule, Effective March 6, 2006

The Stage 2 DBPR is being promulgated simultaneously with the Long Term 2 Enhanced Surface Water Treatment Rule to address concerns about risk tradeoffs between pathogens and DBPs. Stage 2 DBPR builds upon the Stage 1 DBPR to address higher risk public water systems for protection measures beyond those required for existing regulations. These rules strengthen protection against microbial contaminants, especially *Cryptosporidium*, and at the same time, reduce potential health risks of DBPs.

The final Stage 2 DBPR contains maximum contaminant level goals for chloroform, monochloroacetic acid and trichloroacetic acid. National Primary Drinking Water Regulations, which consist of MCLs, monitoring, reporting, and public notification requirements for total trihalomethanes and haloacetic acids. The regulations include revisions to the reduced monitoring requirements for bromate. This document also specifies the best available technologies for the final MCLs. The EPA is approving additional analytical methods for the determination of disinfectants and DBPs in drinking water. The Stage 2 DBPR rule is intended to reduce potential cancer, reproductive and developmental health risks from DBPs in drinking water. The requirements of this rule apply to community water systems and non-transient non-community water systems that add and/or deliver water that is treated with a primary or residual disinfectant other than Ultraviolet (UV). For public water systems serving fewer than 10,000 people; Stage 2 compliance monitoring began October 1, 2013.

An Initial Distribution System Evaluation (IDSE), conducted by the water provider, is intended to select new compliance monitoring sites that reflect locations with system high TTHM and HAA5 concentrations. Water providers would recommend new or revised monitoring sites based on their IDSE study. The results from the IDSE study would not be used for compliance purposes. For surface water systems with less than 10,000 people, water providers must monitor either quarterly (population from 500 to 9,999) or semi-annually (population less than 500) for one year at two distribution system sites per plant. These sites must be in addition to the Stage 1 DBPR compliance monitoring sites. Water providers that certify to the State that all samples taken in the last two years were below 40 mg/l TTHM / 30 mg/l HAA5 are not required to conduct the IDSE.

For long-term compliance monitoring, the principles of reduced compliance monitoring strategy (for very low DBP levels) utilized in Stage 1 DBPR would continue in the Stage 2 DBPR. Water providers would collect paired samples (TTHM and HAA5) at the site representing the highest TTHM and the highest HAA5 locations in the distribution system, as identified under the IDSE. If the highest levels of TTHM and HAA5 are observed at the same location, then only one sample would be needed. Monitoring would be either quarterly (population from 500 to 9,999) or annually (population less than 500).

The District has never been in violation of either Stage 1 or Stage 2 DBPR. As long as the District maintains its current treatment process, no future violations are foreseen.

Filter Backwash Recycle Rule

The EPA is required to regulate the recycling of filter backwash water within the treatment process of a public water system. The filter backwash recycle rule provisions impact all conventional and direct filtration systems, which recycle filter backwash and use of surface water or GWUDI. Under the rule, the following provisions will be required.

- Recycle water from filter backwash, supernatant from sludge thickening, and liquids from sludge dewatering must pass through all filtration processes for treatment.

Specific information on the regulations concerning public water systems may be found in the Oregon Administrative Rules (OAR), Chapter 333, Division 61. The rules are located at:
http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Rules/Documents/pwsrules.pdf

The District has a backwash recycle system, and complies with the Filter Backwash Recycle Rule.

Arsenic and Clarifications to Compliance and New Source Monitoring Rule

In January 2001, the Arsenic and Clarifications to Compliance and New Source Monitoring Rule was enacted. The major features of this rule included the following:

- Include health effects statements in Consumer Confidence Reports for arsenic levels from 5 to 50 ug/l and when systems are in violation of the arsenic MCL of 0.010 mg/l.
- All new systems/sources must collect initial monitoring samples for all Inorganic Compounds (IOCs), Synthetic Organic Compounds (SOCs), and Volatile Organic Compounds (VOCs).
- The new arsenic MCL of 10 ug/l became effective on January 23, 2006.
- One sample must be taken and analyzed after effective date of MCL. Surface water systems must take annual samples.
- A system with a sampling point result above the MCL must collect quarterly samples at that sampling point, until the system is reliably and consistently below the MCL.

The District has had 'non-detect' levels of Arsenic in every sample since 1986. Oregon Health Records do not show sample results prior to this date.

4.3 Responsibilities as a Water Supplier

Per OAR 333-061-0025, water suppliers are responsible for taking all reasonable precautions to assure that the water delivered to water users does not exceed maximum contaminant levels, to make certain that water system facilities are free of public health hazards, and to verify that water system operation and maintenance are performed as required by these rules. This includes, but is not limited to, the following:

- Routinely collecting and submitting water samples for laboratory analyses at the frequencies prescribed by OAR 333-061-0036;
- Taking immediate corrective action when the results of analyses or measurements indicate that maximum contaminant levels have been exceeded and report the results of these analyses as prescribed by OAR 333-061-0040;
- Reporting as prescribed by OAR 333-061-0040, the results of analyses or measurements which indicate that maximum contaminant levels have not been exceeded;
- Notifying all customers of the water system and the general public in the service area, as prescribed by OAR 333-061-0042, when the maximum contaminant levels have been exceeded;
- Notifying all customers served by the water system, as prescribed by OAR 333- 061-0042, when reporting requirements are not being met, when public health hazards are found to exist in the system, or when the operation of the system is subject to a permit or a variance;
- Maintaining monitoring and operating records and making these records available for review when the system is inspected;

- Maintaining a pressure of at least 20 pounds per square inch (psi) at all service connections at all times;
- Following-up on complaints relating to water quality from users and maintaining records and reports on actions undertaken;
- Conducting an active program for systematically identifying and controlling cross connections;
- Submitting, to the Oregon Health Authority, plans prepared by a Professional Engineer registered in Oregon for review and approval before undertaking the construction of new water systems or major modifications to existing water systems, unless exempted from this requirement;
- Assuring that the water system is in compliance with OAR 333-061-0032
- Assuring that the water system is in compliance with OAR 333-061-0210 through OAR 333-061-0272 relating to certification of water system Operators; and
- Assuring that Transient Non-Community water systems utilizing surface water sources or groundwater sources under the influence of surface water are in compliance with OAR 333-061-0065(2)(c) relating to required special training.

4.4 Summary of District's Compliance with Regulations

The District has indicated that they have had no violations and are compliant with the current regulatory regulations. The District had one action level notice for lead sampling within the distribution system; however the District believes this was a result of a sampling issue which will be resolved through further additional lead sampling. The District's reportable turbidity over the past five years has been less than 0.5 NTU.

SECTION 5:

EXISTING WATER SYSTEM

SECTION 5: **EXISTING WATER SYSTEM**

The District's existing water system consists of raw water intake facilities, treatment plant facilities, treated water storage, and the treated water distribution system. These components are discussed in detail below. A water systems map is shown in Figure 5.4.1. A HWPUD Water System Summary Sheet can be found in Appendix H.

5.1 Water Rights and Raw Water Supply

Evaluation of the existing raw water supplies and water rights is crucial to the formulation of a successful long-range plan for the District. The following is a discussion of the sources, availability, and reliability of the District's raw water sources.

Raw Water Sources

The District has one source of raw water: Clear Lake. An overall map of the Study Area showing Clear Lake is displayed in Figure 3.1.2.

Clear Lake

Clear Lake is the second lake in a chain of four lakes located half a mile northeast of Florence, Oregon. The lake lies in a trough between the buildup of the dune sheet to the west, and the bedrock of the Coast Range foothills to the east. About 40 percent of the watershed for the Clear Lake is lush forest, while 15 percent is sand dunes and the lake itself accounts for 25 percent of the total area. The remaining area is non-vegetated, residential developments.

Clear Lake lies on the 50-mile long North Florence Dunal Aquifer. The Aquifer was designated a 'sole source' aquifer by the Environmental Protection Agency on October 7, 1981. This designation established the aquifer as the primary, sole, or principal drinking water source for the area.

The sands of the North Florence Dunal Aquifer are a substantial water holding and transporting system. Permeability is high, and creek and stream flow is low. The only surface streams that cross the dune sheet, are Sutton Creek to the north and the Siuslaw River to the south. The streams derive most of their flow from the hills to the east; there is also substantial discharge of groundwater into these streams from the aquifer. These streams flow through Collard Lake and into Clear Lake. A steady, year round flow of one to two cfs occurs in these streams.

Water flows out of Clear Lake by a surface stream to Acherly Lake, and then to Munsel Lake, and Munsel Stream; or it seeps into the sand aquifer system directly from the lake. The bottom of Clear Lake is mostly clean sand. Small deposits of clay and organic mud occur along the north shore, in coves along the east shore, and at the outlet.

The water quality in Clear Lake is generally excellent, having minimal turbidity. Heavy rains and rapid groundwater movement minimize the concertation of chemical constituents. The alkalinity is very low, and there is only slight enrichment of sodium and calcium.

Water Rights

All water in Oregon is publicly owned. As a result of this public ownership, a water right is generally required for anyone to use water, whether it originates from surface or underground sources. Oregon water laws are based on the principal of prior application. That is, if a person obtains a water right on a particular source before someone else, the person would then possess a "senior" water right that would permit them first use of the water during times of lower flows or droughts. A "junior" water right is one that is obtained after other water rights for a particular source have been assigned. A water right may be both senior to some and junior to others. During periods of low water availability, a water right holder may use as much water as their water right allows as long as the use is truly beneficial and all senior water rights are satisfied.

The District currently holds surface water right certificates and permits on Clear Lake totaling 6.25 cfs. A brief summary of each water right is given below. Although the existing water rights total 6.25 cfs, the current intake is limited to 1.5 cfs due to the stipulations within the easement along which the intake line travels. For more water right information, please see the Water Management Conservation Plan, February 2015, HWPUD. Water right documentation is provided in Appendix B. Table 5.1.1 summarizes the District's Water Rights.

TABLE 5.1.1
WATER RIGHTS DOCUMENTATION SUMMARY

Source	Application	Permit	Certificate	Magnitude (cfs)	Magnitude (MGD)	Priority Date
Clear Lake	44408	33171	56356	1.55	1.00	1/19/1968
Clear Lake	52076	37524	80690	1.50	0.97	4/30/1974
Clear Lake	69079	50036	-	2.25	1.45	5/4/1987
Clear Lake	74717	52090	-	0.95	0.61	10/13/1994
Total				6.25	4.03	

Diverted Water

The District has a raw water meter at the intake facility. The estimated amount of water diverted from this source for the water Years 2015 to 2018 is presented in Table 5.1.2.

TABLE 5.1.2
HISTORICAL WATER DIVERSION (2015 – 2018)

Parameter/Year	2015-2016	2016-2017	2017-2018
Clear Lake Intake Water Diversion			
Total Gallons, MG	146	149	157
Avg. Daily cfs	0.53	0.55	0.58
Max. Month, cfs	0.92	1.01	1.04
Peak Week, cfs	1.01	1.11	1.09
Max. Daily, cfs	1.17	1.21	1.25
Total Water Rights, cfs	6.25		

Based on the historical water diversion, the rate of withdrawal from Clear Lake is significantly lower than the allocated senior water rights (6.25 cfs).

5.2 Raw Water Facilities

The raw water facilities consist of a raw water intake (diversion structures), raw water constant head/surge control tank, and raw water transmission main. These facilities are discussed in detail below.

Raw Water Intake

The raw water intake is located 70 feet off the bank of Clear Lake. A screen is mounted on the end of the intake pipe to restrict fish and debris from entering the pump station. Reverse flow through the screen can clear debris that may be clogging the screen thereby reducing the flows through the pump station. A 16-inch HDPE pipe conveys the raw water from the screen to the pump house located at the southwest corner of Clear Lake. Three 40 hp pumps (one being redundant) with a capacity of 1,000 gpm each convey raw water through 1.2 miles of 16-inch HDPE pipe to the Water Treatment Plant (WTP). The intake pipe, pump house, and transmission main underwent improvements in 2002 to 2003 during the construction of the new WTP. There is a 125kW diesel generator onsite for backup power in the event of a power outage. The pump station and intake facilities are in good condition. The intake pumps are controlled by the water elevation in the raw water constant head/surge control tank.

Raw Water Constant Head/Surge Control Tank

The raw water is conveyed to the raw water constant head/surge control tank located at the WTP site. This welded steel tank minimizes pressure spikes. The tank is eight feet in diameter, with 24-foot sidewalls. The overflow height is 23 feet, and the tank stores 8,643 gallons of water. The water level within the tank is determined by an ultrasonic level transducer. The tank is in fair condition. The exterior of the tank is beginning to show rust and signs of corrosion as a result of the tank coating reaching the end of its intended service life.

FIGURE 5.2.1
RAW WATER SURGE CONTROL TANK

5.3 Water Treatment Plant

The HWPUD has one potable WTP. The 1.5 mgd WTP was constructed in 2003. The treatment process at the WTP consists of three treatment units (up-flow clarifiers, followed by media filter) which provide clarification and filtration. Chemical injection systems provide coagulation and disinfection, and the clearwell which provides sufficient contact time for the complete disinfection of the treated water.

In 2009, the third treatment unit was installed in the WTP. The media within all of the media filters was replaced in 2012. This improvement introduced Granular Activated Carbon (GAC) into the media to address the high levels of manganese in the raw water. The units have the design capacity of 350 gpm each with a combined design capacity of 1,050 gpm (1.51 mgd). Disinfection is accomplished by sodium hypochlorite injection. There is a chlorination tank outside of the WTP. The filter effluent pumps deliver water to the tank. The treatment plant provides good quality water throughout the year and meets the State and Federal Standards for domestic water supply systems.

There are other systems found within the WTP that are not directly part of the treatment process. These systems are the backup power generator, backwash pond, and finished water pumps. The backup power generator is 200kW and is located outside the WTP. A summary of WTP systems is given in Table 5.3.2, and the WTP Site Plan is shown in Figure 5.3.9.

Water Treatment Plant and Office Buildings

FIGURE 5.3.1
WATER TREATMENT PLANT BUILDING

The WTP building has metal sides and a metal roof. The building includes two chemical feed areas, a soda ash feed area, a storage room, electrical room, office/laboratory, restroom, and three package treatment units.

Currently there are several issues with the WTP building. These problems are described below:

- During winter months there is standing water in the entry way to the lab/offices which has caused corrosion to the metal structure.
- The storage area in the back of the WTP currently serves little purpose, and could be more efficiently used if the area was closed in.
- The metal roof girders in this area are corroded.
- The soda ash facilities create dust that spreads throughout the WTP when in use.
- The roof and entry is showing signs of deterioration and corrosion.

FIGURE 5.3.2
DISTRICT OFFICE BUILDING

The District office is located at the WTP site. The office serves as a storage facility, break area, conference room, and office space. This building serves as the billings and accounts receivable office for the District.

The office building has evolved over the years, and is a conglomeration of additions intended to meet the growing needs of the District. It appears there have been at least three expansions to the office complex. The building is aged, has different finished floor elevations, sloped floors, cracked concrete, and minimal insulation. The phased development was not pre-planned and is therefore lacking flow and functionality. A building inspection was performed in 2018 and noted a variety of issues with the building including electrical and siding issues. The building is suspected of having asbestos siding and lead paint. A copy of the inspection report is located in Appendix F.

Plant Operation

Treated water production is controlled by the water level in the Finished Water Storage Tank which has a telemetry system that communicates with the WTP Supervisory Control and Data Acquisition (SCADA) system. When the water level in this tank drops to a predetermined level, the WTP automatically turns on.

Chemical Feed Systems

The purpose of the chemical feed system is to coagulate, disinfect, and to provide pH and corrosion control. Aluminum sulfate (48 percent) is used for coagulation. Sodium hypochlorite (12.5 percent) provides disinfection. Caustic soda (25 percent) facilitates pH control. All pumps, mounting, piping, and storage containers have been well maintained and are in good condition.

FIGURE 5.3.3
COAGULANT INJECTION STATION

Clarification

Raw water is fed into the package treatment units where there is upflow through non-buoyant media in the clarifier. The flow through the adsorption clarifier is 10 gpm/sq. ft. The area of the clarifier is 35 sq. ft. The total flow through a single clarifier is 350 gpm. Air scour is used to remove built up contaminants on the media. The air scour flow rate is 4 cfm/sq. ft.

FIGURE 5.3.4
WTP FILTRATION UNIT

Filtration

The clarified water is fed into the polish filter portion of the package treatment plant where objectionable color, turbidity, bacteria and other harmful organisms are removed. The filtering rate is 5.0 gpm/sq.ft., the backwash rate is 1,050 gpm, and the air scour rate is four cfm/sq. ft. The total flow rate through a single filter is 350 to 420 gpm.

The media filters underwent improvements in 2012, and as a result are in fair condition. In 2012 the original anthracite filter media material was replaced with granular activated carbon.

FIGURE 5.3.5
BACKWASH POND

Backwash

The backwash pond is a sloped concrete basin which has two sections that are approximately 100 ft. long, 24 ft. wide, have a ramped bottom with a max depth of eight feet, and a maximum volume of 125,900 gallons. Backwash water is directed to one of two backwash basins located near the WTP using one of two 1,050 gpm backwash pumps at 35 feet of Total Dynamic Head (TDH). These ponds are operated in series, with the first pond being filled and settled prior to transferring the backwash water into the second pond. Settled water is pumped to an unnamed creek, or is pumped back into the raw water line with submersible backwash return pumps. These pumps operate at 30 to 100 gpm with a maximum TDH of 50 feet.

Filter Effluent Pumps

The filtered water is pumped from the filters to the finished water storage tank via the filter effluent pumps. One effluent pump is attached to each treatment unit. If the treatment unit is activated, the pump is turned on. Each pump is equipped with a Variable Frequency Drive (VFD), and has a capacity of 350 to 420 gpm at 40 feet of head. The pumps are in good condition.

Chlorination Facilities

There is a chlorination station next to the filter effluent piping. The station consists of four chemical feed pumps, a 50 gallon drum of sodium hypochlorite 12.5 percent solution, and a grated shelf on which the pumps are mounted. The injection rate is flow paced based on water production.

FIGURE 5.3.6
SODIUM HYPCHOLORITE STATION

Chlorine Contact Tank (CCT)

Disinfection is required to destroy harmful viruses and bacteria in water by inactivation or destruction. Optimum disinfection facilities involve an appropriate disinfecting agent, an adequate dosage rate, and sufficient contact time for virus inactivation and bacteria destruction. The CCT is a circular welded steel storage tank sitting next to the existing water treatment plant. Sodium hypochlorite is added following the filters and prior to entering the CCT. The baffled clearwell dimensions are 24 feet high by 44 foot diameter. The effective CCT volume is 261,450 gallons. Assuming a baffling factor of 0.5, the tank has a theoretical detention time of 124 minutes at 1,050 gpm. The WTP has adequate contact time as per the "Disinfection Contact Time Tracer Study" provided by Oregon Health Authority December 2013. This document can be found in Appendix G.

FIGURE 5.3.7
CHLORINATION TANK

The CCT serves three purposes: 1) storage, 2) contact time for disinfection, and 3) source of backwash water for the filter units.

Metering

New electromagnetic flow meters were installed as part of the 2002 to 2003 WTP rehabilitation. There are flow meters at the inlet of each filter, and on the treated water main following the manifold combining all filter flows. There are no water measurements made on general water usage (sanitation, pump seals, chemical make-up, water quality measurements, etc.) at the WTP.

Finished Water Pumps

A finished water pump station located at the WTP pumps water from the CCT to the distribution system. The pump station is a tri-plex system operating with one redundant pump. The pumps are 25 hp and capable of pumping 500 gpm each, giving the pump station a total capacity of approximately 1,000 gpm. The pump station is in fair condition. The stainless steel manifold and header piping downstream of the pumps has pin holes throughout it and needs to be repaired or replaced.

FIGURE 5.3.8
FINISHED WATER PUMPS

Water Production and Backwash

Three years of water production data was evaluated and broken into four categories. The categories are as follows: raw water pumped to the District, water used for backwash, total water production, and the percent of water used for backwash. A summary of the District's historical water production and backwash water volumes is given in Table 5.3.1.

TABLE 5.3.1
HISTORICAL WATER PRODUCTION & BACKWASH WATER VOLUMES FOR THE WTP

Parameter	Year			Average
	2015-2016	2016-2017	2017-2018	
Raw Water Pumped to District, MG	0.137	0.138	0.145	0.140
Water Used for Backwash, MG	0.010	0.011	0.012	0.011
Total WTP Production, MG	0.146	0.149	0.157	0.151
Backwash Percentage, %	6.6%	7.5%	7.5%	7.2%

5.4 Service Areas

The District has four service areas, served by four treated water storage reservoirs. The service areas are defined by the area to which each existing reservoir supplies water. Three of the four service areas use booster pumps to pump the water from the lower level service area to the higher reservoir elevation. Typically, in each service area, the pressure ranges from 30 to 100 psi, and the elevation range within the service area is approximately 50 to 160 feet. When the elevations within the service area drop significantly thereby increasing the system pressure above 100 psi, a Pressure Reducing Valve (PRV) is installed and an additional pressure zone is created within the service area. Multiple pressure zones within one service area are common within the HWPUD water system.

TABLE 5.3.2
EXISTING DESIGN DATA – HWPUD WTP

Description	Value
Raw Water Intake	
Type	Drum Screen
Pipeline	
Diameter, inches	16
Length, feet	90
Material	HDPE
Capacity, gpm	2,800
Raw Water Pumps	
Quantity	2
Rated Capacity, gpm, each	1,000
Head at Rated Capacity, feet	120
Horsepower	40
Power	480v, 3 phase
Control	VFD
Raw Water Constant Head/Surge Control Tank	
Nominal Capacity, gallons to overflow	8,643
Diameter, feet	8
Sidewall Height, feet	24
Overflow Elevation, feet	23
Connections	
Inlet, inches	12
Outlet, inches	12
Drain, inches	8
Overflow, inches	12
Vent, inches	8
Sample, inches	(2) 1,2
Manway, inches	(1) 24,
Top Access Port, inches	(1)
Level Indication	Ultrasonic
Filtration Units	
Initial Number	3
Absorption Clarifier Area, sq. ft., each	35
Filter Area, sq. ft., each	70
Clarifier Upflow Rate, gpm/sq.ft.	10
Filter Rate, gpm/sq. ft./mgd	
Nominal	5/0.5
Maximum	6/0.6
Filter Effluent Pumps	
Quantity	3
Rated Capacity, gpm, each	
Nominal	350
Maximum	420
Head at Rated Capacity, feet	40
Horsepower	7.5
Power	480V 3 Phase

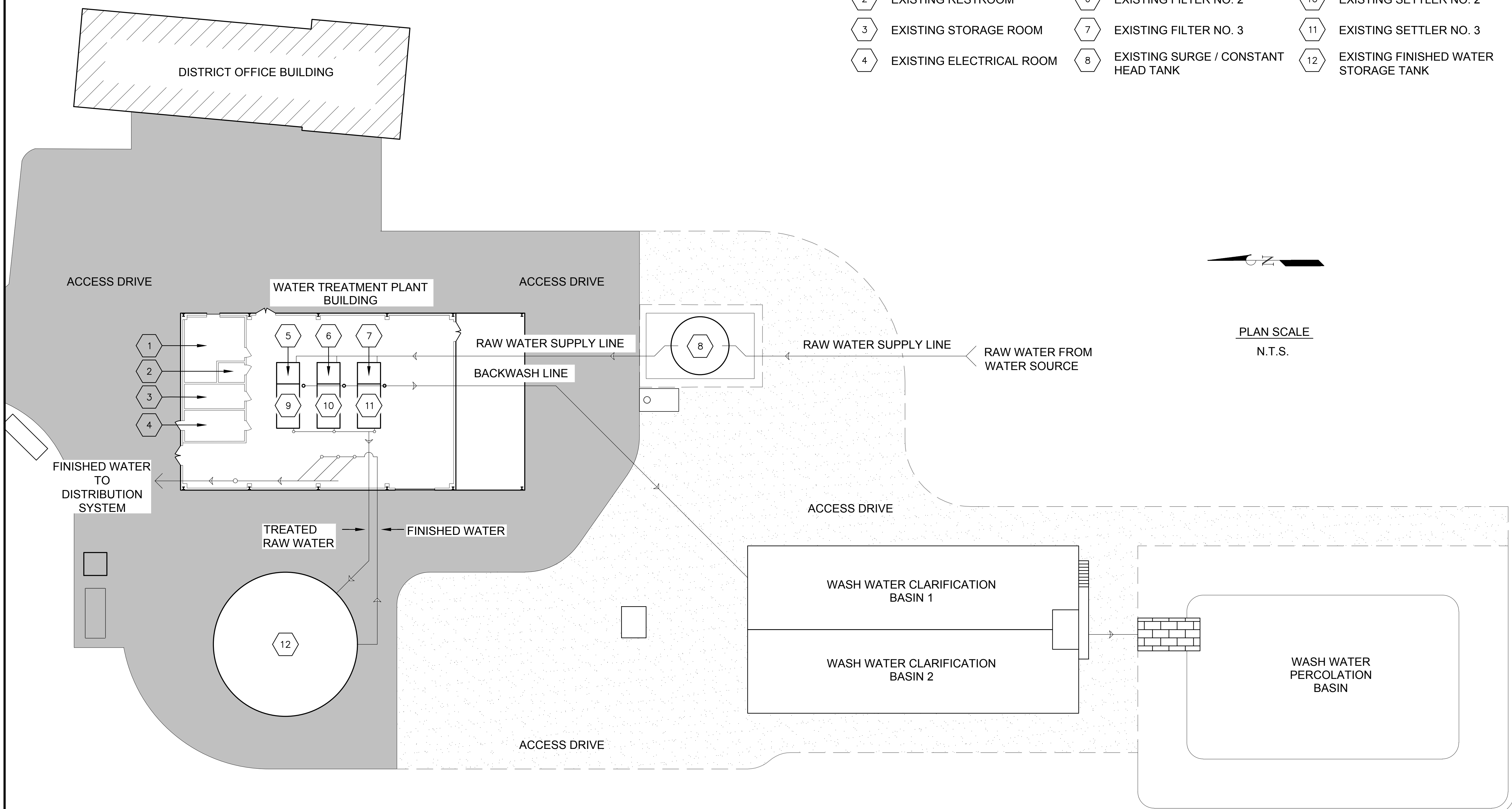
Description	Value
Backwash Pumps	
Quantity	2
Rated Capacity, gpm, nominal	1,050
Head at Rated Capacity, feet	35
Horsepower, maximum	25
Power	480V 3 Phase
Air Scour Blowers	
Quantity	2
Rated Capacity,scfm/sq.ft.	4
Horsepower	7.5
Power	480V 3 Phase
Chemical Feed Systems	
Primary Coagulant	
Chemical Type	Aluminum Sulfate
Purpose	Coagulant
Concentration, %	48
Typical Dosage Range, mg/l	10-Feb
Pump Capacity, GPH	0-1.0
Pump Type	Diaphram
Automatic Control	Flow paced to total influent flow rate
Storage	10 gallon day tank, 50 gallon drum by chemical vendor
Secondary Coagulant Polymer	
Chemical Type	Cationic polymer
Purpose	Coagulant
Concentration	Neat
Typcial Dosage Range, mg/l	1.0-3.5 (When in lieu
Pump Capacity, GPH	0-1.0
Control	Flow paced to total influent flow rate
Storage	5 gallon day tank, 50 gallon drum by chemical vendor
Filter and Polymer	
Type	Non-ionic or anionic polymer
Purpose	Secondary flocculent prior to feeding
Concentration	

TABLE 5.3.2 CONT.
EXISTING DESIGN DATA – HWPUD WTP

Description	Value	Description	Value
Typical Dosage Range, mg/L	0.1-0.5 to clarifier inlet	**Backwash Return Pumps**	
		Quantity	2 submersible pumps
Pump Capacity, GPH	0-1.0		
Control	Manual dosage set point	Rated Capacity Range, gpm	30-100
		Head at Rated Capacity, feet	50
Storage	5 gallon day tank, 50 gallon drum by chemical vendor	Horsepower	7.5
		Power	480V 3 Phase
		Chlorine Contact Tank	
		Nominal Capacity, gallons	261,450
Sodium Hypochlorite		Diameter, feet	44
Type	Sodium Hypochlorite	Sidewall Height, feet	24
		Water Depth to Overflow, feet	23
Purpose	Disinfectant	Connections	
Concentration, %	12.5	Inlet, inches	12
Typical Dosage Range, mg/L	1.0-2.0	Outlet, inches	14
Pump Capacity, GPH	0-1.0	Drain, inches	6
Control	Manual dosage set point	Overflow, inches	12
		Vent, inches	48
Storage	50 gallon drum by chemical vendor	Sample, inches	1 qty 2
		Level Indication	Target scale and ultrasonic transducer
Soda Ash			
Type	Sodium carbonate, dry	**Finished Water Pumps**	
		Quantity	3
Purpose	PH Adjustment, corrosion control	Rated Capacity, gpm, each	500
		Head at Rated Capacity, feet	120
Concentration, %	1-6 solution mix	Horespower	25
Typical Dosage Range, mg/L	5-20	Power	480V, 3 phase
Pump Capacity, GPH	0-20	Drive	Constant speed
Control	Flow paced to total high service pump flow rate	**Standby Generators**	
		Raw Water Pump Station	
		Type	Diesel
Storage	bottom style mix tank	Capacity	125 kW/156 KVA
		Fuel Storage, gallons	200
Backwash Pond		Transfer Switch	Automatic
Quantity	2	Treatment Plant	
Dimensions	1	Type	Diesel
Length, feet	100	Capacity	200 kW/250 kVA
Width, feet	24	Fuel Storage, gallons	400
Water Depth & Capacities/Basin		Transfer Switch	Automatic
Maximum, feet, gallons	8,125,900		
Minimum, feet, gallons	3,38,200		
Access Slope	4:1 ramp		

KEY NOTES:

1. EXISTING OFFICE / LAB
2. EXISTING RESTROOM
3. EXISTING STORAGE ROOM
4. EXISTING ELECTRICAL ROOM
5. EXISTING FILTER NO. 1
6. EXISTING FILTER NO. 2
7. EXISTING FILTER NO. 3
8. EXISTING SURGE / CONSTANT HEAD TANK
9. EXISTING SETTLER NO. 1
10. EXISTING SETTLER NO. 2
11. EXISTING SETTLER NO. 3
12. EXISTING FINISHED WATER STORAGE TANK



PLAN SCALE
N.T.S.

HECETA WATER PUD WATER MASTER PLAN
WATER TREATMENT PLANT EXISTING SITE PLAN

FIGURE NO. 5.3.9

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

Pressure Zones

There are ten pressure zones served by four reservoirs in the distribution system. A summary of each pressure zone with approximate elevations served, estimated static pressures, associated reservoirs, and booster pump stations is provided in Table 5.4.1. The service areas and associated pressure zones are depicted in Figure 5.4.1, and a hydraulic profile of the water system is shown in Figure 5.4.2.

TABLE 5.4.1
SUMMARY OF PRESSURE ZONES

Service Area		Service Elevation Range, ft	Static Pressure Range, psi	Associated Reservoirs	Associated Pump Stations/PRVs
A	Clear Lake	25-130	37-83	Clear Lake	Finished Water PS
B	Upper Collard Lake	235-470	10-90	Collard Lake	Collard Lake PS
C	Enchanted Valley	150-250	6-132	Enchanted Valley	Enchanted Valley PS
D	Upper Sutton Lake	87-310	41-141	Sutton Lake	Sutton Lake PS
E	Sutton Lake-North Mercer Rd.	40-158	55-106	Sutton Lake	Ben/Bunch-North Mercer PRV
F	Sutton Lake- Sutton Lake Rd.	40-227	68-92	Sutton Lake	North Sutton #2 PRV
G	Sutton Lake-Southwest	40-135	20-69	Sutton Lake	North Lane-Shore Crest-Levage Dr. PRVs
H	Southern Collard Lake Rd.	126-300	35-121	Collard Lake	Collard Lake PRV
I	Sutton Lake-Rustic Ln.	35-121	35-70	Sutton Lake	Rustic Lane PRV
J	Southern Collard Loop	144-235	40-79	Collard Lake	Collard Loop PRV

5.5 Treated Water Storage

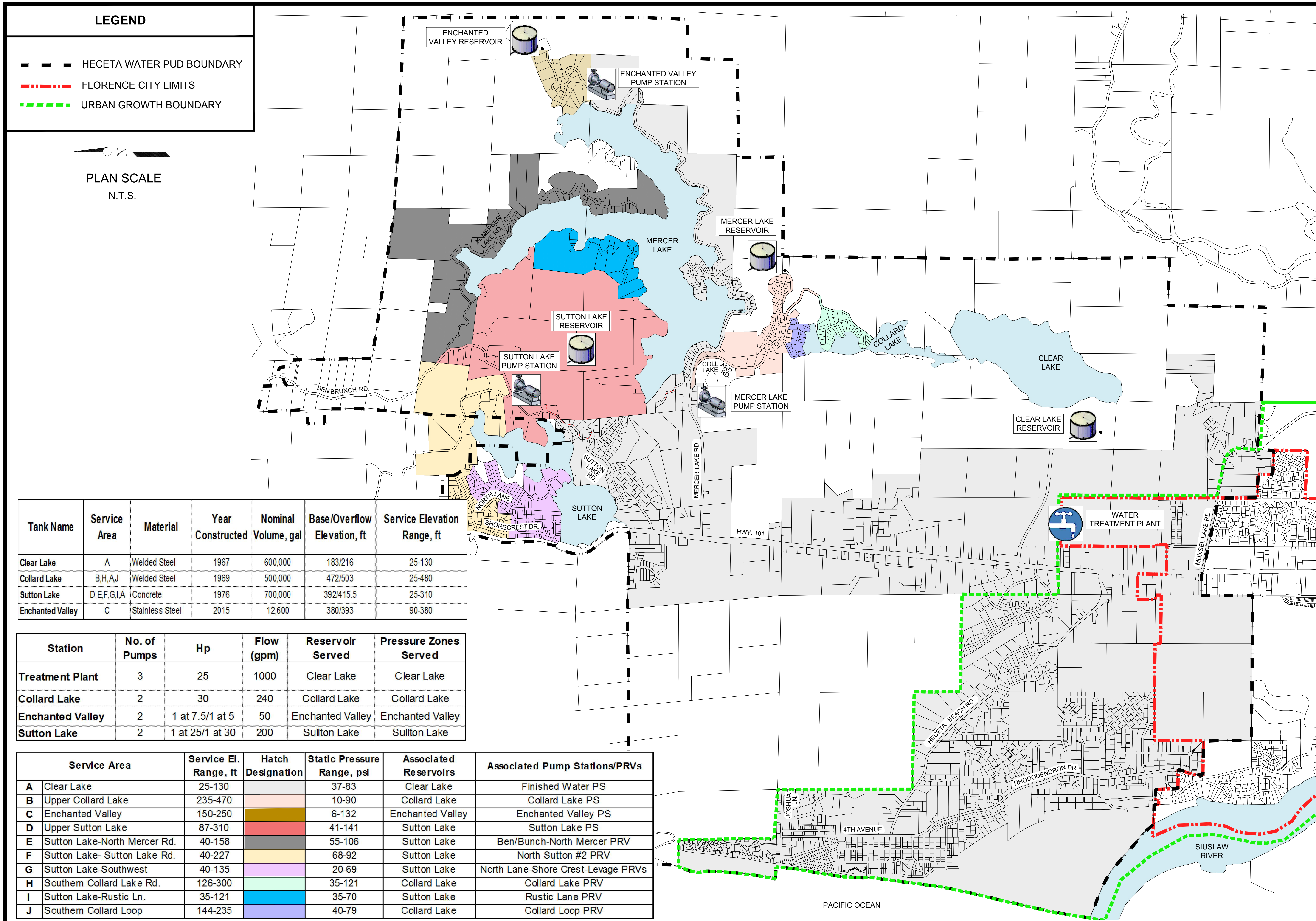
The purpose of treated water storage reservoirs or tanks is to provide:

- A sufficient amount of water to average or equalize the system's daily demand.
- Adequate pressures throughout the system.
- Sufficient storage for fire flow demand.
- Reserve storage for periods when the District is without a water supply or the WTP is offline.

The District's water system has a total of four storage reservoirs providing a nominal storage capacity of 1,830,000 gallons of storage.

Reservoirs

A brief site inspection of the District's reservoirs was made on February 2017, which primarily consisted of a review of the outside of the reservoirs and associated appurtenances. No observations were made of inside of the reservoirs or of the reservoir roofs. The following is a summary of the site observations and comments from District Staff.



Tank Name	Service Area	Material	Year Constructed	Nominal Volume, gal	Base/Overflow Elevation, ft	Service Elevation Range, ft
Clear Lake	A	Welded Steel	1967	600,000	183/216	25-130
Collard Lake	B,H,A,J	Welded Steel	1969	500,000	472/503	25-480
Sutton Lake	D,E,F,G,I,A	Concrete	1976	700,000	392/415.5	25-310
Enchanted Valley	C	Stainless Steel	2015	12,600	380/393	90-380

Station	No. of Pumps	Hp	Flow (gpm)	Reservoir Served	Pressure Zones Served
Treatment Plant	3	25	1000	Clear Lake	Clear Lake
Collard Lake	2	30	240	Collard Lake	Collard Lake
Enchanted Valley	2	1 at 7.5/1 at 5	50	Enchanted Valley	Enchanted Valley
Sutton Lake	2	1 at 25/1 at 30	200	Sullton Lake	Sullton Lake

	Service Area	Service El. Range, ft	Hatch Designation	Static Pressure Range, psi	Associated Reservoirs	Associated Pump Stations/PRVs
A	Clear Lake	25-130		37-83	Clear Lake	Finished Water PS
B	Upper Collard Lake	235-470		10-90	Collard Lake	Collard Lake PS
C	Enchanted Valley	150-250		6-132	Enchanted Valley	Enchanted Valley PS
D	Upper Sutton Lake	87-310		41-141	Sutton Lake	Sutton Lake PS
E	Sutton Lake-North Mercer Rd.	40-158		55-106	Sutton Lake	Ben/Bunch-North Mercer PRV
F	Sutton Lake- Sutton Lake Rd.	40-227		68-92	Sutton Lake	North Sutton #2 PRV
G	Sutton Lake-Southwest	40-135		20-69	Sutton Lake	North Lane-Shore Crest-Levage PRVs
H	Southern Collard Lake Rd.	126-300		35-121	Collard Lake	Collard Lake PRV
I	Sutton Lake-Rustic Ln.	35-121		35-70	Sutton Lake	Rustic Lane PRV
J	Southern Collard Loop	144-235		40-79	Collard Lake	Collard Loop PRV

FIGURE NO. 5.4.1

HECETA WATER PUD WATER MASTER PLAN
PRESSURE ZONE, SERVICE AREA, AND SYSTEM INFORMATION MAP

THE DYER PARTNERSHIP ENGINEERS & PLANNERS
DATE: JULY, 2019
PROJECT NO.: 188.05

\\dyer2\h\dyer-part\AAprojects\188 Heceta Water District\188.05 Water Master Plan\AutoCAD Maps\Fireflow-Fire Hydrant-Wetland-FIRM-Hazard Maps.dwg, 8/8/2019 4:57:27 PM PLOT DATE August 9, 2019

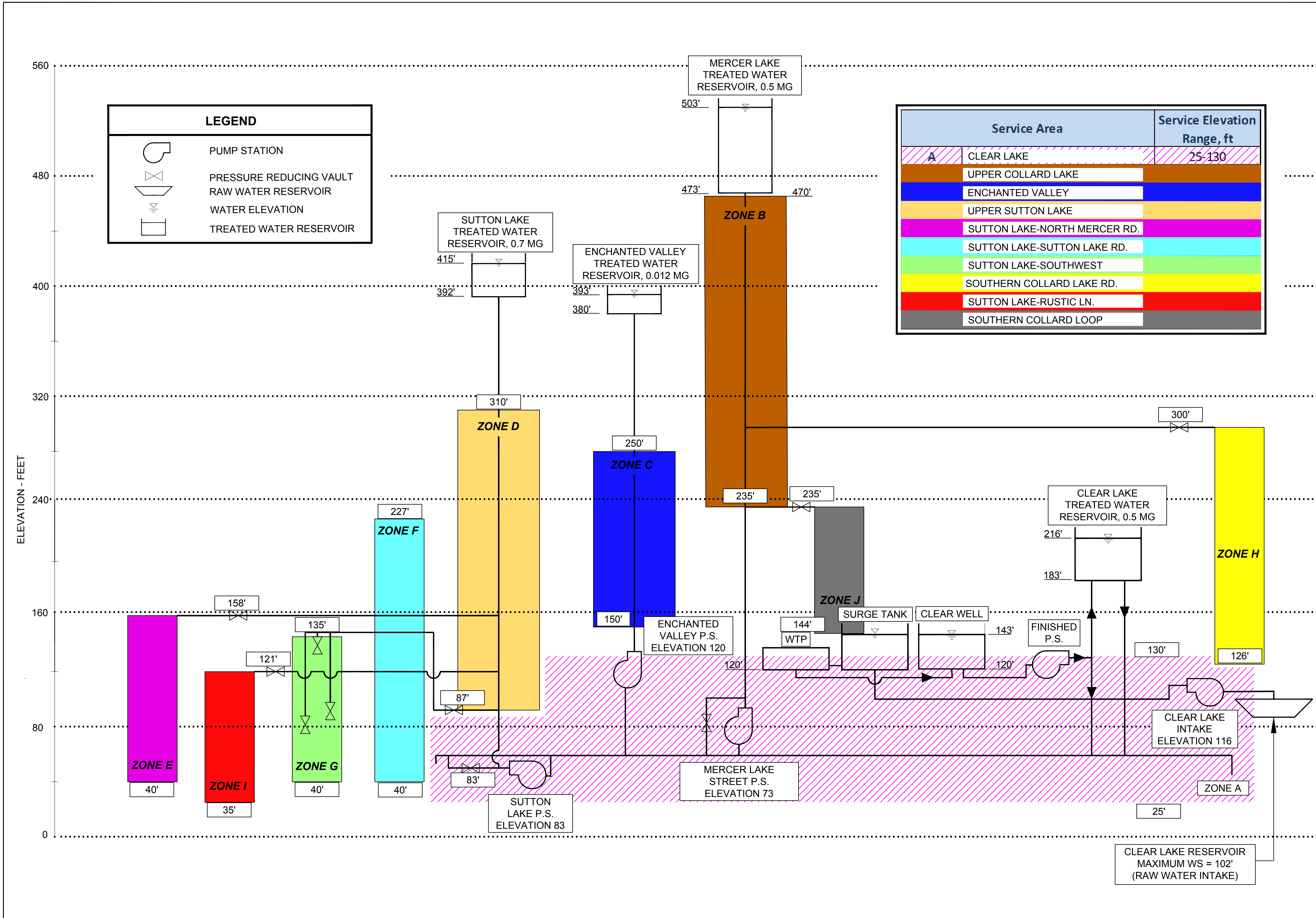


FIGURE NO. 5.4.2

HECETA WATER PUD WATER MASTER PLAN

WATER MASTER PLAN

EXISTING WATER DISTRIBUTION HYDRAULIC PROFILE

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

Clear Lake Reservoir
The Clear Lake Reservoir receives treated water directly from the WTP plant. The welded steel reservoir was constructed in 1967, has a base and overflow elevation of 183 and 216 feet respectively, and provides a total of 600,000 gallons of storage to the District's largest service area. Elevations within this service area range from approximately 25 feet to 130 feet. The reservoir serves Pressure Zone A.

The water level within Clear Lake Reservoir is utilized to control the operation of the finished water pumps at the WTP. The reservoir's overall condition is fair. There is no cathodic protection, or seismic valving at this reservoir. The exterior of the reservoir was recoated in 2014 and is in good condition. Interior coating failures and corrosion were noted in the last inspection report.

FIGURE 5.5.1
CLEAR LAKE RESERVOIR

Sutton Lake Reservoir
This 700,000 gallon reservoir receives water from the Sutton Lake Pump Station, has base and overflow elevations of 392 and 415.5 feet respectively, was originally constructed in 1976, and is a pre-stressed precast concrete construction. The service elevations range from approximately 25 to 310 feet. This reservoir currently serves Pressure Zones A, D, E, F, G, and I. The condition of the reservoir is fair. There are small cracks in the exterior of the reservoir, but that is typical given its age. There is no cathodic protection or seismic features installed at this reservoir.

FIGURE 5.5.2
SUTTON LAKE RESERVOIR

Enchanted Valley Reservoir
This 12,600 gallon reservoir receives treated water from the Enchanted Valley Pump Station, has base and overflow elevations of 380 and 393 feet respectively, was constructed in 2015, and is a welded stainless steel construction. This reservoir replaced the original wood stave reservoir constructed in 1973. The service elevations range from approximately 150 to 280 feet. Enchanted Valley Pump Station fills this reservoir tank based on pressure at the pump station. The condition of the reservoir is excellent condition. There is no cathodic protection or seismic features installed at this reservoir. The reservoir serves Pressure Zone C.

FIGURE 5.5.3
ENCHANTED VALLEY RESERVOIR

Mercer Lake Reservoir
This 500,000 gallon reservoir receives treated water from the Mercer Lake Pump Station, has base and overflow elevation of 472 and 503 feet respectively was constructed in 1969, and is welded steel construction. The service elevations range from approximately 25 to 390 feet. The Mercer Lake Pump Station maintains the water levels within this reservoir. This reservoir currently serves Pressure Zones A, B, H, and J. The outside of the reservoir was recoated in 2014 and is in good condition. Interior is in fair condition per the last reservoir

FIGURE 5.5.4
MERCER LAKE RESERVOIR

inspection. The reservoir has a single inlet/outlet which does not promote mixing within the reservoir. There is no cathodic protection or seismic features on this reservoir. Interior coating failures and corrosion were noted in the last inspection report.

Summary

The reservoirs in the system range in age from three to fifty-one years old. The older reservoirs will require more frequent monitoring and maintenance. Given their age, the older reservoirs appear to be in fair to good condition. None of the reservoirs are outfitted with cathodic protection or seismic features. A summary of relevant reservoir data is provided in Table 5.5.1.

TABLE 5.5.1
TREATED WATER RESERVOIRS

Reservoir Name	Service Area	Material	Year Constructed	Nominal Volume, gal	Base/Overflow Elevation, ft	Service Elevation Range, ft
Clear Lake	A	Welded Steel	1967	600,000	183/216	25-130
Collard Lake	B,H,A,J	Welded Steel	1969	500,000	472/503	25-480
Sutton Lake	D,E,F,G,I,A	Concrete	1976	700,000	392/415.5	25-320
Enchanted Valley	C	Stainless Steel	2015	12,600	380/393	85-380

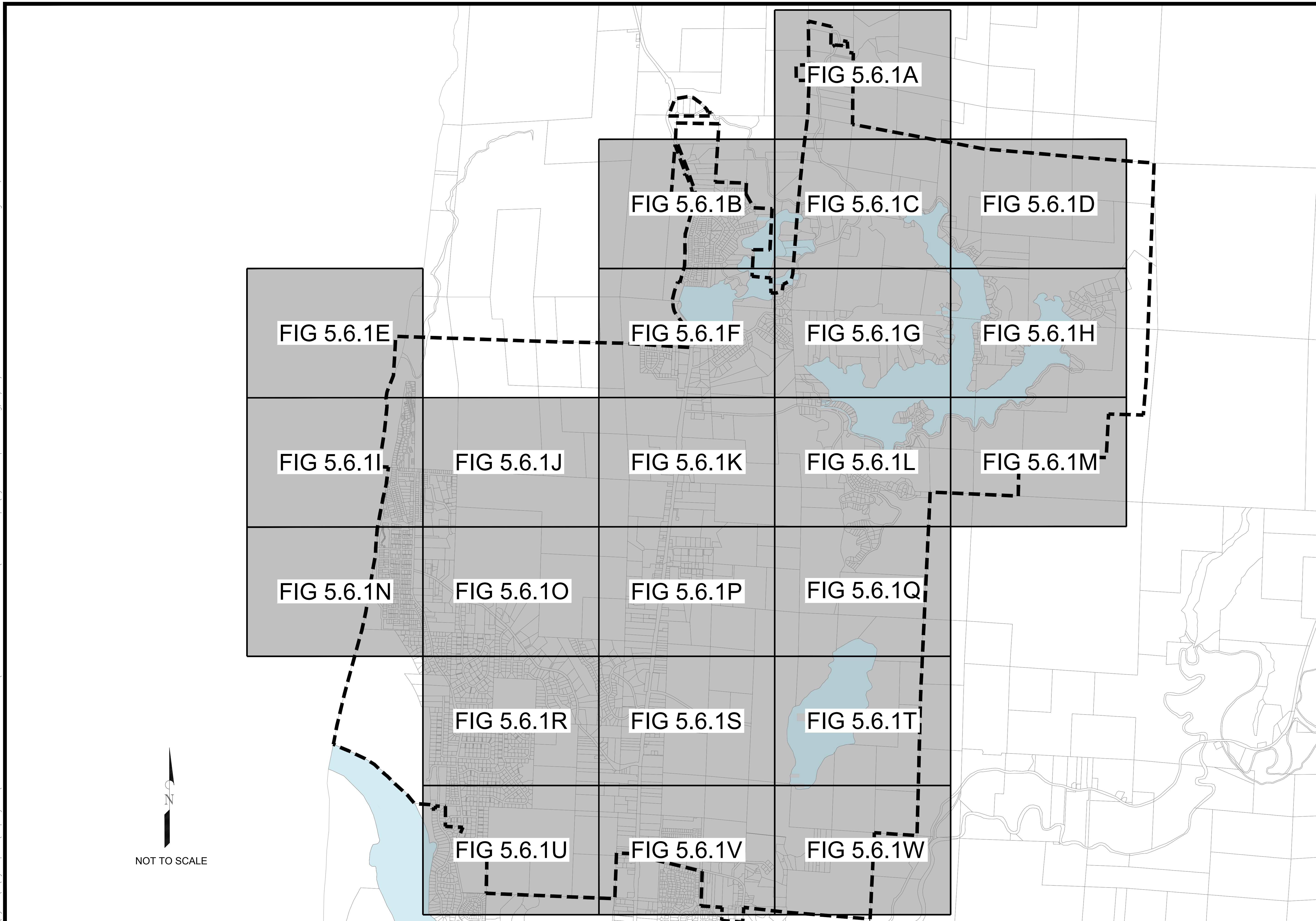
5.6 Water Distribution System

The main water distribution pipe within the District's water system range from two to twelve inches in diameter. The treated water transmission main from the WTP to the Clear Lake Reservoir is twelve inches in diameter. The pipe sizes in the Heceta Beach area range from four to ten inches in diameter. The pipe sizes around Mercer Lake are primarily six inches on the south side, and range from eight to ten inches in diameter on the north side. The pipe sizes around Sutton Lake range from four inches to ten inches in diameter. The pipe sizes north of Collard Lake range from four to six inches in diameter. An overview of the District's water distribution system is presented in Figures 5.6.1 to 5.6.1W. A summary of the distribution system pipe sizes (not including service lines) is given in Table 5.6.1.

In addition to variation of diameter, the water distribution system is also composed of a variety of pipeline materials. The material that was used to construct water lines over the years depended primarily on the accepted and available materials of the time. In the 1940s and 1950s, cast iron, steel, and galvanized piping were commonly used. In the 1970s, Asbestos Cement (AC) piping was utilized for water main construction in the 1970s. Today ductile iron, PVC and polyethylene (HDPE) pipe materials are used almost exclusively in the construction of new water lines. The District's piping consists primarily of AC and PVC pipe for mainline pipes, and galvanized steel and polyethylene pipe for service lines. Current materials of choice for replacement are PVC pipe for mainline pipes and HDPE pipe for service lines.

The existing condition of the distribution system depends greatly on the materials that were used to construct the system as well as the level of workmanship at the time of construction. Although a historical log of distribution system repairs has not been maintained, the District Staff has designated the areas that experience frequent leaks, and noted the known locations of AC pipe. Given the characteristics and age of most AC pipe, it should be assumed that this pipe has reached the end of its useful life.

Computer modeling was conducted to analyze the performance of the existing HWPUD water system. Hydraulic analysis software called WaterCad® by Haestad Methods was used to perform the complex calculations necessary to analyze the water system.



HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

FIGURE NO. **5.6.1**

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

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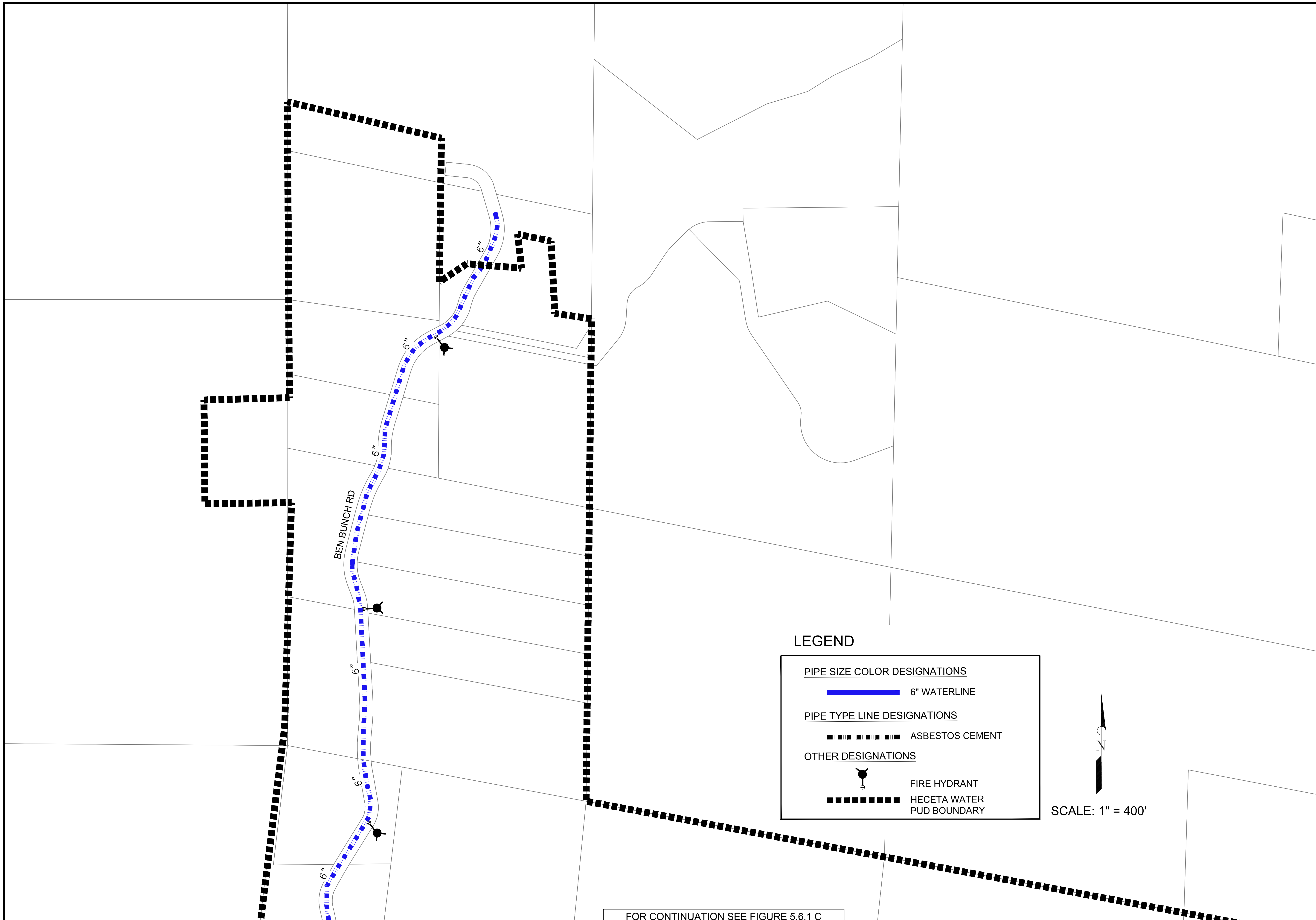


FIGURE NO.
5.6.1A

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

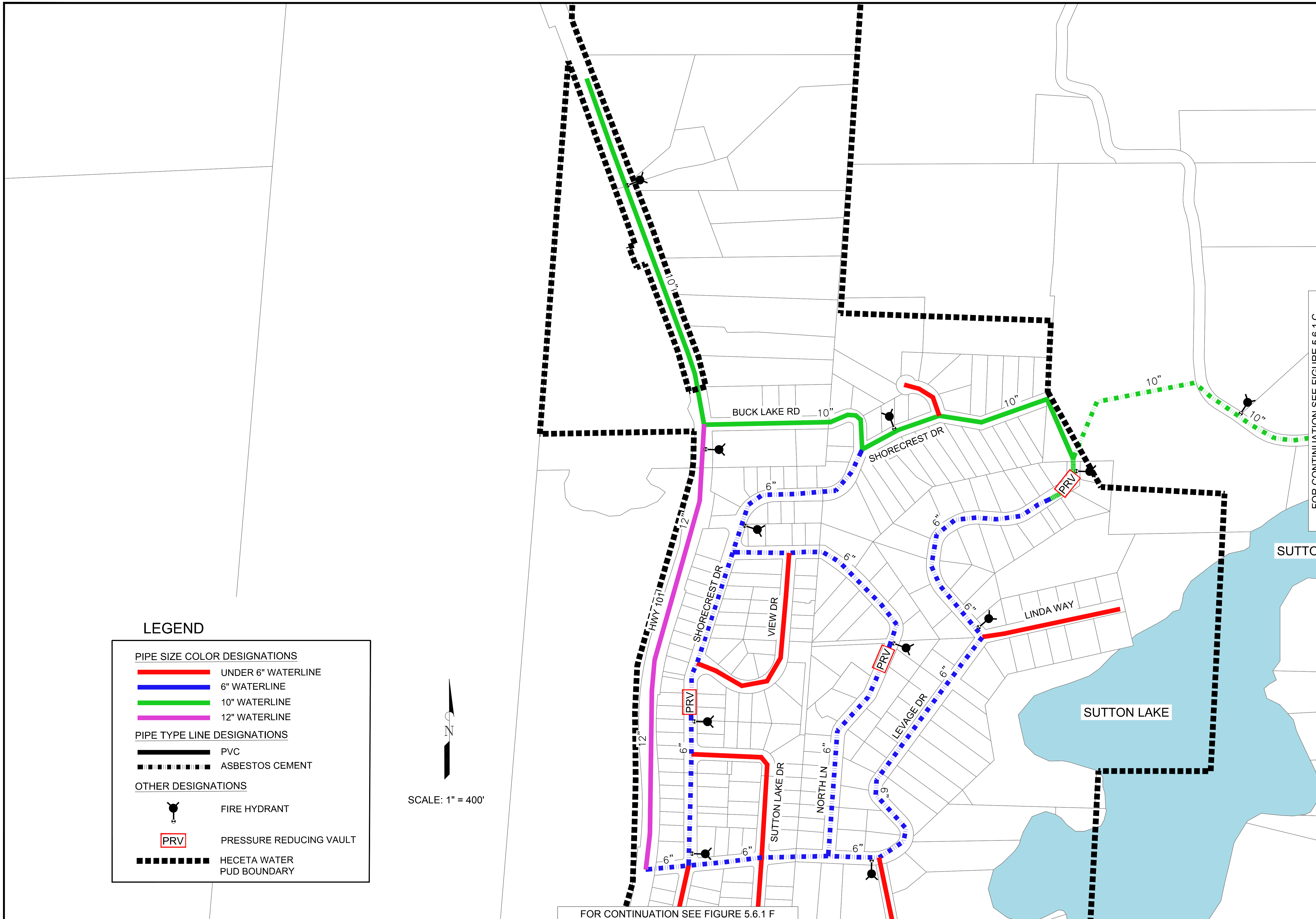


FIGURE NO.
5.6.1B

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

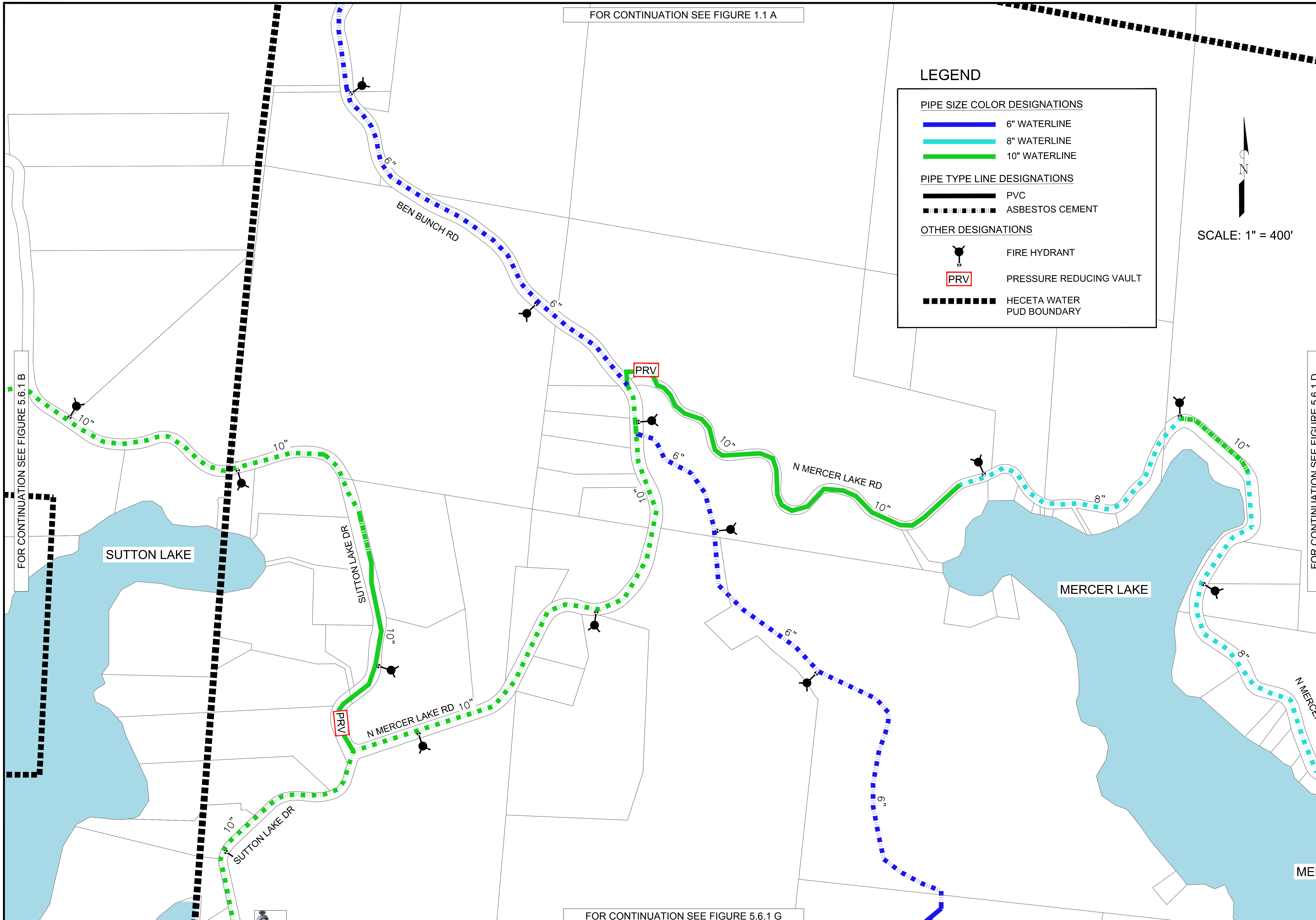


FIGURE NO. 5.6.1C

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

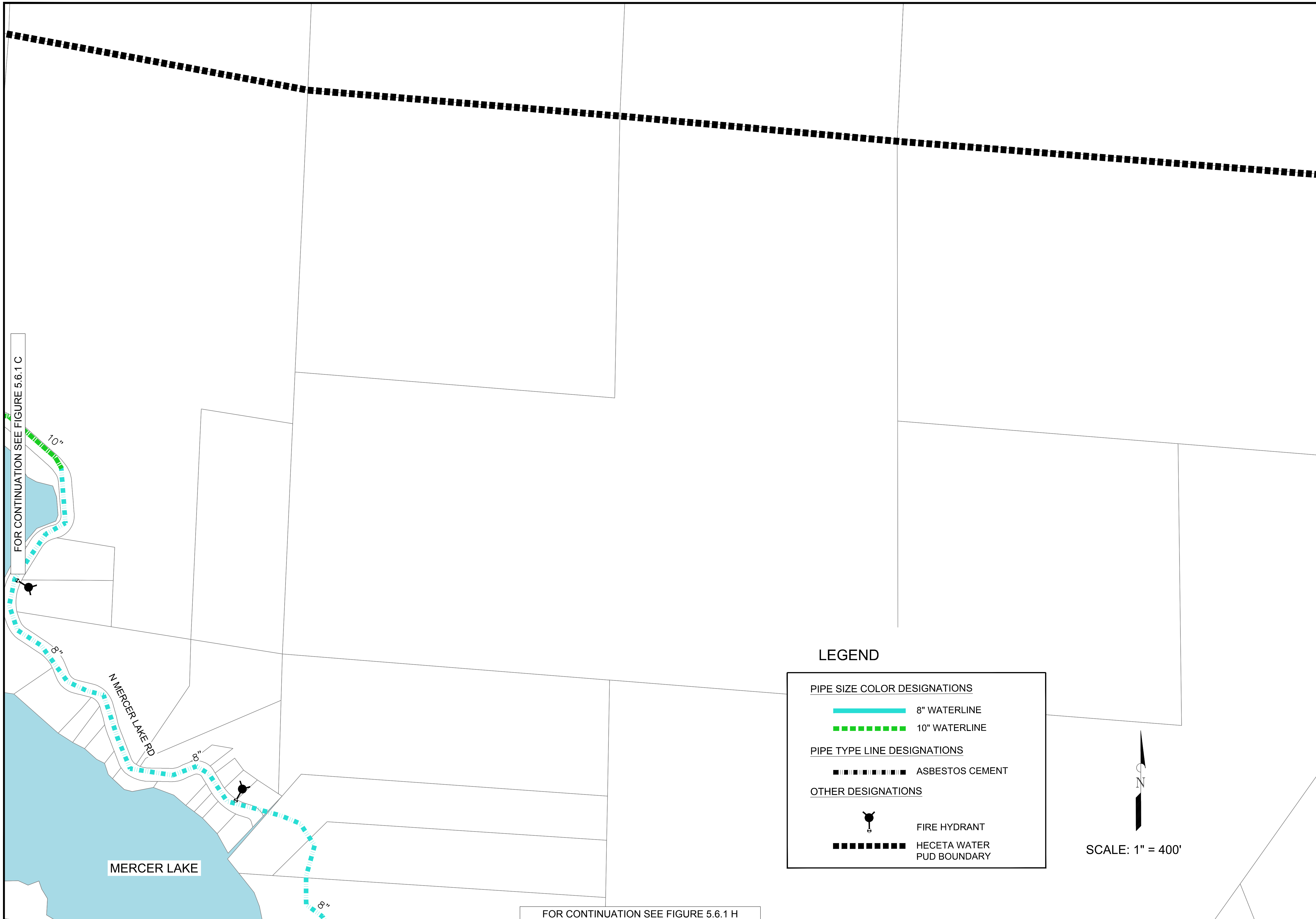


FIGURE NO. 5.6.1D

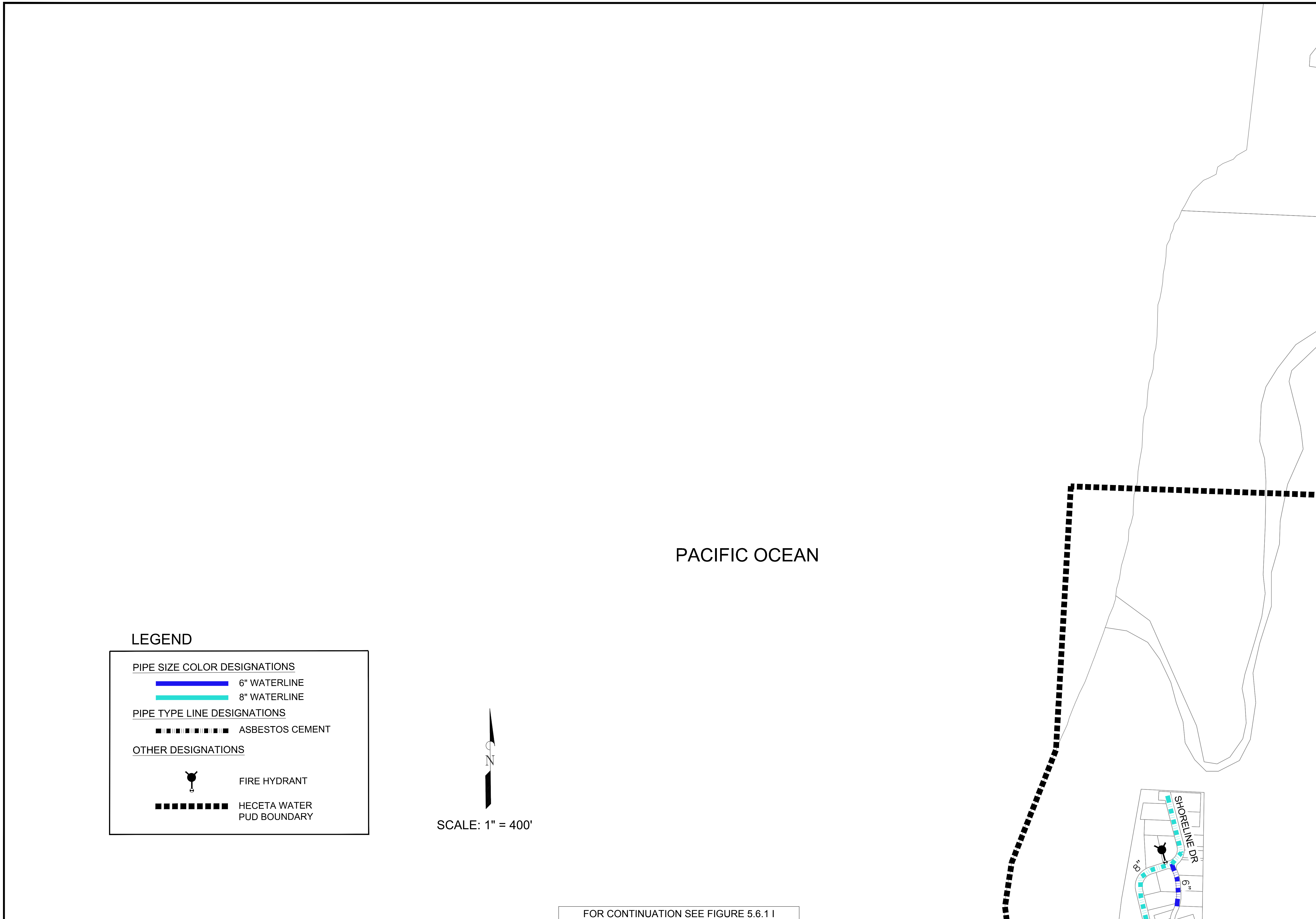
HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05



FOR CONTINUATION SEE FIGURE 5.6.1 I

FIGURE NO. **5.6.1E**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

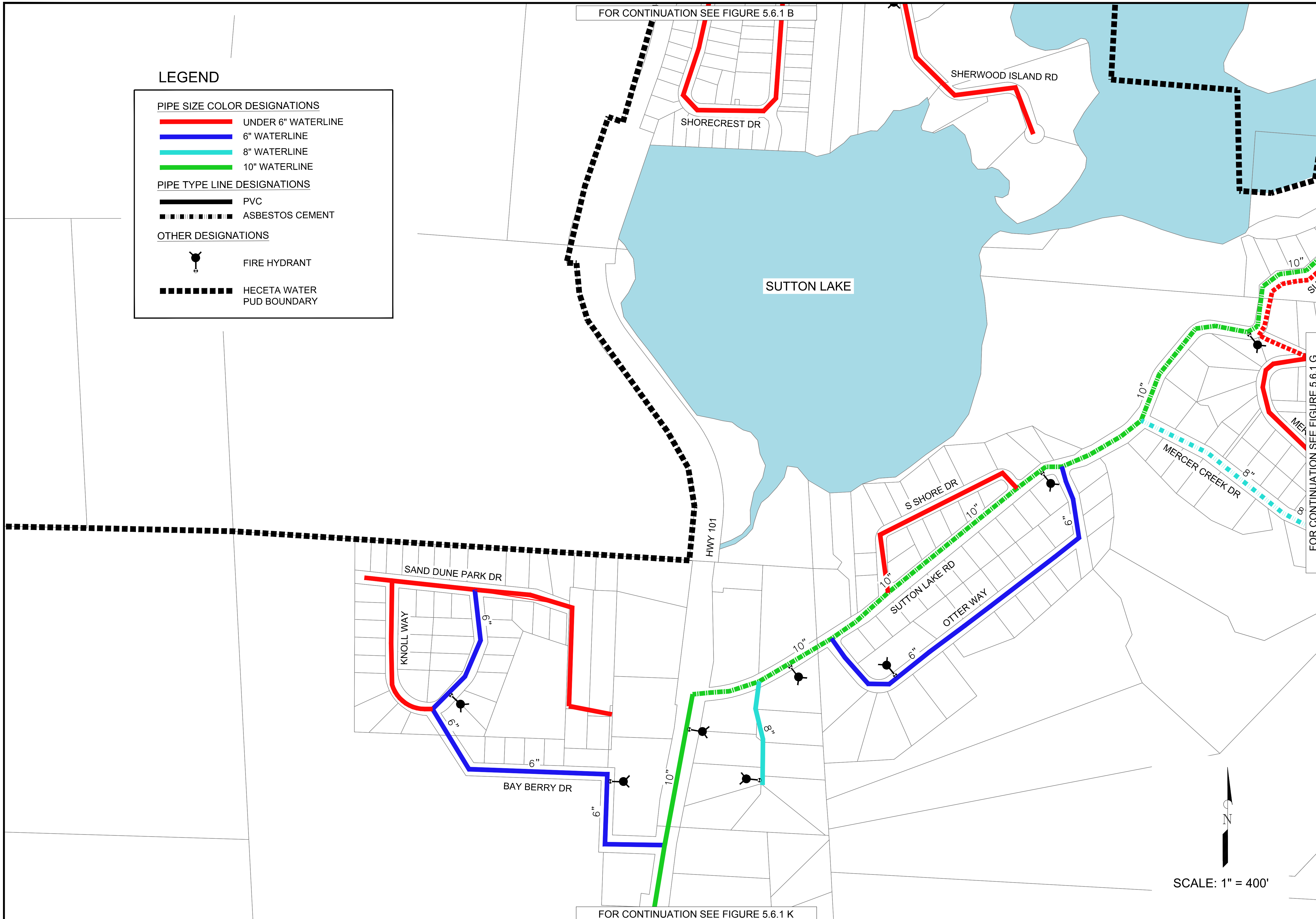


FIGURE NO. **5.6.1F**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

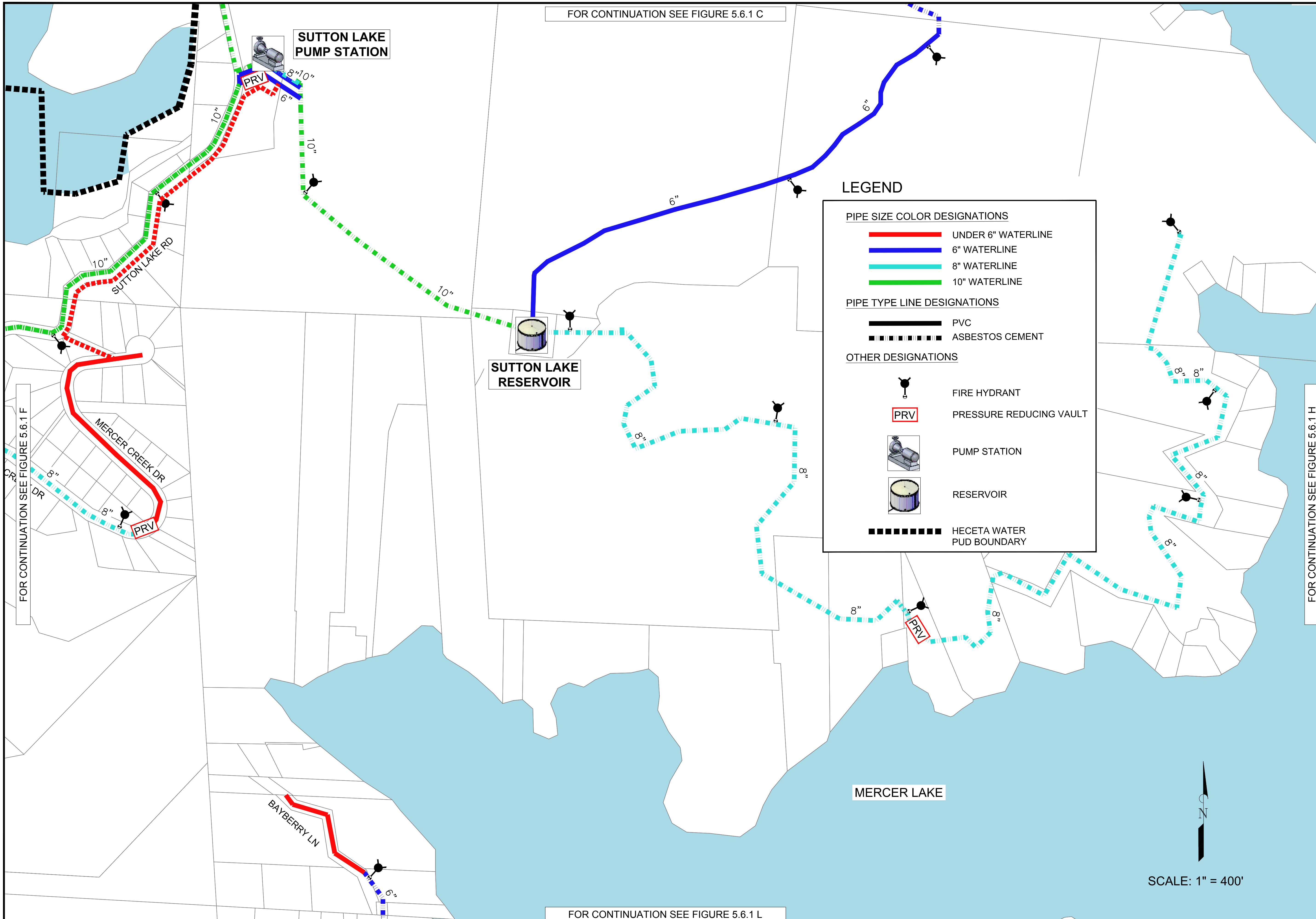


FIGURE NO. **5.6.1G**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

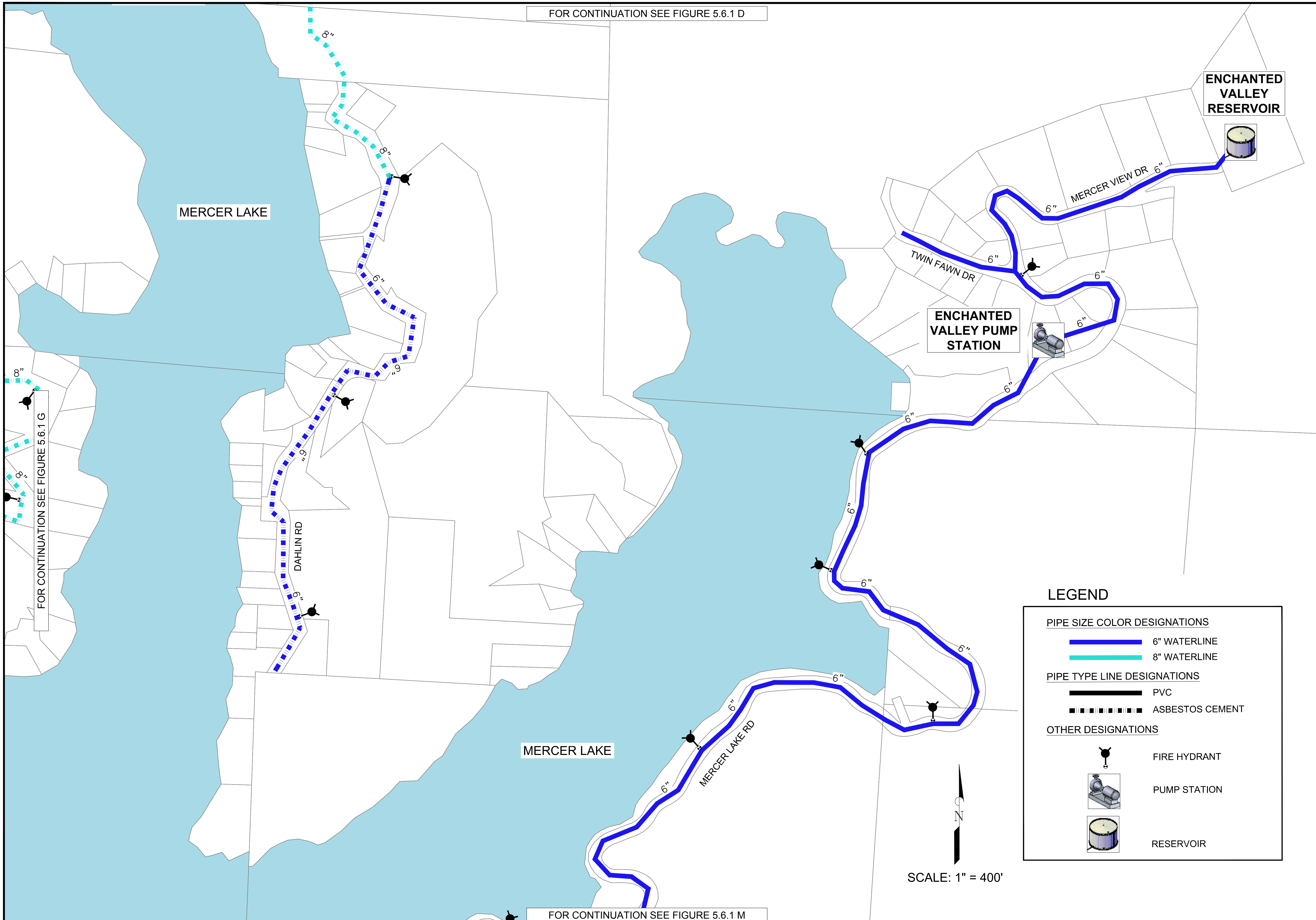


FIGURE NO. **5.6.1H**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

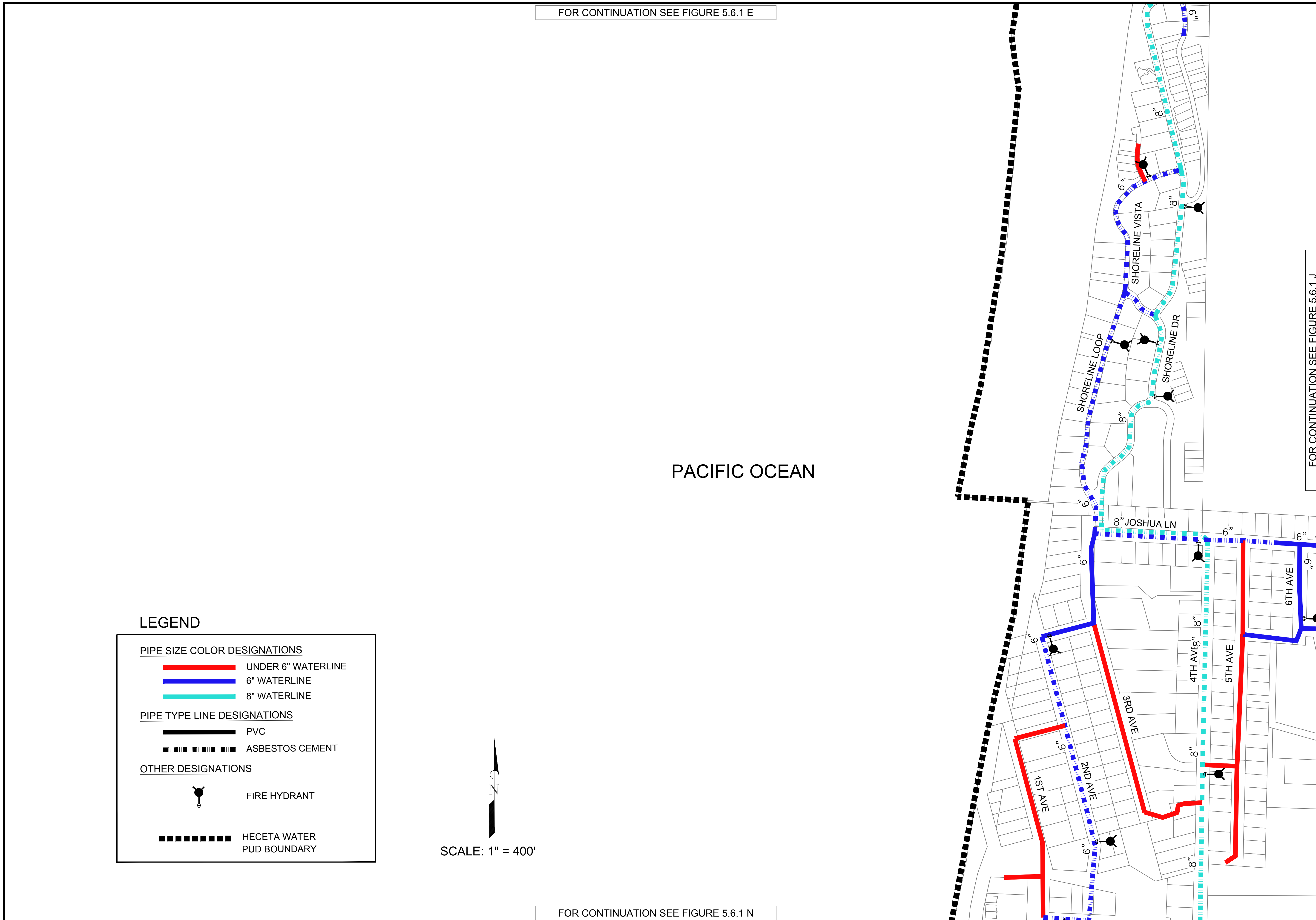


FIGURE NO. **5.6.1I**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

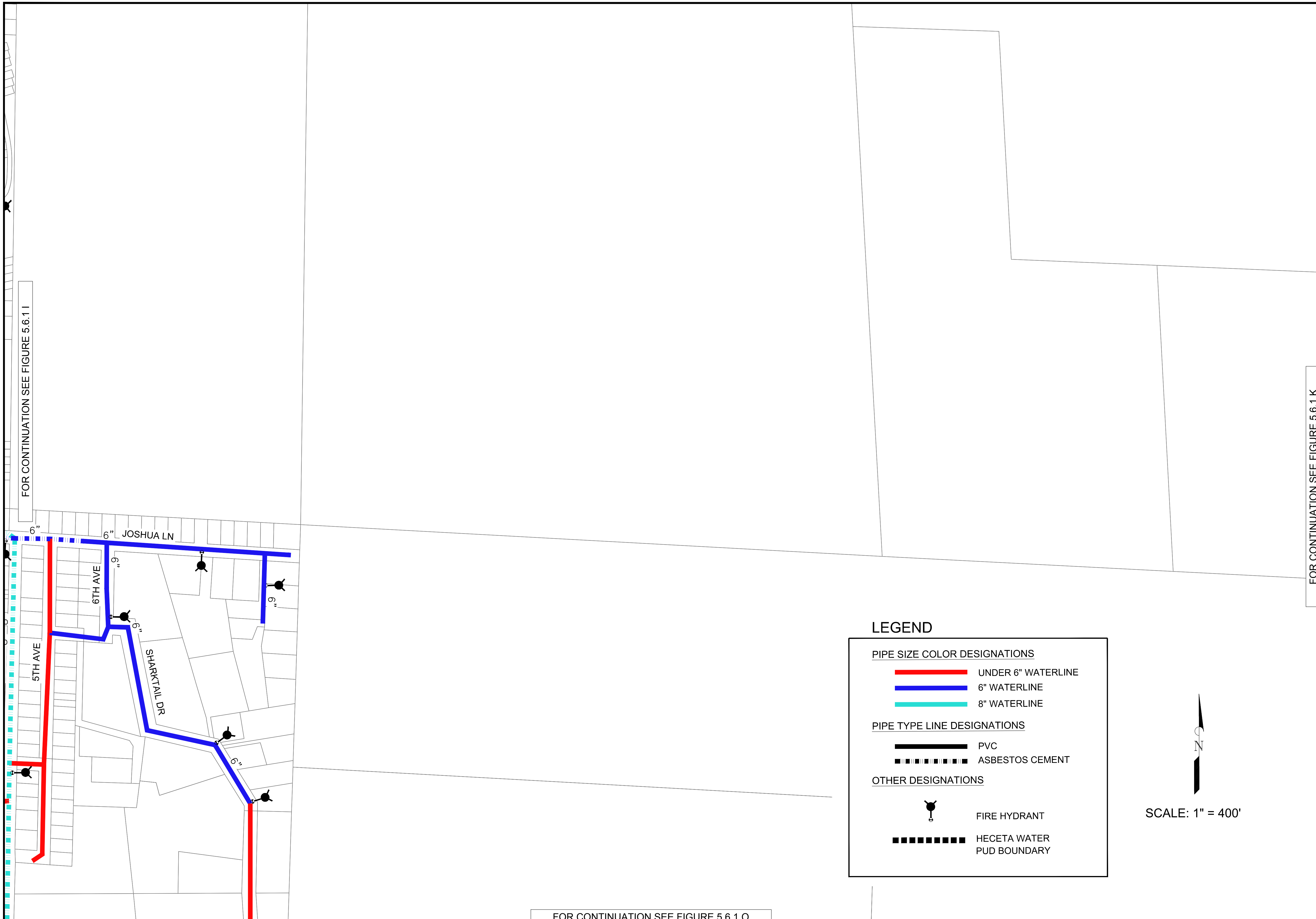


FIGURE NO. **5.6.1J**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

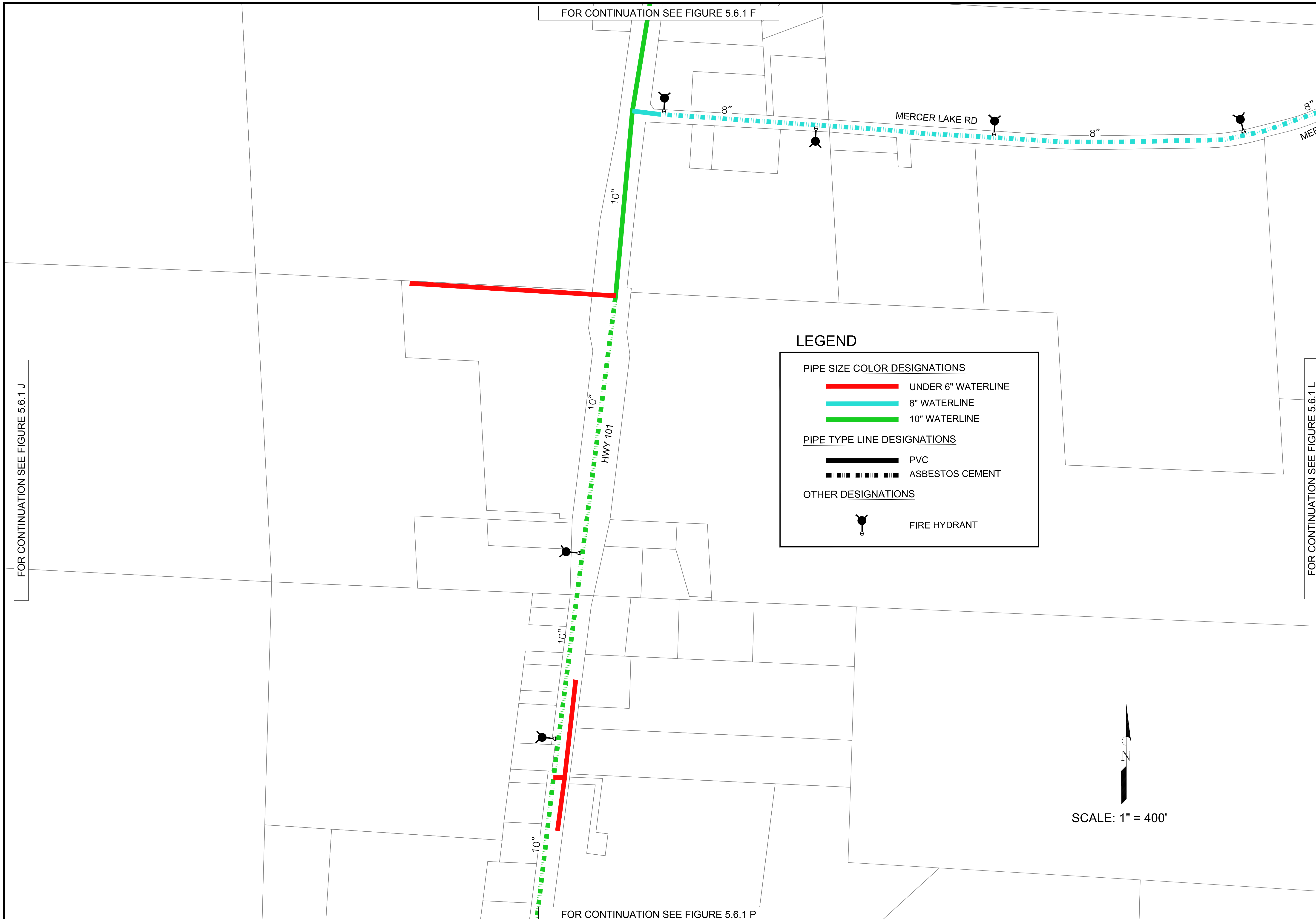


FIGURE NO. **5.6.1K**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

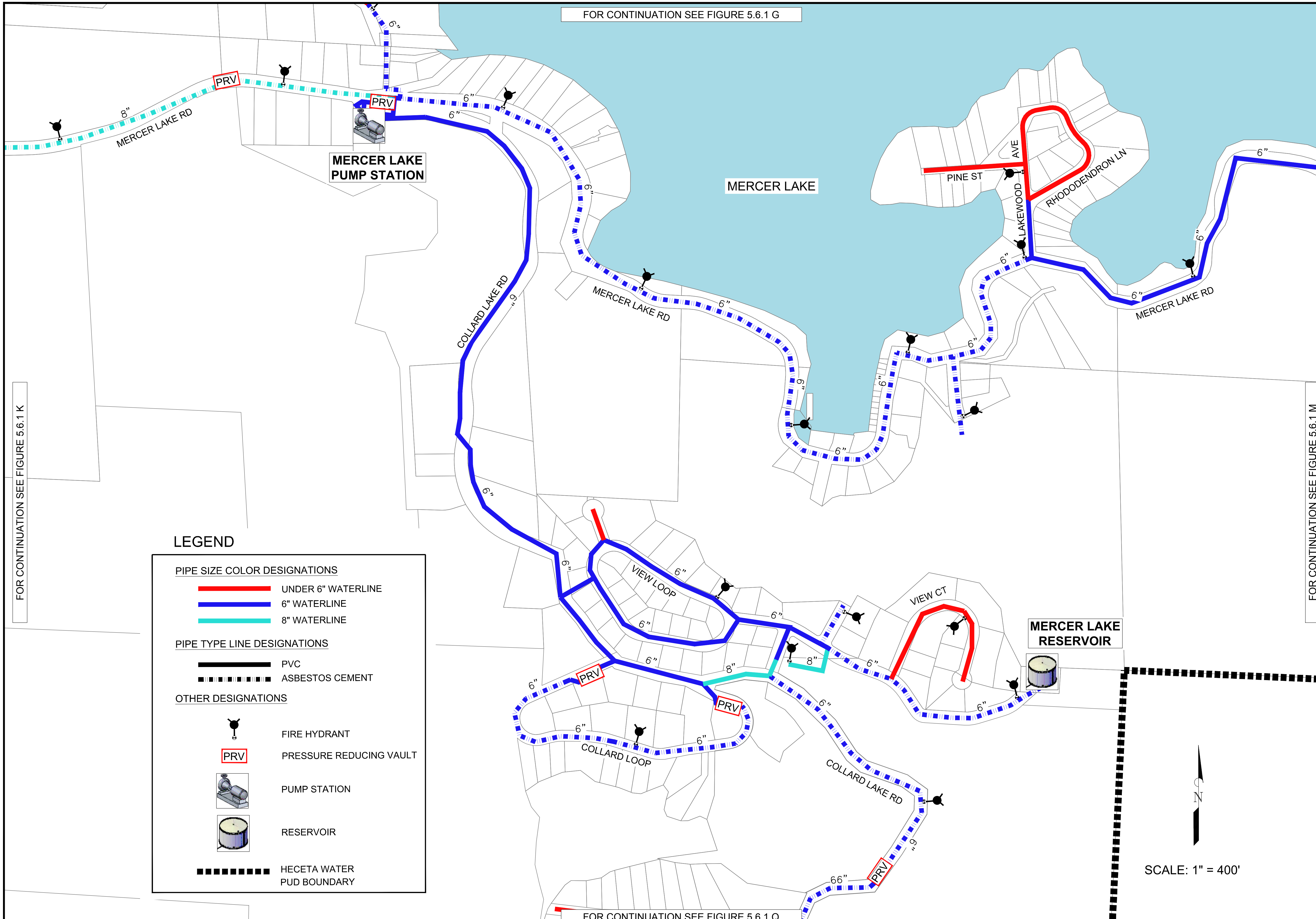


FIGURE NO. **5.6.1L**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

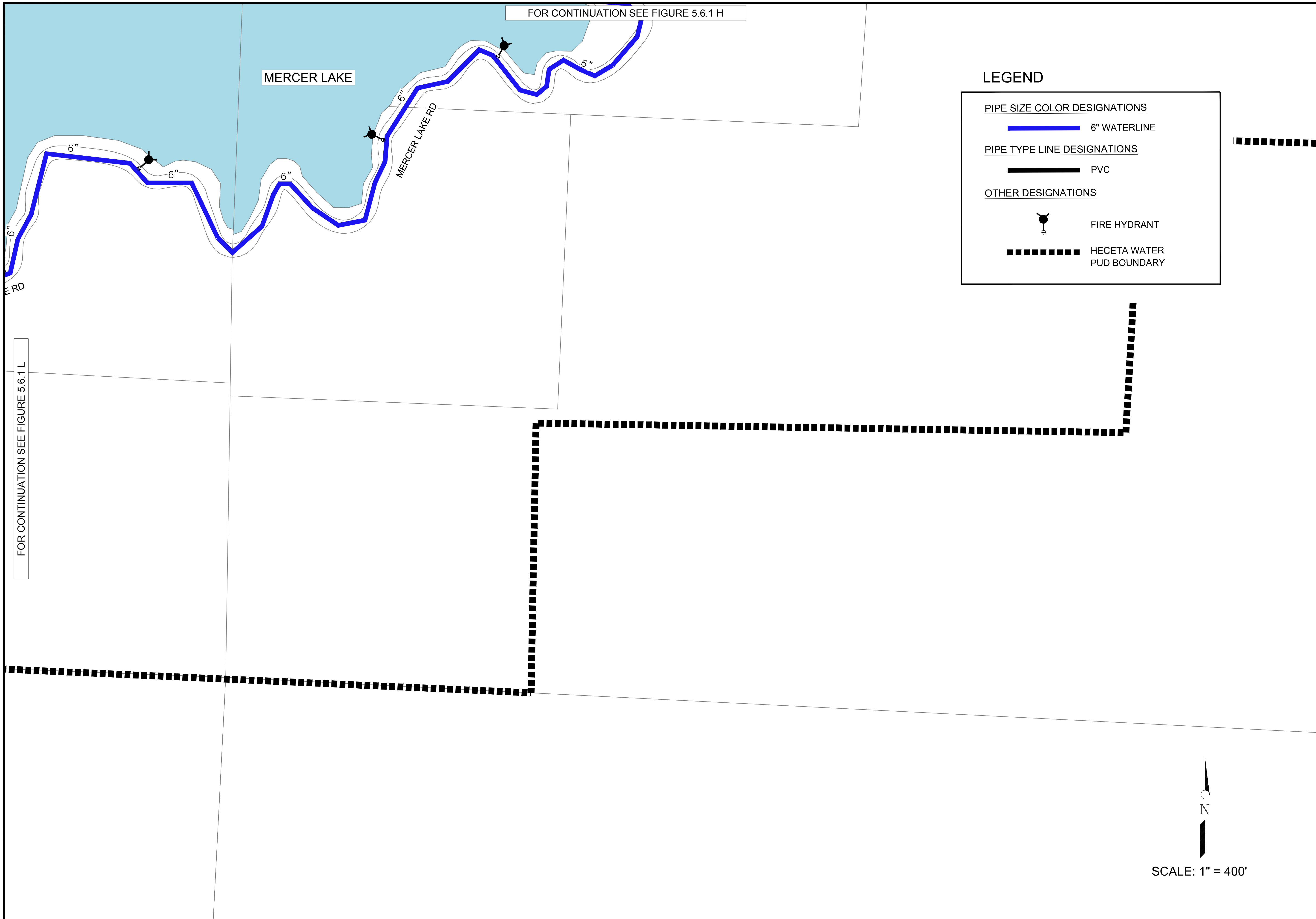


FIGURE NO. **5.6.1M**

HECETA WATER PUD WATER MASTER PLAN

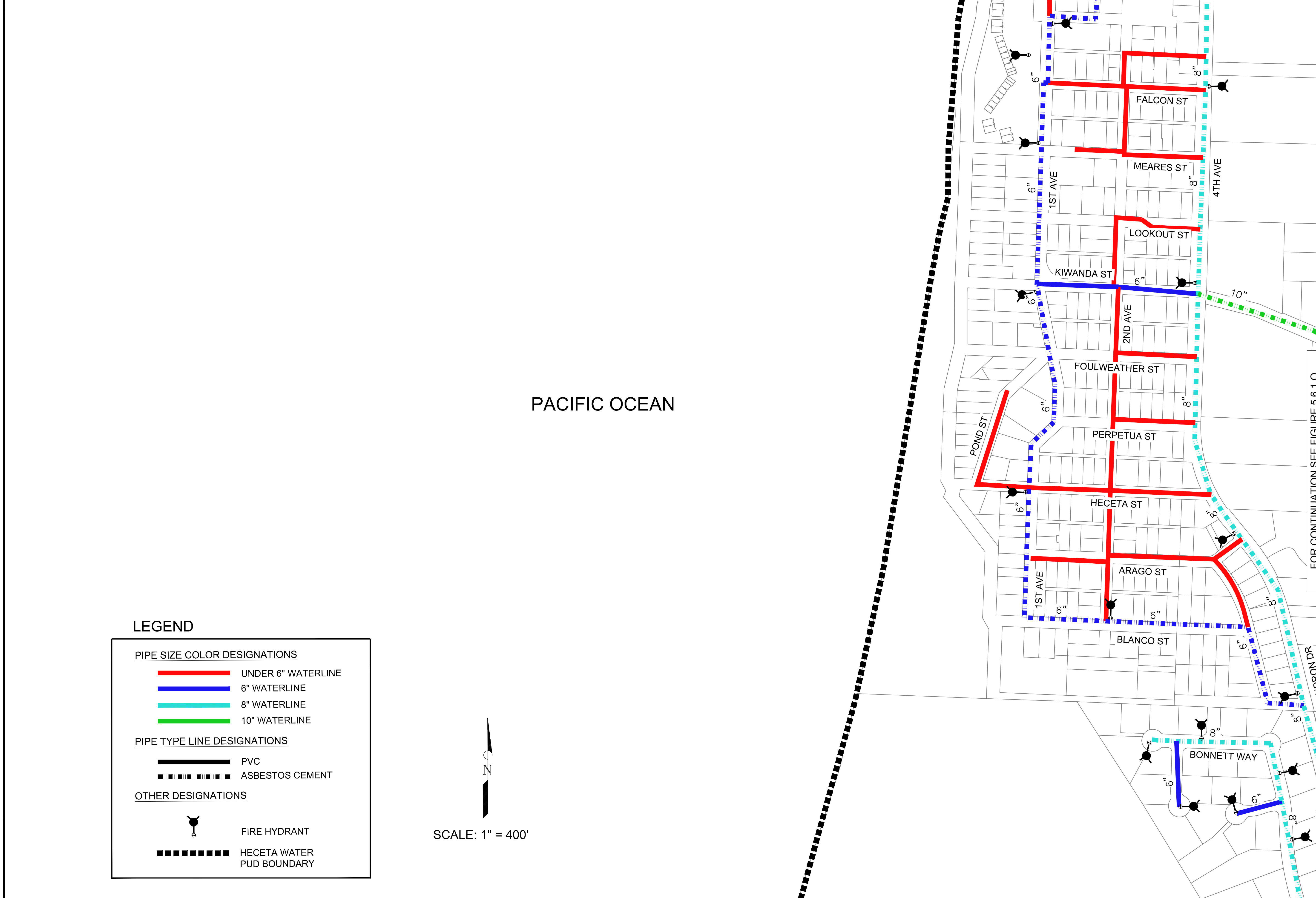
EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

FOR CONTINUATION SEE FIGURE 5.6.1 I



FOR CONTINUATION SEE FIGURE 5.6.1 O

FIGURE NO. **5.6.1N**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

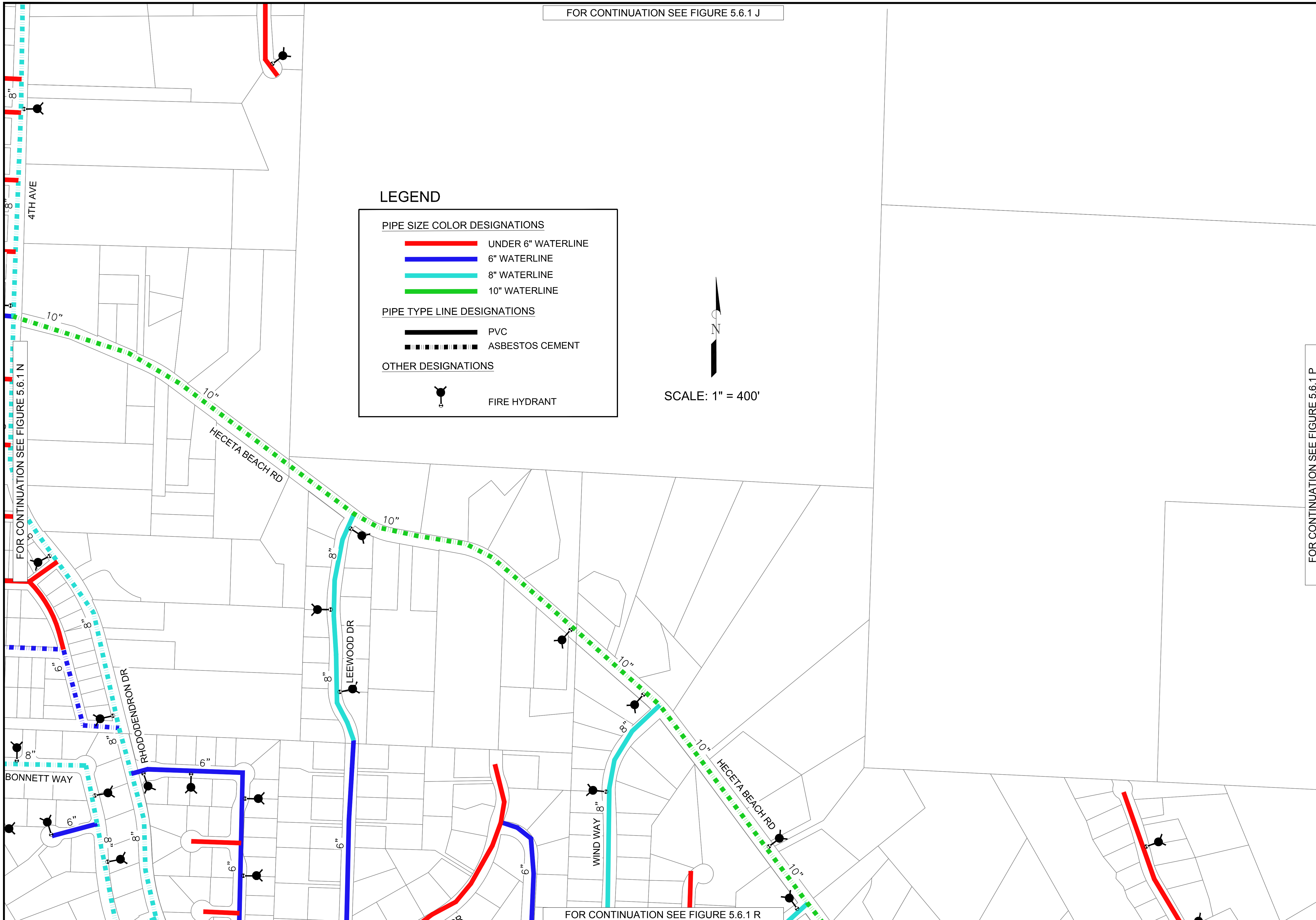


FIGURE NO. **5.6.1O**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

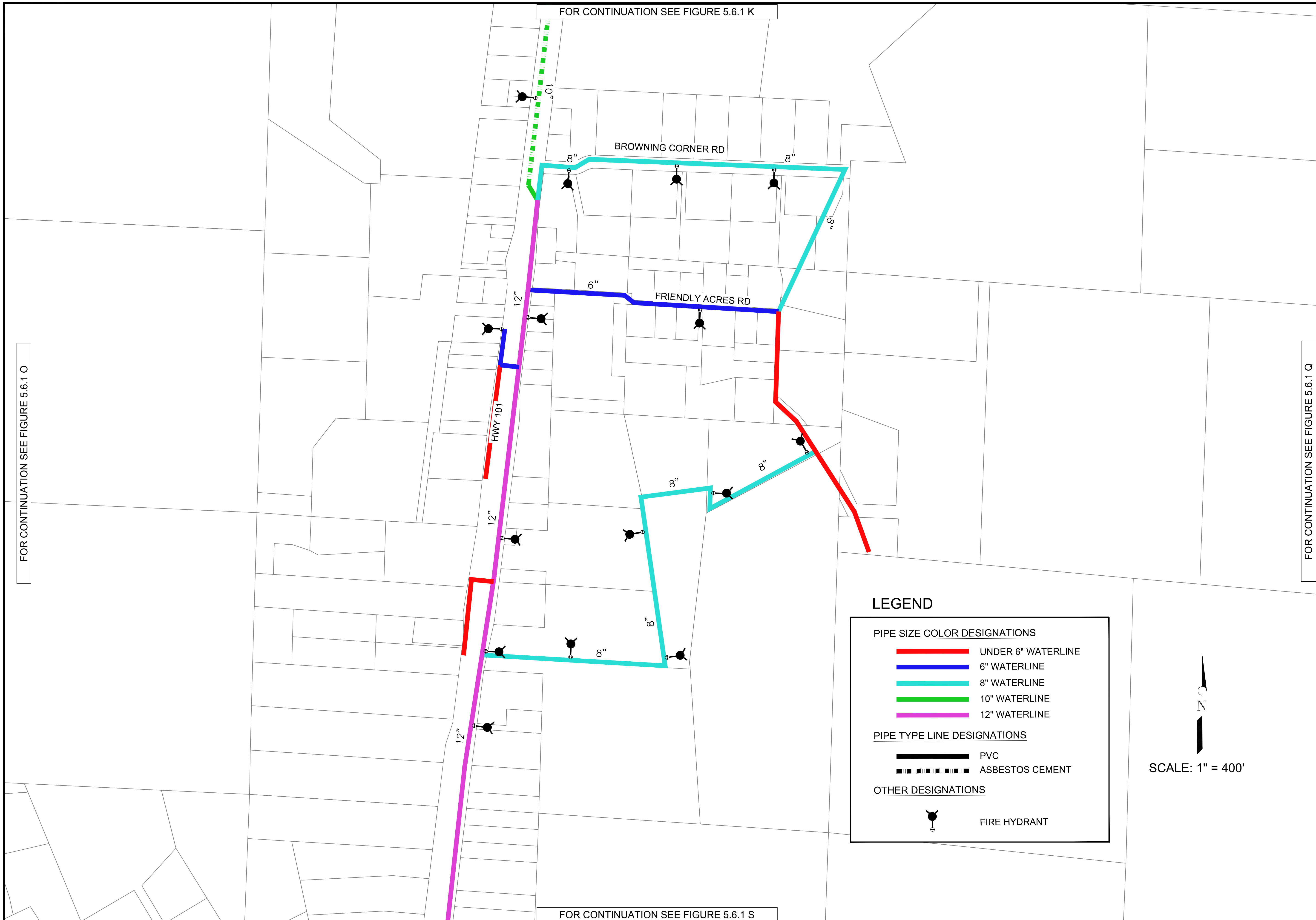


FIGURE NO. **5.6.1P**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

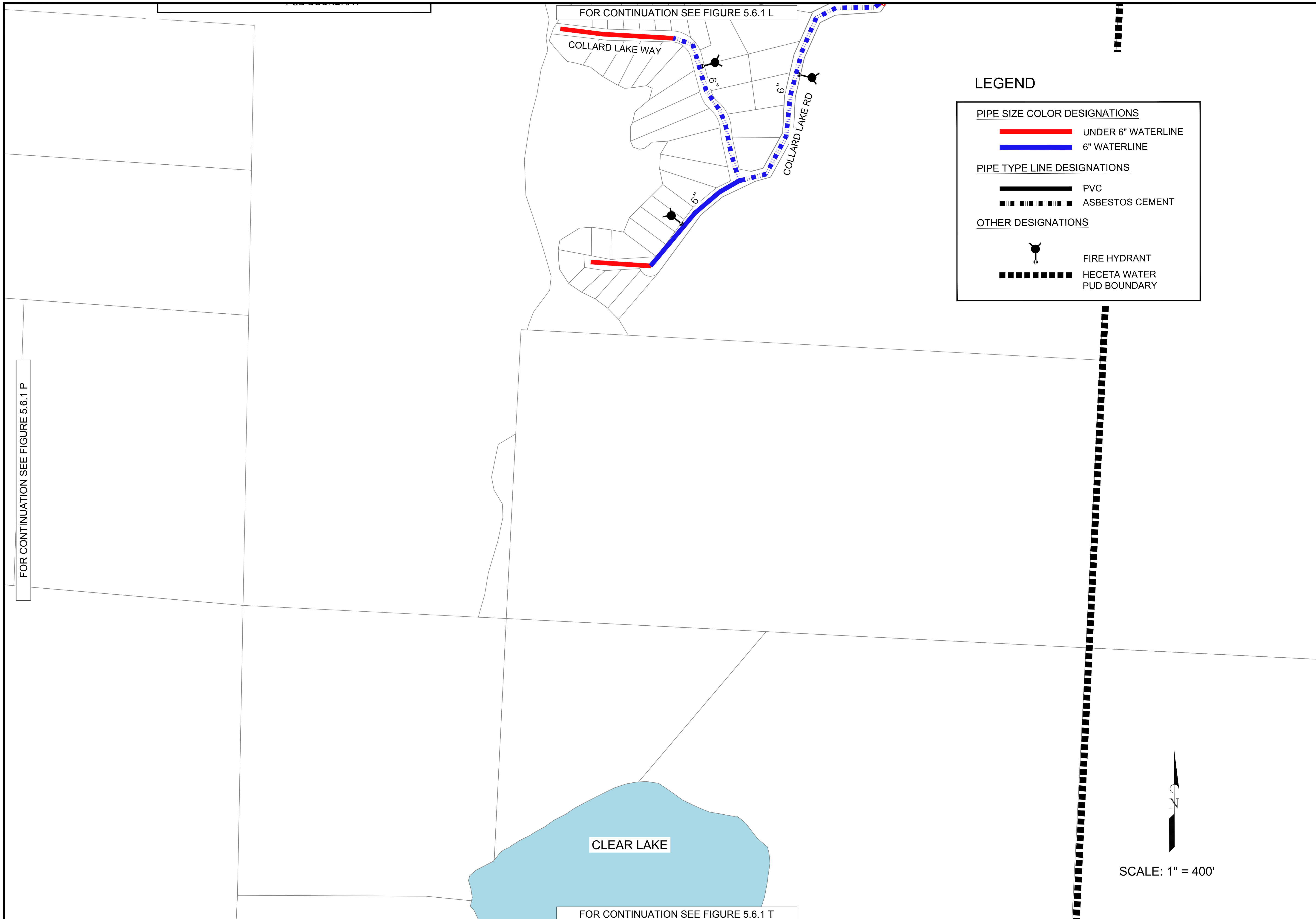


FIGURE NO. **5.6.1Q**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

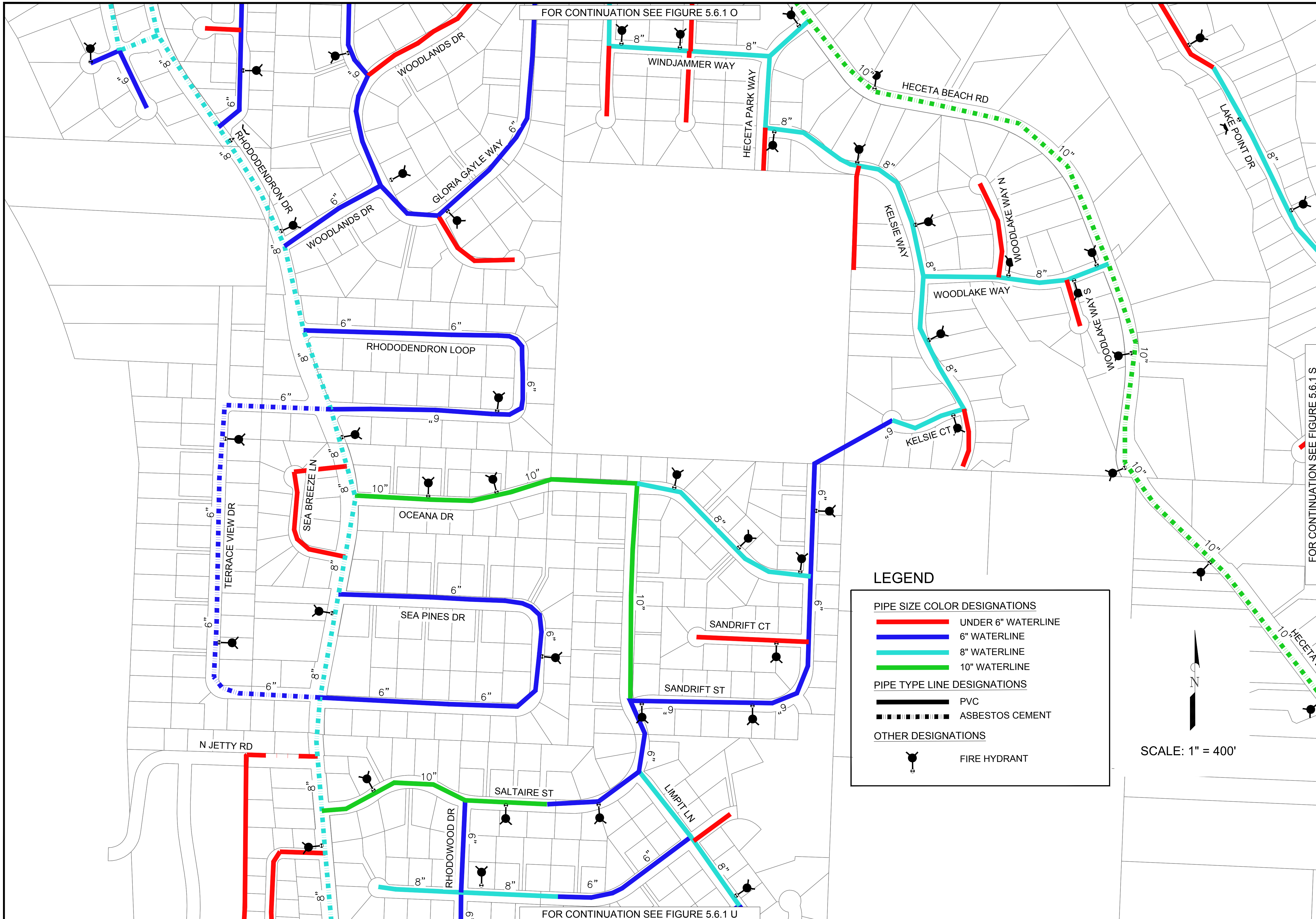


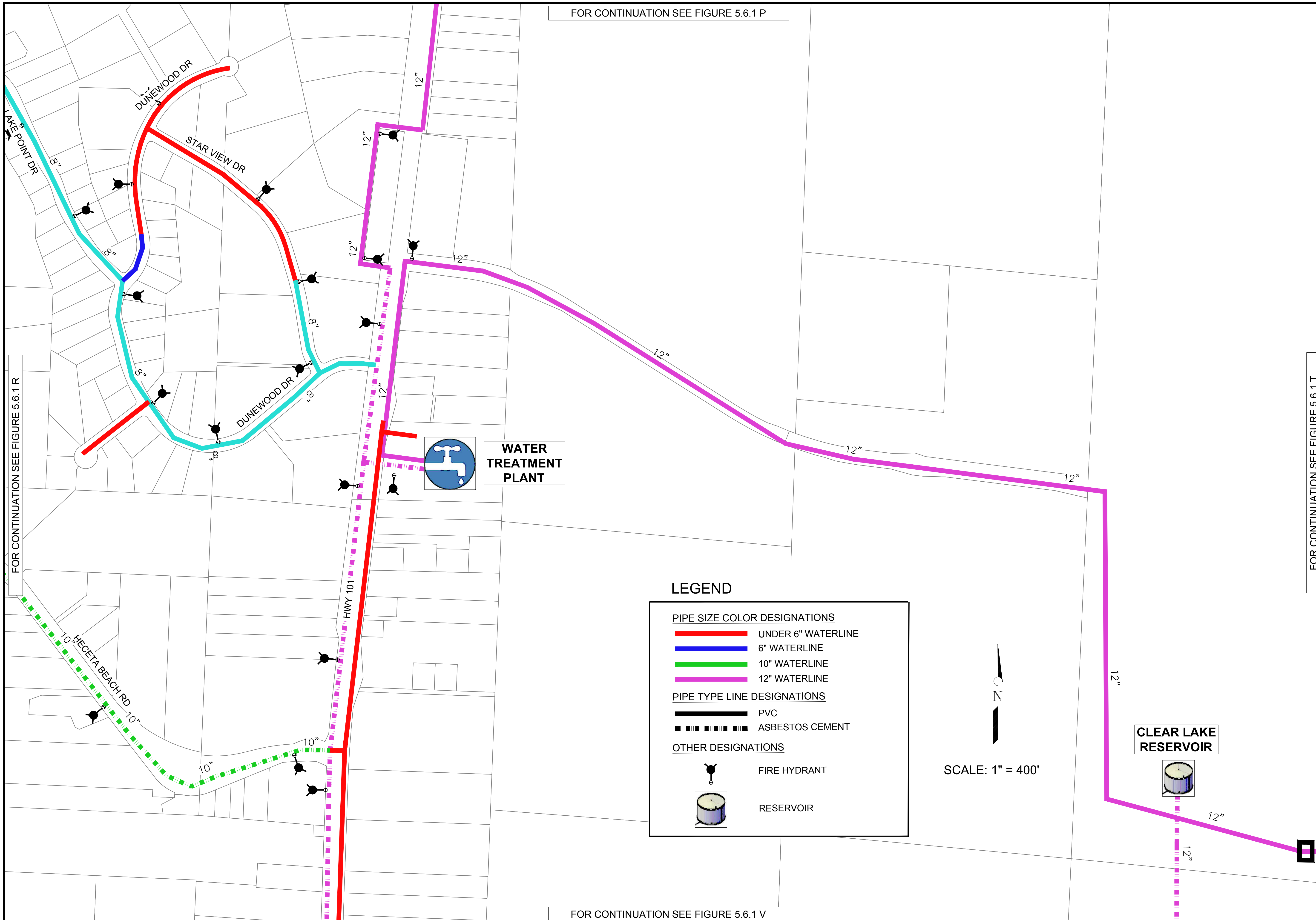
FIGURE NO.
5.6.1R

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05



HECETA WATER DISTRICT WATER MASTER PLAN

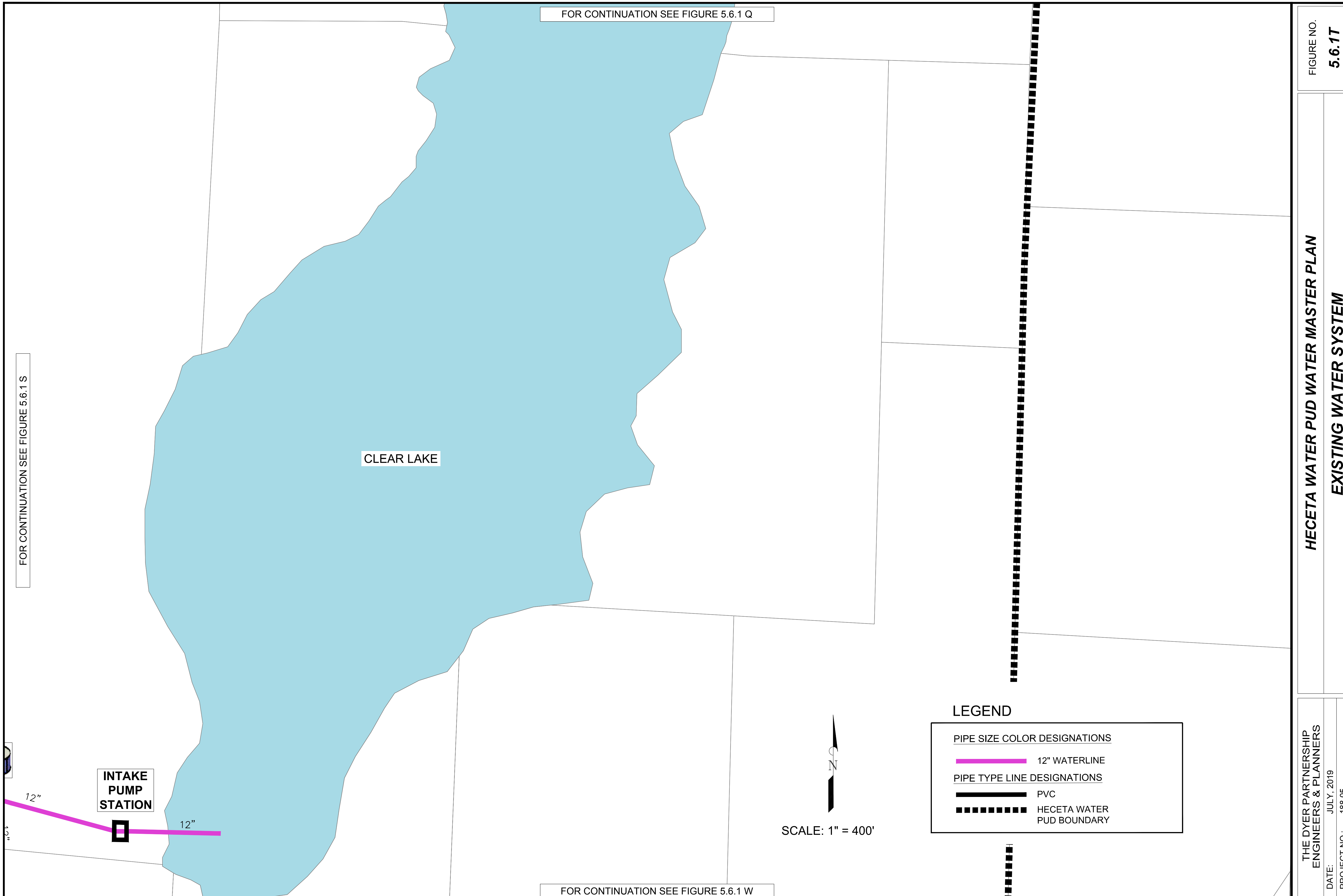
EXISTING WATER SYSTEM

FIGURE NO. **5.6.1S**

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.00


FOR CONTINUATION SEE FIGURE 5.6.1 Q
FOR CONTINUATION SEE FIGURE 5.6.1 S
FOR CONTINUATION SEE FIGURE 5.6.1 W
CLEAR LAKE
INTAKE PUMP STATION
12"
12"
N
SCALE: 1" = 400'
LEGEND
PIPE SIZE COLOR DESIGNATIONS
12" WATERLINE
PIPE TYPE LINE DESIGNATIONS
PVC
HECETA WATER PUD BOUNDARY
FIGURE NO.
5.6.1T
HECETA WATER PUD WATER MASTER PLAN
EXISTING WATER SYSTEM
THE DYER PARTNERSHIP ENGINEERS & PLANNERS
DATE: JULY, 2019
PROJECT NO.: 188.05

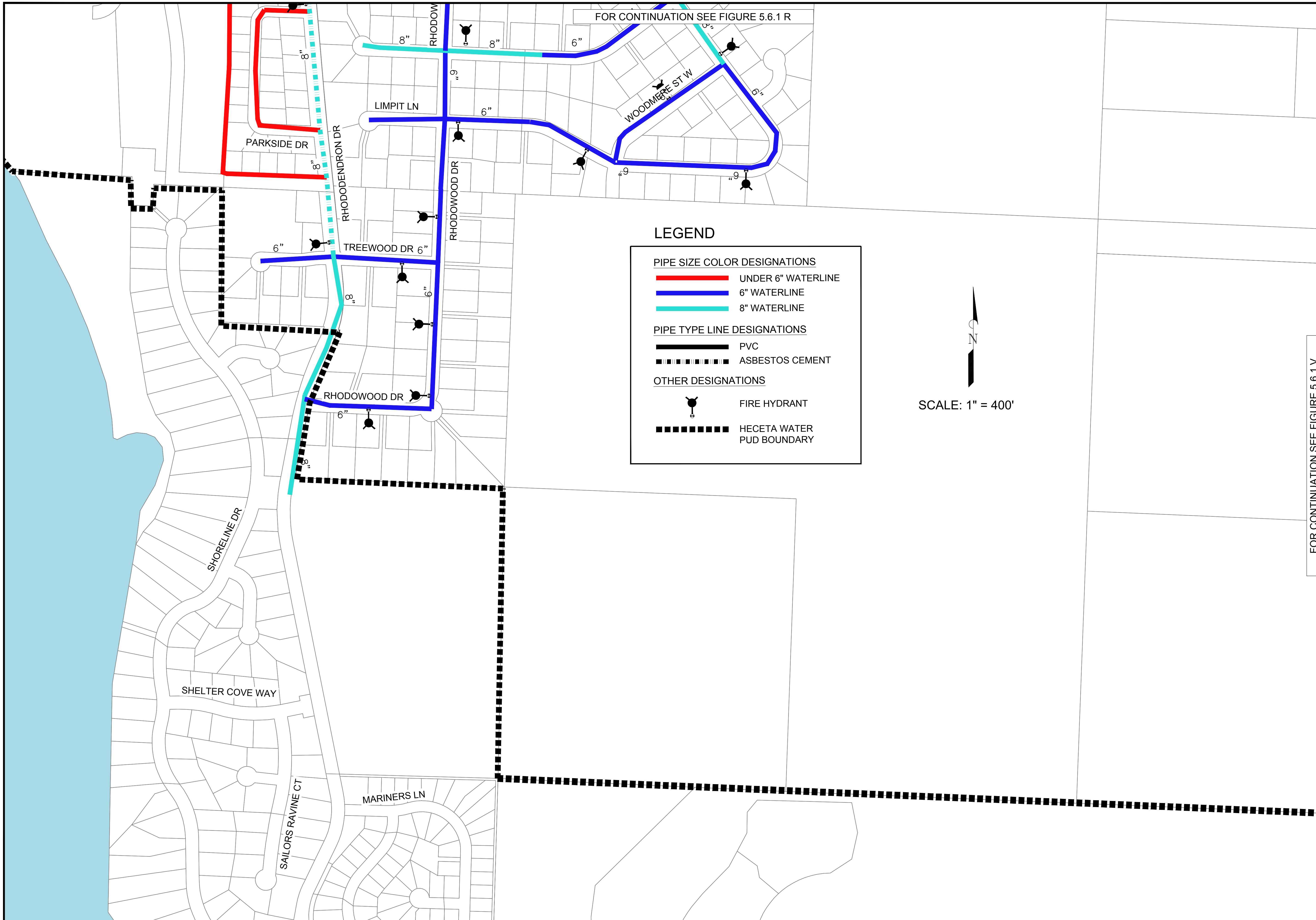


FIGURE NO. **5.6.1U**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

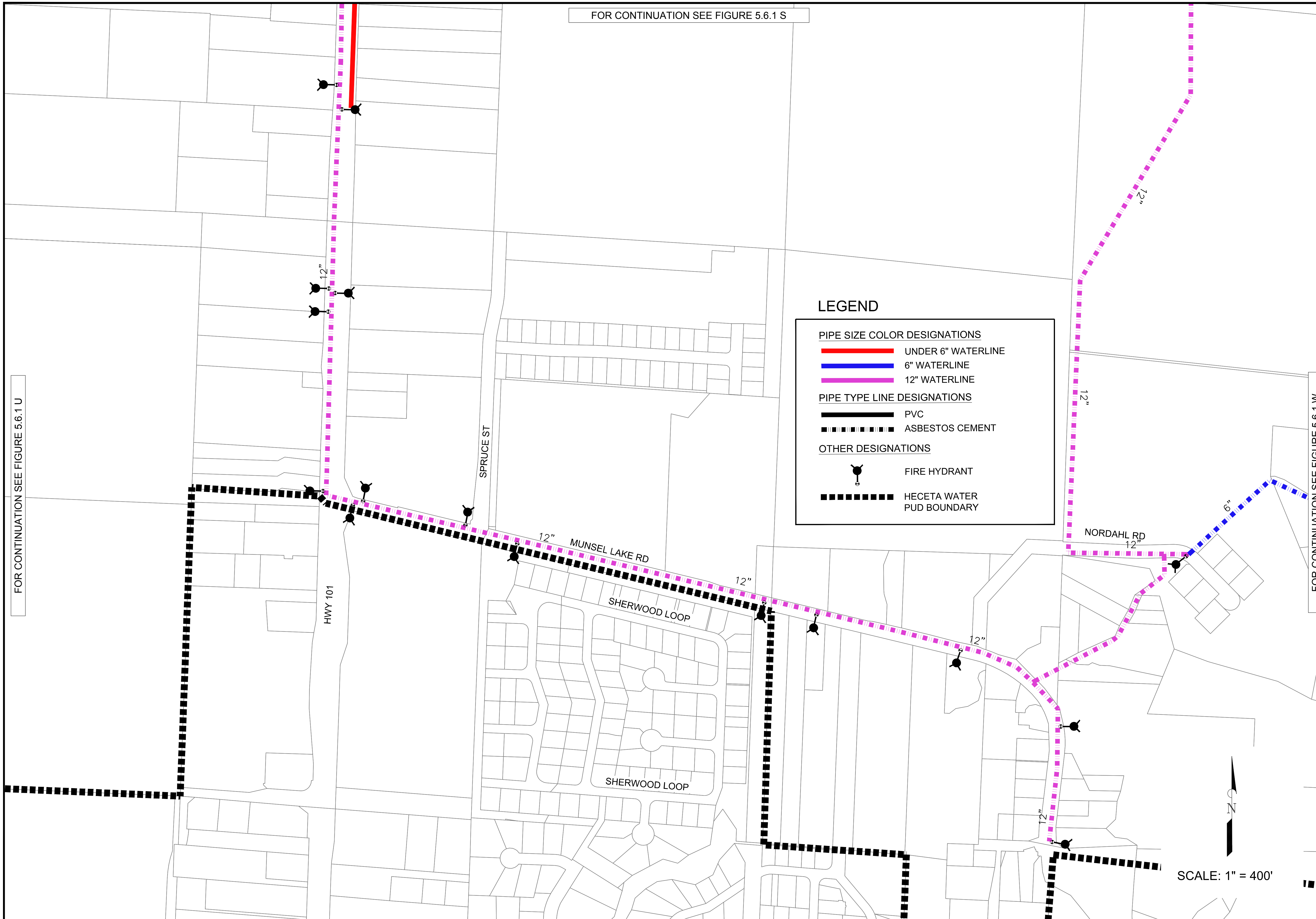


FIGURE NO. **5.6.1V**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

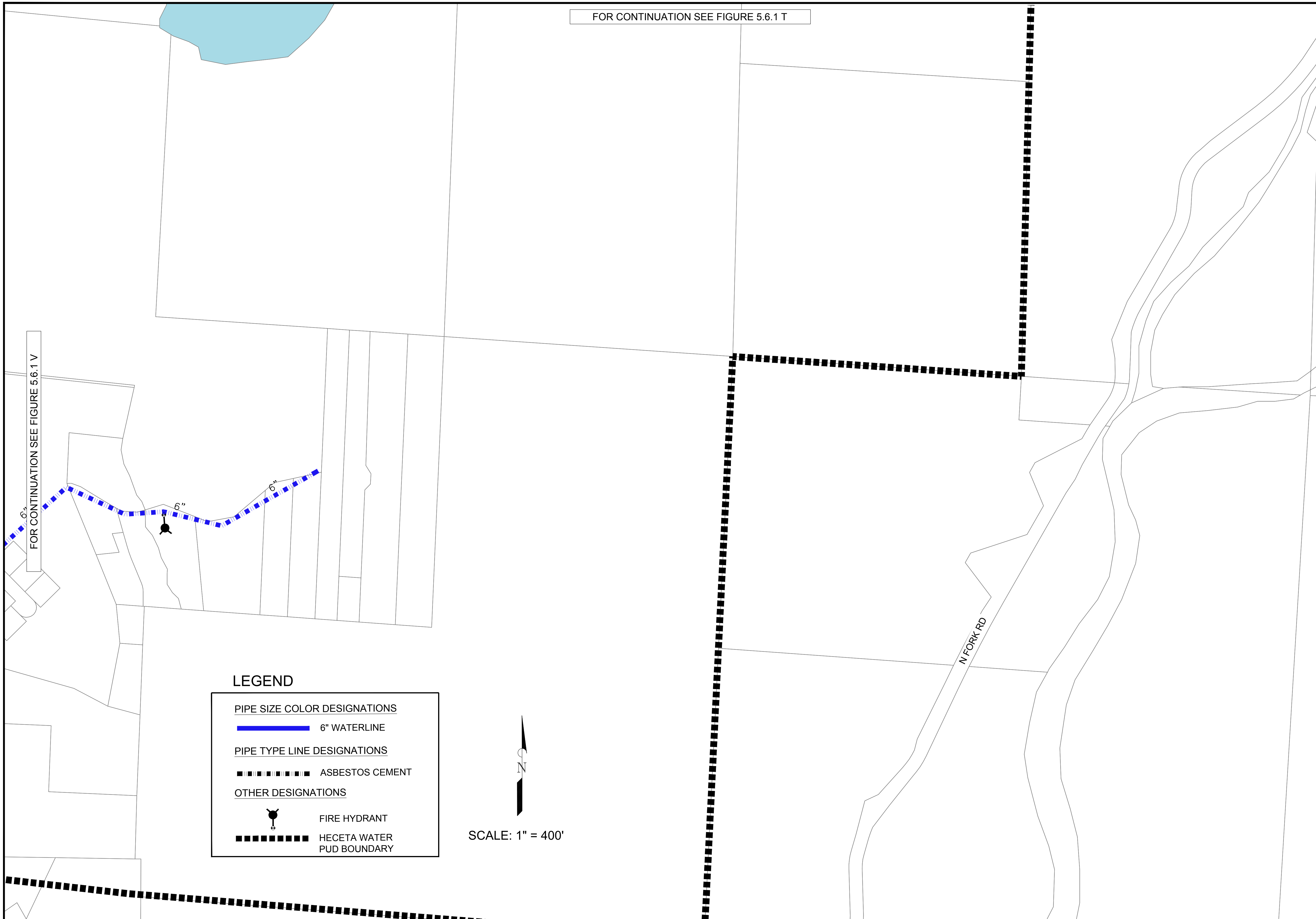


FIGURE NO. **5.6.1W**

HECETA WATER PUD WATER MASTER PLAN

EXISTING WATER SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

The diameter and materials of each pipeline section was inputted into the computer model. A discussion on the computer modeling results of the distribution system is presented in Section 8.

TABLE 5.6.1
DISTRIBUTION SYSTEM SIZE AND MATERIAL INVENTORY

Pipe Diameter, in.	Total, ft.	% of Total
4	22,027	9
6	110,381	44
8	56,344	22
10	39,552	16
12	22,360	9
Total	250,664	100

Booster Pump Stations

Booster pump stations are utilized to pump water to reservoirs and boost pressures from lower level service areas to higher service areas. A summary of the booster pump stations within the District is given in Table 5.6.2 below.

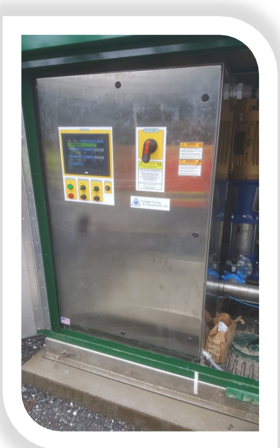
TABLE 5.6.2
EXISTING BOOSTER PUMP STATIONS

Pump Station	No. of Pumps	HP	Flow (gpm)	Reservoir Served	Pressure Zones Served
Collard Lake	2	30	240	Collard Lake	Collard Lake
Enchanted Valley	2	1 at 7.5/1 at 5	50	Enchanted Valley	Enchanted Valley
Sutton Lake	2	1 at 25/1 at 30	200	Sutton Lake	Sutton Lake

Mercer Lake Pump Station

The Mercer Lake Pump Station was built in the 2015 and houses two multi-stage centrifugal pumps equipped with VFDs. Both are 30 hp pumps with a capacity of 240 gpm. The pumps run in a lead/lag configuration, and are controlled by the level of the Mercer Lake Reservoir. The pumps are enclosed in a weathertight fiberglass enclosure. A PRV vault is located adjacent to the station and can be manually opened by the Operators in the event of an emergency.

FIGURE 5.6.2
MERCER LAKE PUMP STATION



Enchanted Valley Pump Station

The Enchanted Valley Pump Station was built in the 1970s and houses two pumps. One is a 7.5 hp and the other is 5 hp pump. The 7.5 hp pump and a new control panel were installed at the pump station in 2005. The capacity of the pump station is 50 gpm. These pumps currently operate in a lead/lag configuration, and are manually operated based on the Enchanted Valley Reservoir elevation. The pump station building is rotting, and the older pump is reaching the end of its useful life. The overall condition of the pump station is poor. The pump station currently has no fire flow pumps.

FIGURE 5.6.3
ENCHANTED VALLEY PUMP STATION

Sutton Lake Pump Station

The Sutton Lake Pump Station was built in the 1970s and houses two pumps. One pump is 25 hp, and the other is 30 hp. The capacity of the pump station is 200 gpm. In 2005, one new control panel was installed. The rest of the equipment at the pump station is nearing the end of its useful service life. Pump maintenance is problematic due to the access point, the pump configuration, and minimal clearances. The pump station is currently manually operated. The overall condition of the structure, controls, and pumping and piping components is in poor condition.

Sutton Lake's replacement pump station is currently being designed. The new pump station will not alter the current capacity, but will have additional control features. The system Operators will be able to control the pump station remotely from the WTP, or use the SCADA system to control the pump station using the elevation of the Sutton Lake Reservoir.

FIGURE 5.6.4
SUTTON LAKE PUMP STATION

5.7 Financial Management

The financial management of the District's water system was reviewed by examining the current system charges, revenue, and Operations and Maintenance (O&M) budget.

System Charges and Revenue

The District collects water system charges to retire debt and finance the operation and maintenance of the water system. A summary of the current system charges is given below in Table 5.7.1.

TABLE 5.7.1
MONTHLY WATER SYSTEM CHARGES

Service	Base Rate	Rate $/1,000 gals. Up to 8,000 gals.	Rate $/1,000 gals. 8,000-16,000 gals.	Rate $/1,000 gals. 16,000 to 40,000 gals.	Rate $/1,000 gals. Over 40,000 gals.
Inside District					
5/8 - Inch	$28.50	$2.50	$3.00	$3.75	$4.75
1- Inch	$49.75	$2.50	$3.00	$3.75	$4.75
2 -Inch	$158.00	$2.50	$3.00	$3.75	$4.75
4- Inch	$517.25	$2.50	$3.00	$3.75	$4.75
Outside District					
5/8 - Inch	$42.75	$2.50	$3.00	$3.75	$4.75
1- Inch	$74.40	$2.50	$3.00	$3.75	$4.75
2 -Inch	$237.25	$2.50	$3.00	$3.75	$4.75
4- Inch	$742.00	$2.50	$3.00	$3.75	$4.75

The District collects other revenue for the water system operation from service fees, new connections, and other miscellaneous sources. A summary of the revenue budget for the fiscal year 2017 to 2018 is presented in Table 5.7.2.

TABLE 5.7.2
WATER OPERATIONS REVENUE: (2017 - 2018 BUDGET)

Item	Amount ($)
Cash on Hand	$1,000,000
Users Fees	$1,100,000
Connection Charges	$6,660
Interest Earned	$1,800
Service Charges	$9,000
Miscellaneous	$3,500
SDWRLF Loan (IFA)	$180,000
Franchise Fees	$2,500
Transfer from HWD General Fund	$6,800
Transfer from Debt Services-Non-G.O.	$500
IFA Loan/Grant "Collard Lake Rd"	$737,000
HWPUD Prior Years Property Taxes	$2,500
Total Resources	$3,050,260

Operation and Maintenance Budget

Each fiscal year, the District proposes, approves and adopts an O&M budget for the water system. The General Fund is an internal service fund, which acts as a cost center for personnel, equipment, and materials to the other internal funds. A portion of the O&M budget is directed to the Construction Fund, and Equipment Replacement Reserve Fund; which was created for the distribution of funds required by the District's Capital Improvement Plan. Additional funds are distributed to the Debt Service Fund for the purpose of timely payments of long-term financing of water system improvements. A summary of the General Fund expenditures is presented in Table 5.7.3.

TABLE 5.7.3
WATER OPERATIONS REQUIREMENTS: (2017 - 2018 BUDGET)

Item	Amount ($)
Personnel Services	$553,715
Materials and Services	$332,150
Capital Outlay	$195,000
Special Payments	$5,000
Construction Fund Transfer	$917,000
Debt Service Fund Transfer	$193,532
Equipment Replacement Reserve Fund	$30,000
Operating Contingency	$823,863
Total Requirements	$3,050,260

SECTION 6:

WATER USE AND PROJECTED DEMANDS

SECTION 6: **WATER USE AND PROJECTED DEMANDS**

6.1 Description and Definitions

Water demand can be defined as the quantity of water delivered to the system over a period of time to meet the needs of consumers, provide filter backwashing water, and to supply the needs of firefighting and system flushing. In addition, virtually all systems have an amount of leakage or loss that cannot be feasibly or economically reduced or eliminated. Total demand, therefore, includes all consumption and lost water. Demand varies seasonally with the lowest usage in winter months and the highest usage during summer months. Variations in demand also occur with respect to time of day (diurnal) with higher usage occurring during the morning and early evening periods and lowest usage during nighttime hours.

The objective of this section is to determine the current water demand characteristics and to project future demand requirements that will establish system component adequacy and sizing needs. Water demand is described in the following terms:

Average Annual Demand (AAD)
The total volume of water delivered to the system in a full year expressed in gallons. When demand fluctuates up and down over several years, an average is used.

Average Daily Demand (ADD)
The total volume of water delivered to the system over a year divided by 365 days. The average use in a single day expressed in gallons per day (gpd).

Dry Season Daily Demand (DDD)
The gallons per day average during the months of June through October.

Maximum Monthly Demand (MMD)
The gallons per day average during the month with the highest water demand. The highest monthly usage typically occurs during a summer month.

Peak Weekly Demand (PWD)
The greatest seven day average demand that occurs in a year. Expressed in gallons per day.

Maximum Day Demand (MDD)
The largest volume of water delivered to the system in a single day expressed in gallons per day. The MDD is commonly used to size facilities to provide capacity for periods of high demand. The MDD usually occurs during the warmest part of the year when agriculture, irrigation, and recreational uses of potable water are at their greatest. Higher use is also commonly associated with holidays, such as the Fourth of July, or during events, such as a County Fairs.

Peak Hourly Demand (PHD)
The maximum volume of water delivered to the system in a single hour expressed in gallons per day. Distribution systems should be designed to adequately handle the peak hourly demand. During this peak usage, storage reservoirs supply the demand in excess of the maximum day demand. Peak hour demand is commonly experienced during the early morning hours when many water users are bathing, cooking, and engaging in other activities that require widespread water use.

Demands expressed in gpd, can be divided by the population served to come up with a demand per person or a per capita demand which is expressed in gallons per capita per day (gpcd). Per capita demands can be multiplied by future population projections to determine future water demands.

In addition to water demand parameters, various terms are used and values calculated that are related to water conservation. These water conservation terms are described below (EPA 1998).

Loss/Lost Water
Metered source water less revenue producing water and authorized unmetered water uses.

Nonaccount Water
Metered source water less metered water sources.

Unaccounted for Water
The amount of nonaccount water less known or estimated losses and leaks.

For most communities, the known or estimated losses and leaks within a water system are not known. Rather the amount of system loss or leakage is estimated based on an audit of water usage within the system. To the extent possible, the above water conservation terms will be used in this Plan.

6.2 Current Water Demand

For the purposes of this study, current water demand was evaluated using three different methods; with the methods varying by:

1. Water Consumption.
2. Raw Water Treated.
3. Water Diverted.

These different water demands are discussed in detail below.

1. Water Consumption

Water consumption or sales records allow for: determination of actual water consumption by the District's water users, calculation of an Equivalent Dwelling Unit (EDU), and provide measurement of non-account water when compared with plant production records.

Water Sales

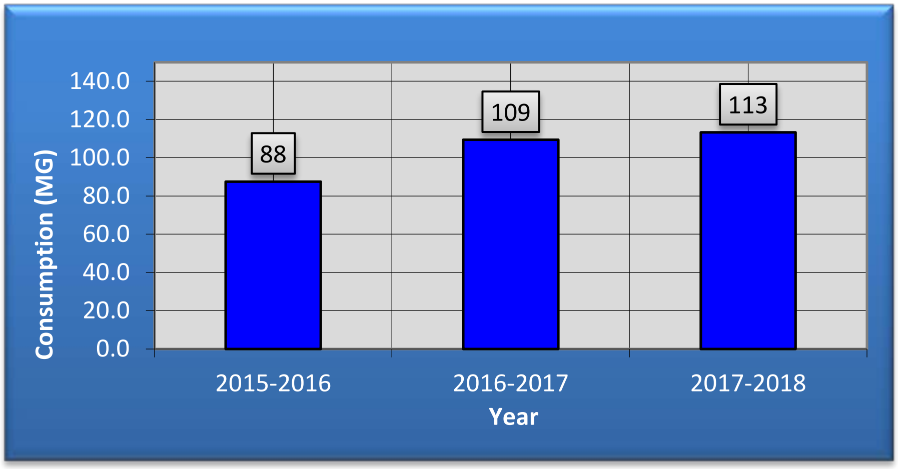
For this study, water consumption is based on the District's water consumption records for the Years 2015 through 2018. A graph of the total annual amount of water sold to customers (consumption), including bulk water sales, is presented in Figure 6.2.1.

The largest historical amount of water consumed by the District was in the Year 2018.

Equivalent Dwelling Units

The number of EDUs, or residential housing units within a system, is determined to calculate the average cost for water services to a typical residence. The average cost per residential connection is not only used to educate the system users but is also used by regulatory and funding agencies for comparing costs with other communities. Since a water system typically consists of commercial, institutional, and industrial users, the most common method of calculating the average residential user cost is to evaluate each source on the basis of water consumption relative to the typical residential account or EDU.

FIGURE 6.2.1
TOTAL METERED CONSUMPTION 2015 - 2018



Total metered consumption data for users within the District is compiled over a period of time (typically a year). Residential usage is determined by subtracting commercial and unbilled contributions from the total water usage. The average water usage per EDU is calculated by dividing the residential water usage by the total number of dwelling units within the District. The total number of EDUs is determined by dividing the total water usage by the average water usage per EDU.

For the EDU calculation, the different sources (or sectors) within the District were divided into the following categories.

- Residential (single family dwellings, mobile home parks, multi-family, and assisted living).

- Commercial/Industrial (e.g. supermarkets, motels, etc.)

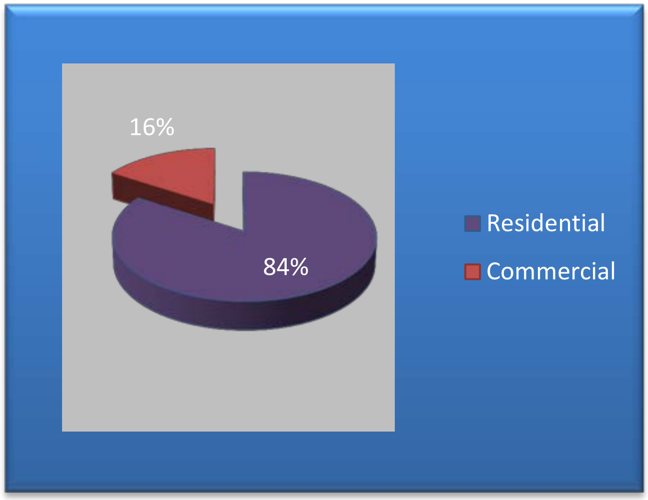
The estimated number of EDUs is summarized in Table 6.2.1. The estimated annual residential water consumption per EDU, based upon calendar year 2018, is 39,947 gallons per EDU per year. The total number of EDUs per demand source was calculated from the quotient of the total annual water consumption for each source by the annual residential usage. For example, commercial usage within the District was 16,308,305 gallons per year. Therefore, total EDUs for this usage is 16,308,305 gallons divided by 39,947 gallons per EDU (408). The total number of EDUs for each source was rounded to the nearest EDU.

It should be reiterated that Table 6.2.1 shows the average consumption levels within the system. All losses, nonaccount water, and other water uses are not accounted for within the consumption data. Water system planning requires that all water diverted from the source be analyzed and considered as total water system consumption.

Residential sources account for approximately 84 percent of all water consumed within the District. The remaining system users (i.e. commercial, public, and non-profit) utilize 16 percent of the metered water.

There are only four service connections outside the District boundaries. These are all 5/8 inch connections and account for a small percentage of the Districts total water usage. The distribution of EDUs based on water consumed by the District is summarized in Table 6.2.1 and shown in Figure 6.2.2.

FIGURE 6.2.2
PERCENT USAGE PER SOURCE



Equivalent Dwelling Units for Billing Purposes

Total number of EDUs can also be determined based on the usage costs. This process involves determining the average monthly cost for a single service residential dwelling. The total number of EDUs associated with each non-residential connection is then tabulated by dividing their annual cost by the defined cost per EDU. For example: if a commercial account spent $350 a month, and the average cost per EDU was set to $40.17 a month, the total EDUs for that account would be 8.75 (350/40).

E*quivalent Dwelling Units for Funding Purposes*

Many funding agencies do not recognize the usage per EDU as unique to the specific planning area, but rather employ the use of a more generalized usage rate per EDU. The usage rage assumed by many funding agencies is 7,500 gallons per month (90,000 gallons per year) per dwelling unit. The distribution of EDUs based on funding requirements is summarized in Table 6.2.1.

TABLE 6.2.1
ESTIMATED NUMBER OF EDUS BASED ON WATER CONSUMED (Year 2018)

Number of Connections	Usage		EDU [1] (gpy) (CALCULATED USAGE)	EDU [2] (gpy) (FUNDING USAGE)
	Annual	ADD		
Residential				
2,172	95,366,072	261,277	2,172	1,060
Commercial/Industrial				
20	20,025,920	54,866	456	223
Total				
2,192	**115,391,992**	**316,142**	**2,628**	**1,282**

1. Usage used to determine number of EDUs based on average useage per residence is 43,907 gallons per year.
2. Usage used to determine number of EDUs based on funding standards is 90,000 gallons per year.

2. Raw Water Treated

For planning purposes, demand projections and unit design factors for water consumption should be based on the District's yearly water production data rather than historical customer water consumption records (meter readings). This methodology incorporates all system losses and unmetered usage in the projected water requirements developed later in this Water Master Plan. The amounts of treated water produced, pumped to the District for consumption, and utilized for backwash are discussed below.

Water Treatment Plant Production

The amount of water produced at the Water Treatment Plant (WTP) and sent to the District for consumption is based on daily records maintained by the District Staff. The amount of treated water produced at a WTP is equal to the sum of the amount of water sent to the District for consumption plus the amount of water used for backwash, and miscellaneous water usage at the WTP (e.g. for pump seals, sanitary usage, etc.). The District does not currently record miscellaneous water usage at the WTP, therefore this miscellaneous usage at the WTP is not known. For this study, water treatment plant production will be based on the sum of water pumped to the District for consumption and the amount of water used for backwash.

Water production data was used to calculate the Average Annual Demand (AAD), Average Daily Demand (ADD), Dry Season Daily Demand (DDD), Maximum Monthly Demand (MMD), Peak Weekly Demand (PWD), and Maximum Daily Demand (MDD). A definition of each of these water demand parameters was previously given in Section 6.1. A summary of the water demand parameters for the Years 2015 to 2018 is presented in Table 6.2.2. The maximum water production for the time periods reviewed was observed in the Year 2018.

TABLE 6.2.2
ANNUAL, MONTHLY, WEEKLY AND DAILY TREATED WATER PRODUCTION

Year	AAD (mgy)(1)	ADD (mgd)(2)	DDD (mgd)	MMD (mgd)	PWD (mgd)	MDD (mgd)
2015-2016	146	0.342	0.478	0.595	0.654	0.755
2016-2017	149	0.355	0.516	0.650	0.720	0.779
2017-2018	157	0.377	0.552	0.669	0.702	0.806
Average	151	0.358	0.515	0.638	0.692	0.780

1. mgy-million gallons per year
2. mgd-million gallons per day

AAD/ADD
Over the past three years, the overall annual average water production has ranged from 146 to 157 million gallons (MG) per year or approximately 0.34 to 0.38 million gallons per day (mgd). The average water production over this period was approximately 1.51 MG per year or 0.36 mgd. The highest water production was observed in the Years 2017 to 2018.

DDD
The DDD value represents the daily water production during the dry season months (June through October), which includes the highest water demand months (usually July or August). Although this value is not typically calculated for water systems, it is presented in this report to allow a comparison of dry season production with available water to be diverted from the District's raw water sources. The DDD over the time period reviewed ranged from approximately 0.48 mgd with a flow of 0.55 mgd. The highest water production was observed in the Years 2017 to 2018.

MMD
The MMD represents the highest flow produced over a month. For the District, the MMD typically occurs in the months of July or August. From the Year 2015 to 2018, the MDD ranged from approximately 0.60 to 0.67 mgd. The average MMD flow for this period was 0.64 mgd.

PWD
The PWD is the peak water production over a week. This flow usually occurs during the month of the highest water production (i.e. July or August). The PWD over the last three years has ranged from 0.65 to 0.70 mgd. The average PWD flow for this period was 0.69 mgd.

MDD
The MDD values given in Table 6.2.2 are the highest daily water production rates for the given time periods. The MDD typically occurs in the month with the peak week of maximum water production. Over the last three years, the MDD has ranged from approximately 0.76 to 0.80 mgd. The average MDD over this time period was approximately 0.78 mgd.

Peaking Factor
Peaking factors are commonly used to develop relationships between the ADD and the other planning criteria. These factors are used primarily for calculating future water demand. Peaking factors tend to be similar from one water system to another. Typically, MMD is approximately 1.5 times the ADD while the PWD is generally between 1.5 and 2.0 times the ADD. Peaking factors between 2 and 2.5 are commonly used for MDD. As the DDD is a unique value for this study, there are no typical peaking values for comparison.

The peak hourly demand is often used in the computer modeling process to ensure that the storage and distribution system will continue to function during short, peak demand situations. This value may be calculated by plotting the probability of occurrence of demand versus the various water demand values. From this logarithmic plot, the PHD value can be extrapolated.

The PHD was estimated by means of an extrapolation based on probability. Such a projection is based on the principle that an average monthly flow is likely to occur 6/12 of the time or 50 percent, and a peak monthly flow occurs 1/12 of the time or 8.3 percent. Likewise, peak weekly flow will take place 1/52 of the time or 1.9 percent; peak daily flow occurs once in 365 days or 0.27 percent, a peak hour flow happens once in 8,760 hours or 0.011 percent. Using this method and the flow data for the Year 2016 (MDD equals 2.43 mgd; PWD equals 2.07 mgd; MMD equals 1.93 mgd; ADD equals 1.26 mgd), the PHD for the District was estimated to be 3.6 mgd. The calculated peaking factor (PHD/ADD) is 2.5, which is slightly less than the range of peak factors of 3 to 5 commonly used for PHD. A summary of the calculated flow peaking factors is presented in Table 6.2.3.

TABLE 6.2.3
SUMMARY OF TREATED WATER PRODUCTION PEAKING FACTORS

Time Period	DDD/ADD	MMD/ADD	PWD/ADD	MDD/ADD	PHD/ADD
2015-2016	1.40	1.74	1.91	2.21	2.60
2016-2017	1.45	1.83	2.03	2.19	2.60
2017-2018	1.46	1.78	1.86	2.14	2.78

Water Pumped to the District for Consumption
The water pumped to the District for consumption represents the amount of water leaving the WTP and conveyed to the District. This value does not take into account water utilized at the WTP (e.g. backwash and miscellaneous water usage).

The amount of water pumped to the District was derived from the plant data for AAD, ADD, MMD, PWD, and MDD. A summary of the compiled water demand parameters for water pumped to the District (Years 2015 to 2018) is presented in Table 6.2.4.

TABLE 6.2.4
ANNUAL, MONTHLY, WEEKLY AND DAILY WATER USED BY DISTRICT

Year	AAD (mgy)	ADD (mgd)	DDD (mgd)	MMD (mgd)	PWD (mgd)	MDD (mgd)
2015-2016	117	0.321	0.454	0.566	0.624	0.724
2016-2017	138	0.328	0.474	0.601	0.660	0.738
2017-2018	145	0.349	0.516	0.620	0.648	0.748
Average	133	0.333	0.482	0.596	0.644	0.737

The calculated peaking factor (PHD/ADD) is 3.01, which is slightly less than the range of peak factors of three to five commonly used for PHD. A summary of the calculated flow peaking factors is presented in Table 6.2.5.

TABLE 6.2.5
SUMMARY OF TREATED WATER USED BY DISTRICT FLOW PEAKING FACTORS

Time Period	DDD/ADD	MMD/ADD	PWD/ADD	MDD/ADD	PHD/ADD
2015-2016	1.42	1.76	1.94	2.25	2.67
2016-2017	1.44	1.83	2.01	2.25	2.67
2017-2018	1.48	1.78	1.86	2.14	2.69

Non-account Water

Water sold is typically less than the amount of water produced at the plant due to system leaks, unmetered use at the WTP (backwash water, turbidimeter water, wash down, etc.), unmetered use within the distribution system, inaccuracies in customer meters, and other unmetered use such as fire flows and system flushing. A comparison of the amount of water treated (sum of water pumped to the District), and the amount of water consumed is given in Table 6.2.6.

TABLE 6.2.6
COMPARISON OF WATER PRODUCED, BACKWASH, PUMPED AND CONSUMED

Time Period	Raw Water (gpy)	Backwash (gpy)	Water Pumped, gpy	Water Consumed, gpy	% Nonaccount
2015-2016	146,452,000	9,604,000	136,848,000	87,520,526	36%
2016-2017	149,226,000	11,183,000	138,043,000	109,337,452	21%
2017-2018	156,579,000	11,754,000	144,825,000	113,232,588	22%

(1) Percent unaccounted is based on the quotient of the water consumed and water pumped to the District.

Over the last three years, the average amount of nonaccount water pumped to the District is approximately 26 percent. Previously, in the Years 2001 to 2006 the average nonaccount was 4.6 percent, 14.6 percent for the years 2008 to 2011, and 15.9 percent for the Years 2011 to 2014. The considerable variation between these numbers could be contributed to the inaccuracy of the flow meters at the WTP.

There is a three percent variable between two flow monitoring devices within the WTP. After adjusting the numbers to account for the variability, it has been concluded that the HWPUD nonaccount water has been above the 15 percent threshold for the last three years. Potential sources of lost treated water include the following:

- Leakage within the District's water distribution system.
- Inaccurate water meters.
- Unauthorized use or connections without meters.
- Unmetered water for firefighting and operations such as street cleaning, water main flushing and testing.

The Oregon Administrative Rules (OAR) Section 690-86, states that all water systems should work to reduce system leakage levels to 15 percent or less. If the reduction of system leakage to 15 percent is found to be feasible, the water provider should work to reduce system leakage to ten percent. With the amount of nonaccount water within its system, the District has met regulatory standards and requirements. However, the District should continue to strive to account for and maintain the nonaccount water. Reductions in lost water can result in increased revenues, reduced expenses, and improved water system performance. Measures and programs to account for and reduce water losses are discussed in Section 9.

3. Water Diverted

As part of the auditing process, the District must account for all water diverted from each source. This is typically accomplished through a metering device at or near the point of diversion. OAR 690-085-0015 requires that, "Where practical, water use shall be measured at each point of diversion." However, the rule also states that:

"…measurements may be taken at a reasonable distance from the point of diversion if the following conditions are met:

- The measured flow shall be corrected to reflect the flow at the point of diversion. The correction will be based on periodic flow measurements at the point of diversion taken in conjunction with flow measurements at the usual measuring point;
- If the measured flow includes flow contributions from more than one point of diversion, the measured flow shall be proportioned to reflect the flow at each point of diversion using the method prescribed subsection (a) of this section; and
- A description of the correction method shall be submitted with the annual report the first time it is used and any time it is changed, or once every five years, whichever is shorter."

If the point of diversion is relatively close to the water treatment plant, it is common for many communities to use a single influent meter at the water plant to measure the amount of water that is diverted.

As mentioned in Section 5.1, there is concern about the accuracy of the raw water flow meters. For this, the amount of diverted water from each source was calculated based on the sum of the amount of water pumped to the District, and backwash water, which is the WTP water production.

Summary

The water used by the District defines the metered demand. The water production of the WTP defines the production demand. The production demand dictates the necessary capacity of the WTP. This water demand data will serve as the basis for the planning criteria of this Water Master Plan. These parameters were primarily based on the water production data for the year of the highest demand (Years 2017 to 2018), and are shown in Table 6.2.7.

TABLE 6.2.7
SUMMARY OF CURRENT TREATED WATER PRODUCTION

Demand Parameter	Total, mgd	Peaking Factor	Per Capita Demand, gpcd
Average Daily Demand, ADD	0.377	1	77
Dry Season Daily Demand, DDD	0.552	1.46	112
Maximum Monthly Demand, MMD	0.669	1.78	136
Peak Weekly Demand, PWD	0.702	1.86	143
Maximum Daily Demand, MDD	0.806	2.14	164
Peak Hourly Demand, PHD	1.150	3.05	234

(1) Based on population of 4,921 in Year 2018

6.3 Projected Water Demand

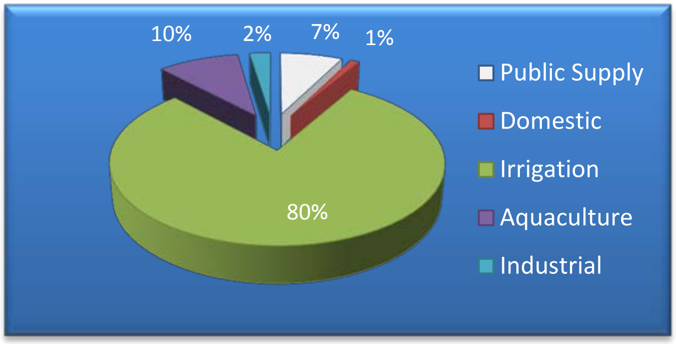
Water demands are projected to Year 2038 using the past records of water produced and water sold along with projected population estimates and anticipated additional water demand (i.e. industry). The goal of projecting future water demand is not to build larger facilities to accommodate excessive water consumption; but rather to evaluate the capability of existing components and to size new facilities for reasonable demand rates. Large amounts of leakage and excessive water consumption should not be projected into the future estimates. Rather, efforts should be made to reduce leakage and lost water to a reasonable level and utilize lower, more acceptable demand rates for planning efforts. Water demand projections should be based on acceptable water loss quantities, reasonable conservation measures, and the community's expected water use characteristics.

There is a degree of uncertainty associated with future water demand projections for any community. Uncertainties in projections exist because of the estimates used to define the community's current water use and the built-in assumptions made with respect to anticipated growth in a community. The impact of water conservation measures on a community's future water consumption is also difficult to predict.

Future per Capita Water Usage and Growth

The US Department of the Interior documented the per capita water use in Oregon is 113 gpcd. A total of 6,730 mgd of water was used by Oregon in year 2010. Total water withdrawals are separated by water use categories. The categories with their representative water use amounts are shown in Figure 6.3.1. The Department of the Interior documented the per capita water use for Oregon in the 2010 US Geological Survey – Circular 1405.

FIGURE 6.3.1
STATE OF OREGON USAGE



Based on raw water diversion records, the average per capita use in HWPUD is 77 gpcd. This includes all domestic, commercial, and District use divided by population. For this study, future water demand for water pumped to the District will be based on the current water pumped parameters (per capita usage), projected growth within the District (see Section 3.3), and anticipated unaccounted for water. This methodology assumes that water demand characteristics within the District will basically remain the same as the existing per capita basis with consideration for changes in anticipated nonaccount water. The future anticipated nonaccount water is discussed below.

Anticipated Lost Water

Responsible water planning should not include the propagation of high lost water levels into water demand projections. According to OAR 690-86-140, a water system should endeavor to reduce system leakage to 15 percent or less of the total water diverted from their raw water sources. The District's non-account average of 26 percent over the last three years is high, and needs to be addressed.

The District is currently in the process of replacing old meters, and is planning on completing a leak detection process. Both of these tasks will help to reduce the system losses. Additionally, completion of several project within the Capital Improvement Plan (CIP) developed in Section 10 will help to mitigate water loss.

Additional information related to the percentage of non-account water, and the District's methods of managing this number will be presented in the Water Management and Curtailment Plan currently under development by the District.

Summary of Future Water Demand

The ADD projections were calculated by multiplying the projected population (shown in Table 3.3.1) by the per capita usage (77 gpcd). The DDD, MMD, MWD, and PWD were then determined by multiplying the ADD by their respective peaking factors. A summary of the water production demand projections is presented in Tables 6.3.1.

TABLE 6.3.1
FUTURE RAW WATER PRODUCTION DEMAND

Parameter/Year	2018	2023	2028	2033	2038
Total Population	4,921	5,172	5,435	5,713	6,004
% Nonaccount Water	22%	15%	15%	15%	15%
Water Demand (mgd)					
ADD, gpd	0.377	0.368	0.387	0.407	0.427
DDD, gpd	0.552	0.539	0.567	0.596	0.626
MMD, gpd	0.669	0.654	0.687	0.722	0.759
PWD, gpd	0.702	0.686	0.721	0.758	0.796
MDD, gpd	0.806	0.788	0.828	0.870	0.915
PHD, gpd	1.150	1.124	1.181	1.242	1.305

*Growth rate of 1% applied from year 2018 through 2038 reflecting HWPUD reducing % of nonaccount water to 15% by year 2023.

SECTION 7:

DESIGN CRITERIA AND COST BASIS

SECTION 7: **DESIGN CRITERIA AND COST BASIS**

7.1 Design Life of Improvements

The design life of a water system component is sometimes referred to as its useful life or service life. Design life is based on such factors as the type and intensity of use, type and quality of materials used in construction, and the quality of workmanship during installation. The estimated and actual design life for any particular component may vary depending on the above factors. The establishment of a design life provides a realistic projection of service upon which to base an economic analysis of new capital improvements.

The base planning period for this Water Master Plan (WMP) is 20 years, ending in the year 2038. The planning period is the time frame during which the recommended water system is expected to provide sufficient capacity to meet the needs of all anticipated users. The required system capacity is based on population, water demand projections, and land use considerations. The planning period for a water system and the design life for its components may not be identical. For example, a properly maintained steel storage tank may have a design life of 60 years, but the projected fire flow and consumptive water demand for a planning period of 20 years determines its size. At the end of the initial 20-year planning period, water demand may be such that an additional storage tank is required; however, the existing tank with a design life of 60 years would still be useful and remain in service for another 40 years. The typical design life for system components are discussed below.

Raw Water Intakes and Transmission

Intake structures including concrete impoundments should have design lives of 50 to 100 years when properly constructed and maintained. Water transmission piping should easily have a design life of 40 to 60 years if quality materials and workmanship are incorporated into the construction. Modern PVC and cement mortar-lined ductile iron piping can last up to 100 years when properly designed and installed.

Water Treatment Facility

Major structures and buildings should have a design life of approximately 50 years. Pumps and equipment usually have a useful life of about 15 to 20 years. The useful life of treatment equipment can be extended when properly maintained; if additional treatment capacity is not required. Filter media normally has a design life of ten to 15 years. Flow meters typically have a design life of ten to 15 years. Valves usually need to be replaced after 15 to 20 years of use.

Treated Water Transmission and Distribution Piping

Water transmission and distribution piping should easily have a design life of 40 to 60 years if quality materials and workmanship are incorporated into the construction. Modern PVC and cement mortar lined ductile iron piping can last up to 100 years when properly designed and installed.

Treated Water Storage

Distribution storage tanks should have a design life of 50 to 60 years (steel construction) to 70 to 80 years (concrete and welded steel construction). Steel tanks with a glass-fused coating can have a design life similar to concrete construction. Actual design life will depend on the quality of materials, the workmanship during installation, and the timely administration of maintenance activities. Several practices, such as the use of cathodic protection, regular cleaning, and frequent painting can extend or assure the service life of steel reservoirs.

7.2 Sizing and Capacity Criteria

Demand projections presented in Section 6.3 are based on population projections offered in Section 3.3. The projections assume an average 1.0 percent annual growth rate until the Year 2038.

Accurately predicting growth is difficult, especially beyond 20 years into the future. As time progresses, all of the projections should be updated to reflect actual population and demand. The analysis and presentation of recommended improvement alternatives can be found in Section 8.

Raw Water Source

The raw water sources and reservoirs must be capable of meeting Maximum Daily Demand (MDD) of the system over a period of 50 years. The selection of a source is a long-term commitment that cannot be easily changed. Water rights are becoming more critical as the State's population and water demand increases; and the number of viable water sources remains constant. In the District's case, the water sources need to be sufficient to handle the water demand during the dry season months (June through October). The appropriate design parameter for this dry season evaluation would be the MDD.

Intake and Raw Water Pumping Facilities

Intake piping and pump facilities are not easily expanded and should be sized to meet the anticipated MDD 50 years in the future.

Pumps and other mechanical equipment can be expected to last approximately 15 to 20 years under normal conditions before extensive maintenance or replacement is necessary. Commonly, two pumps are installed in a pumping station, each having capacity equal to the capacity of a water treatment plant or the MDD predicted within a planning period. Duplex pumping systems can be designed to alternate after each cycle to extend the life of the equipment. If future demands increase beyond the ability of a single pump, the second pump can serve as a lag pump in parallel to sustain higher flow rates during peak demand times.

Transmission Piping

The long distances and high replacement cost of the transmission lines warrant an analysis for demand beyond the normal 20-year period. The existing transmission lines must have the ability to handle at least the 20-year MDD. The capacity of the raw water and treated water transmission piping will be evaluated against the 20-year MDD.

Water Treatment Facility

Water treatment plants are typically designed to handle the 20-year MDD flow since these facilities can be expanded and typically have an overall design life of around 20 years. The existing treatment plant components will be evaluated against the 20-year MDD flow.

Treated Water Storage

The total treated water storage capacity must include reserve storage for equalization storage, emergency storage, and fire reserve. An alternative method to analyzing the treated water storage requirements suggests itemizing the potential requirements for treated water within the system. A discussion of these various needs follows.

Equalization Storage

Equalization storage is used to meet fluctuations of the supply capacity of the treatment plant and peak demand of the distribution system. Equalizing storage is typically 25 percent of the MDD of the water system.

Emergency Storage

To protect against a total loss of water supply such as would occur with a broken transmission main, a prolonged electrical outage, treatment plant breakdown, or source contamination emergency storage is required. The emergency storage reserve is set at one MDD or three Average Daily Demand (ADD). For the emergency storage calculations it was assumed that supply disruption will occur on a day of maximum demand and be corrected within 24 hours.

Fire Reserve Storage

To provide sufficient water for fire suppression in the water system fire reserve storage is utilized. The amount of fire reserve is based on the maximum flow and duration of flow needed to confine a major fire. Guidelines for determining the required fire flow and duration are generally determined using the "Fire Suppression Rating Schedule" by the Insurance Services Office (ISO) and/or the International Fire Code adopted by the State of Oregon. The needed fire flow and associated fire reserve storage dictated by these two methods can vary considerably.

The ISO needed fire flow is calculated using factors related to type of construction, type of occupancy, exposure to connected buildings, and building affective area. Using their formula a single wood framed dwelling totaling 2,400 square feet would require approximately, 1,000 gallons per minute (gpm) for two hours.

The 2014 Oregon Fire Code recommends fire flows of 1,000 gpm for a minimum of one hour; for one or two family dwellings not exceeding two stories in height or 3,600 square feet. Generally for rural residential dwellings, 500 gpm is utilized as a basis for fire flow suppression. Most residences within Heceta Water People's Utility District are less than 3,600 square feet. Therefore, for this study, the fire reserve storage required for residential areas will be calculated using fire flows of 1,000 gpm and duration of one hour.

Commercial and institutional buildings typically require higher fire flows with longer durations. Determination of these flows are unique to each building under consideration and will depend upon such factors as the square footage of the floor area, and the type of construction based on the International Building Codes (IBC) classifications.

Another important design parameter for reservoirs is elevation. Ideally, reservoirs should be located at similar elevations to allow hydraulic balance within the distribution system. Within a given service area, the need for altitude valves, check valves, Pressure Reducing Valves (PRVs), booster pumps, pumper trucks for extracting fire flows, and other control devices is reduced when a consistent water surface is maintained in all reservoirs. Distribution reservoirs should also be located at an elevation that maintains adequate water pressure throughout the system; sufficient water pressures at high elevations and reasonable pressures at lower elevations. The pressure range in the system should stay within the range of 25 to 100 pounds per square inch (psi) and never drop below 20 psi at any usage rate.

All of the above criteria will be used to evaluate the adequacy of existing storage and the need, if any, for future additional storage in Section 8.4.

Distribution System

Distribution mains are typically sized for fire flow and 20-year population demand, or fire flow and saturation development demand. The mains should be at least 6-inch diameter to provide minimum fire flow capacity. All pipelines should be large enough to sustain a minimum line pressure of approximately 25 psi. The State of Oregon requires a water distribution system be designed and installed to maintain a pressure of at least 20 psi at all service connections at all times. The distribution system must be sized to handle the peak hourly flows and to provide fire flows while maintaining minimum pressures.

In addition to the above design criteria, the following general guidelines are recommended for the design of water distribution systems.

- 6-inch diameter lines - minimum size lateral water main for gridiron (looped) system and dead-end mains.

- 6-inch diameter lines - minimum size for permanently dead-ended mains supplying fire hydrants and for minor trunk mains.

- 8-inch and larger diameter - as required for trunk (feeder) mains.

The distribution system lateral mains should be looped whenever possible. A lateral main is defined as a main not exceeding a 6-inch diameter, which is installed to provide water service and fire protection for a local area including the immediately adjacent property. The normal size of lateral mains for single-family residential areas is 6-inch diameter. However, 8-inch diameter or greater lateral mains may be required to meet both the domestic and fire protection needs of an area.

The installation of permanent dead-end mains and dependence of relatively large areas on a single main should be avoided. For the placement of a fire hydrant on a permanently dead-ended main, the minimum size of such laterals should be 6-inch diameter. However, 6-inch diameter mains may be used for a stub out not exceeding 500 feet in length supplying a single fire hydrant not on a public street and for internal fire protection. On new construction, the minimum size lateral main for supplying fire hydrants within public ways should be 6-inch diameter provided 6-inch diameter mains are looped.

A computer model of the distribution system was developed as part of this Water Master Plan. The model utilized actual pipe sizes, system configuration, and materials as well as system pipe junction elevations and storage tank elevations. A computer model of the District's distribution system was checked to determine the maximum flow rate available at various locations within the system. The model was developed using a software program called WaterCAD® (Version 8XM) offered by Haestad Methods.

The requirements for firefighting within the District were developed by consulting with the local Fire Chief and HWPUD personnel. For a detailed discussion of the distribution system performance and fire flow analysis, see Section 8.5.

District Interconnections

The District currently has two interconnections with the City of Florence. The interconnections are to receive and or supply water to and from the City of Florence in the event of an emergency. The District has established intergovernmental agreements for these interconnections.

7.3 Basis for Cost Estimates

The cost estimates presented in this Plan will typically include four components: construction cost, engineering cost, contingency, and legal and administrative costs. Each of the cost components are discussed in this section. The estimates presented herein are preliminary and are based on the level and detail of planning presented in this WMP. As projects proceed and as site-specific information becomes available, the estimates may require updating. System improvements that are recommended for the HWPUD are detailed in this section along with associated costs.

Construction Costs

The estimated construction costs in this Plan are based on actual construction bidding results from similar work, published cost guides, other construction cost experience, and material prices. Reference was made to the as-built drawings, and system maps of the existing facilities to determine construction quantities, elevations of the reservoirs and major components, and locations of distribution lines. Where required, estimates will be based on preliminary layouts of the proposed improvements.

Future changes in the cost of labor, equipment, and materials may justify comparable changes in the cost estimates presented herein. For this reason, common engineering practices usually tie the cost estimates to a particular index that varies in proportion to long-term changes in the national economy. The Engineering News Record (ENR) construction cost index is most commonly used. This index is based on the value of 100 for the year 1913. Average yearly values for the past ten years are summarized in Table 7.3.1.

TABLE 7.3.1
ENR CONSTRUCTION COST INDEX – 2007 TO 2018 (1)

Year	Index	Change
2018	11,061	3.03%
2017	10,737	3.85%
2016	10,338	2.83%
2015	10,054	2.53%
2014	9,806	2.71%
2013	9,547	2.57%
2012	9,308	2.62%
2011	9,070	3.08%
2010	8,799	2.67%
2009	8,570	3.13%
2008	8,310	4.32%
2007	7,966	2.77%
Average Annual %		**2.92%**

(1) Index based on July of each year at 20-city average labor rates and material prices.

Cost estimates presented in this Plan for construction performed should be projected with a minimum increase of three percent per year. Future yearly ENR indices can be used to calculate the cost of projects for their construction year based on the annual growth in the ENR index.

It is also recommended that in the event other public works projects are being performed in the same location, (i.e., sewer, street, storm, etc.), planning priority be given to combining these water projects with the projects at hand. By proceeding in this manner, the District will save money by eliminating repetitive mobilization, demolition, and road patching for the same locations.

Contingencies

A planning level contingency equal to approximately 15 percent of the estimated construction cost has been added. In recognition that the cost estimates presented are based on conceptual planning, allowances must be made for variations in final quantities, bidding market conditions, adverse construction conditions, unanticipated specialized investigation and studies, and other difficulties which cannot be foreseen at this time but may tend to increase final costs.

Engineering

The cost of engineering services for major projects typically includes special investigations, a predesign report, surveying, foundation exploration, preparation of contract drawings and specifications, bidding services, construction management, inspection, construction staking, start-up services, and the preparation of operation and maintenance manuals. Depending on the size and type of project, engineering costs may range from 15 to 25 percent of the contract cost when all of the above services are provided. The lower percentage applies to large projects without complicated mechanical systems. The higher percentage applies to small, complicated projects.

Additional engineering services may be required for specialized projects. This could include geotechnical evaluations, environmental reports, structural evaluations, and other specialized consulting activities.

Legal and Administrative

An allowance of seven percent of construction costs has been added for legal and administrative services. This allowance is intended to include internal project planning and budgeting, grant administration, liaison, interest on interim loan financing, legal services, review fees, legal advertising, and other related expenses associated with the project.

Land Acquisition

Some projects may require the acquisition of additional right-of-way or property for construction of a specific improvement. The need and cost for such expenditures is difficult to predict and must be reviewed as a project is developed. Efforts were made to include costs for land acquisition, where expected, within the cost estimates included in this Plan.

Environmental Review

In order for a project to be eligible for Federal and/or State grants and loans, a review of anticipated environmental impacts of the proposed improvements is required. The primary goal of the environmental review is to help public officials make decisions that are based on the understanding and consideration of the environmental consequences of their actions; and to take actions that protect, restore, and enhance the environment. To accomplish these tasks, the National Environmental Policy Act (NEPA) was promulgated. The NEPA requires Federal agencies or monies originating from Federal programs to either prepare or have prepared written assessments or statements that describe the:

- Effected environment and environmental consequences of a proposed project.
- Reasonable or practicable alternatives to the proposed project.
- Any mitigation measures necessary to avoid or minimize adverse environmental effects.

The environmental review will include one of the following four levels in the order of increasing complexity.

- Determination of categorical exclusion without an environmental impact or assessment report.
- Determination of categorical exclusion with an environmental impact or assessment report.
- Preparation of an environmental impact or assessment report.
- Preparation of an environmental impact statement.

Within this Plan, the cost for performing the anticipated environmental review was estimated for the projects to be financed with publicly financed grants and loans. The cost for the environmental review will be based on previous experience in preparing the required documents. If funding is obtained from a public funding agency, then the District will likely be required to submit some form of environmental report that examines the potential impact of the proposed improvements on local habitat and species. Review and approval by the affected agencies could take up to twelve months or more. Cost analysis for improvement projects did not include costs associated with the development of the Environmental Report.

Permitting

Permitting is important because many activities associated with constructing and maintaining the water system requires permits to comply with County, State, and Federal requirements for work within wetland areas or waterways. Typically, Oregon Division of State Lands and US Corps of Engineers are required in these instances. Compliance with storm water, erosion control, flood plain, and other various environmental requirements are often involved with the construction of transmission lines, raw water intakes, discharge facilities, raw and finished water reservoirs, and other items. Permits with various road system agencies may be necessary to install water lines within a road right-of-way. For the cost estimates prepared in this WMP, it was assumed that the General Contractor would bear the cost of all permitting. Therefore, no permitting costs are included in these estimations.

SECTION 8:
ANALYSIS AND IMPROVEMENT ALTERNATIVES

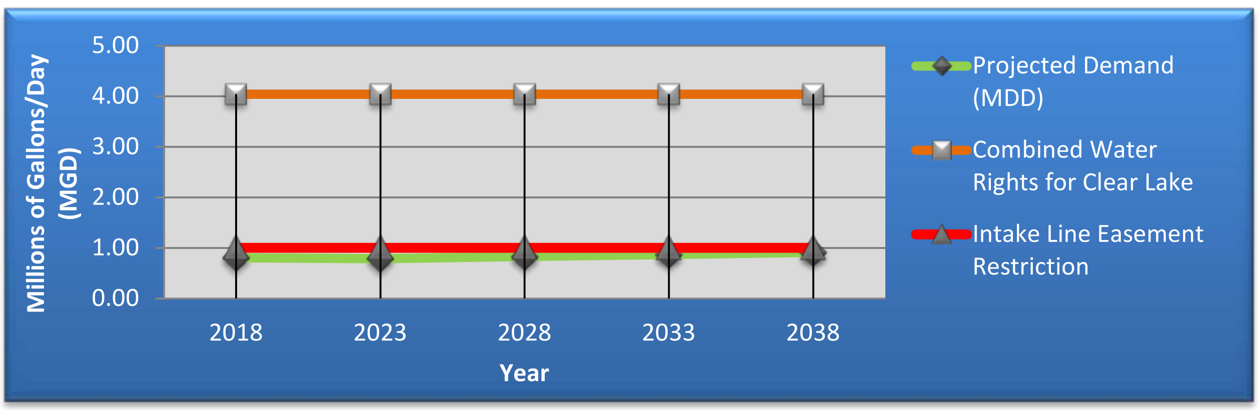
SECTION 8: **ANALYSIS AND IMPROVEMENT ALTERNATIVES**

This section of the Water Master Plan (WMP) presents detailed analyses of each major component within the system and where appropriate, provides an evaluation of proposed alternatives and recommended option(s). Cost estimates for the recommended improvements are given in the Capital Improvement Plan (see Section 9). Improvement phasing and potential impacts to ratepayers are discussed in Section 10.

8.1 Raw Water Sources and Water Rights

As presented in Section 5.1, the District has water rights for 6.25 cfs on Clear Lake. Based on the present and projected water demands discussed in Sections 6.2 and 6.3, the District has not had any difficulty in meeting its water requirements during the wet season months (November through April) because demand is low and the raw water supply is sufficient. The District is not anticipated to have any future difficulty in meeting projected water demands in the wet season months for the same reason. The most critical time for the District to obtain water is during the dry season months (June through October) when demand is high and the supply of raw water is limited. A plot of projected maximum daily demand versus time is presented in Figure 8.1.1.

FIGURE 8.1.1
RAW WATER MAX. DAILY DEMAND (MDD) AND DISTRICT WATER RIGHTS VS. YEAR



Based on the projected Maximum Daily Demand (MDD), the District's existing water rights on Clear Lake are sufficient to meet the District's demand through the planning period and well beyond.

Although the total Clear Lake water rights are sufficient to meet projected demands far into the future, due to easements, the current intake line is limited to one mgd. For the easement, this flow is sufficient to meet the demands through the planning period, but will become deficient shortly after. Alteration to the easement or development of an alternate intake alignment will be necessary in the years following 2038. The District should begin easement discussions with the County in the next five years. A copy of the easement for the raw water transmission main across County property is located in Appendix E.

8.2 Intake Improvements

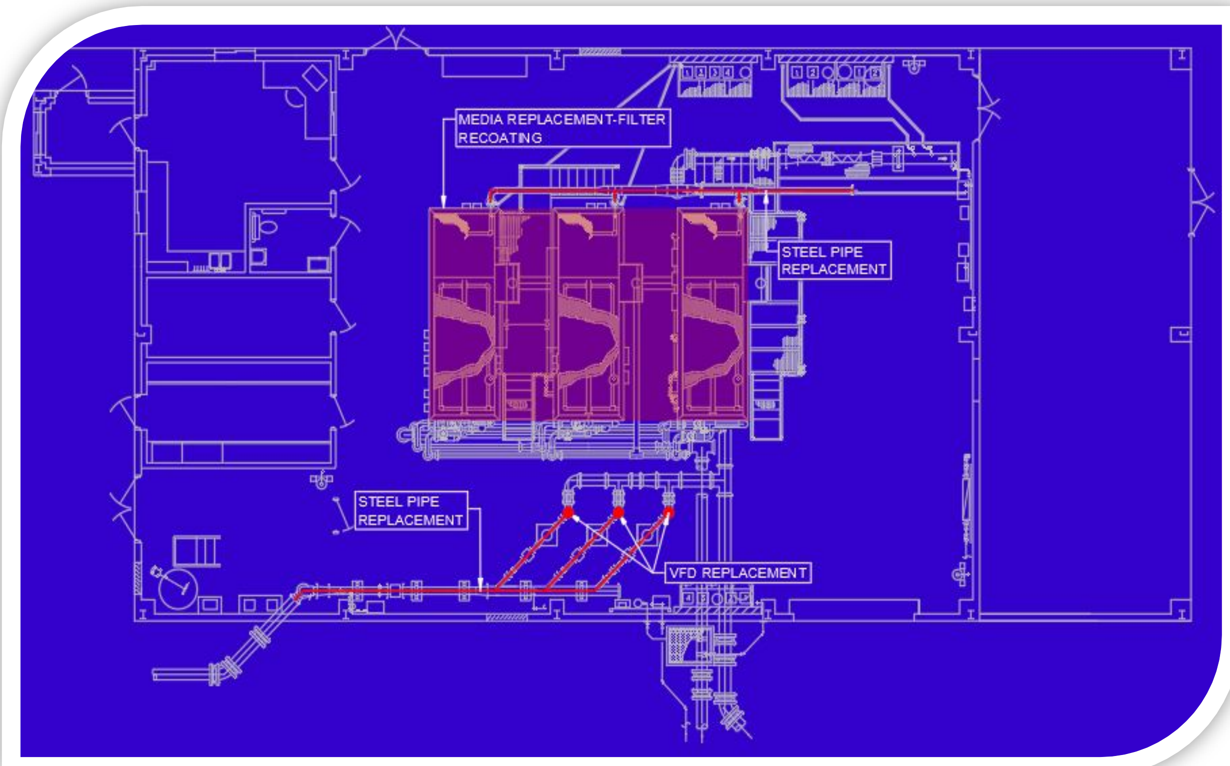
The Clear Lake raw water intake has the capacity to meet the supply demand through the planning period. Although the capacity of the intake system will not need to be increased, the pumps and other system components will reach the end of their typical service life during the planning period. Pumps and miscellaneous equipment will need to be replaced before the close of the planning period.

8.3 Water Treatment Facilities

Water Treatment Plant Operations and Building Improvements

Although the existing Water Treatment Plant (WTP) overall condition is good, there are some improvements that would increase the functionality of the facility. These specific improvements are based on the deficiencies listed in Section 5. Below is a list of recommended improvements. The WTP improvements are shown in Figure 8.3.1.

FIGURE 8.3.1
WATER TREATMENT PLANT RECOMMENDED IMPROVEMENTS



Media Replacement and Filter Coating: It has been six years since the media has been replaced within the filters. None of the filter tanks have been recoated since their installment. With the 20 year planning period the media will need to be replaced, and it is likely the filter tanks will need to be recoated within the planning period.

Effluent Piping: The stainless steel piping downstream of the WTP has begun developed pinholes that leak. This is a source of water loss that should be mitigated. The holes appear in the stainless steel above grade finished water piping within the WTP.

District Office Building Improvements

As discussed in Section 5 the District office is reaching the end of its intended design life. The inspection report has a list including 38 described deficiencies for the District office/shop complex. This includes, but is not limited to:

- Cracked concrete in shop area.
- Paint may contain lead.
- No hot water in shop sink.
- Shop doors do not work.
- Damaged and rotting exterior components: lights, trim, fascia, soffits, downspouts, windows, gutters, etc.
- The roof over halfway through its life cycle.
- Absence of current fire and carbon monoxide alarms.
- No insulations on the water pipes underground.
- Insulation in attic is matted down due to moisture and/or small animal activity.
- Foundation post and pier system is failing. The wood posts appear to be setting on small concrete piers. Several of the posts are rotting and no longer supporting the wood.
- Bathroom sink has no water.
- No heat in bathroom.
- No ventilation in bathroom.
- Bathroom does not meet ADA requirements.
- Electrical issues.
- Exterior hose bibs do not work.
- Due to the age of the building, the siding that needs to be replaced may contain asbestos.

Additionally the function of the building as an office could be greatly improved upon. Given the lacking functionality, associated health risk from lead paint and asbestos, and a significant number of deficiencies in the shop and office, full replacement of the complex is recommended.

Water Treatment Plant Capacity Improvements

The capacity of the WTP intake, treatment process, effluent pumps, and finished water pumps are 1.44 mgd, 1.0 mgd, 1.5 mgd, and 1.5 mgd respectively, while the 2038 MDD is projected to be 0.91 mgd. Therefore, there is no portion of the WTP that needs improvements based on capacity.

Service life and functionality are the drivers behind the recommended improvements at the WTP. Various components (pumps, filters, generator, etc) of the WTP will be reaching the end of their service life near the end of the planning period. These components will need to be replaced.

8.4 Treated Water Storage

The District currently has a total treated water storage capacity of 1,812,600 gallons.

All reservoirs are in fair to good condition. See Section 5 for further details. There is currently no need for reservoir replacement based on condition. Regular inspection and maintenance of each reservoir is required to extend the useful life of the infrastructure. The interior of each reservoir should be inspected every two to three years and deficiencies repaired as required. Based upon the last inspection report the Clear Lake, Collard Lake, and finished water reservoirs will need their interiors recoated within the planning period.

The District reservoirs are lacking cathodic protection and seismic valving. Currently, none of the storage tanks have these systems installed. The recommended improvements will include the installment of cathodic protection and seismic features on all existing reservoirs. See Section 10 for a development of the costs for and phasing of the recommended reservoir options.

Storage capacity is analyzed below to determine the need for any additional reservoirs.

Design Storage Capacity

As discussed in Section 7.2, there are three parameters used to determine the treated water storage requirements of a given water system. These parameters were defined as follows.

1. Equalization was set at 25 percent of MDD.

2. Emergency storage was set at one MDD (Treated water pumped to District).

3. Fire flow was set at 3,000 gpm for a two hour duration.

The MDD for the individual reservoir assessments was based on the MDD per capita, and the population served in each service area.

Storage evaluations were conducted for each reservoir, as well as the combined system. This method assures the each area served by the individual reservoirs has sufficient fire protection under gravity flow conditions. The District has many Pressure Reducing Valves (PRVs) throughout the distribution system that allow water from the upper reservoirs to drain down to the lower pressure zones when fire flows are being withdrawn from the system. This increases the effective available storage in the lower service area. Table 8.4.1 shows the analysis of the individual storage tanks, while Table 8.4.2 shows the combined system assessment.

TABLE 8.4.1
STORAGE TANK FIRE FLOW ASSESSMENTS

Reservoirs	Storage Deficiency (Million Gallons)				
	2018	2023	2028	2033	2038
Clear Lake	-0.20	-0.21	-0.25	-0.29	-0.36
Sutton Lake	0.48	0.47	0.46	0.45	0.44
Mercer Lake	0.34	0.33	0.33	0.32	0.31
Enchanted Valley	-0.05	-0.05	-0.06	-0.06	-0.06

"-" Denotes insufficient storage

TABLE 8.4.2
ENTIRE SYSTEM FIRE FLOW ASSESSMENTS

Parameter/Year	2018	2023	2028	2033	2038
Water Demand (MGD)					
MDD	0.81	0.87	0.91	0.87	0.91
Necessary Storage (MG)					
Emergency Storage (1 x MDD)	0.81	0.87	0.91	0.87	0.91
Equalization (.25 x MDD)	0.20	0.22	0.23	0.22	0.23
Fire Reserve (4500 GPM @ 2 Hours)	0.54	0.54	0.54	0.54	0.54
Total Required Storage	1.55	1.63	1.68	1.63	1.68
Storage Assessmant (MG)					
Existing Storage	1.82	1.82	1.82	1.82	1.82
Surplus Storage	0.27	0.19	0.13	0.19	0.13

Recommended Storage Capacity Improvements

Table 8.4.1 shows that both the Clear Lake and the Enchanted Valley service areas are lacking fire storage. However, as mentioned above, the higher level service areas can convey water to the Clear Lake service area through PRVs. This negates any need for additional storage within the Clear Lake service area.

The Enchanted Valley service areas distance from the WTP and the existing 6-inch line running to its location prohibits the use of a fire flow pump to boost the pressures and provide fire flows. To address this issue, a new reservoir would need to be constructed providing sufficient storage. There is minimal land available for placement of a larger storage tank, so this option is not viable.

Another alternative for addressing the storage deficiencies in the Enchanted Valley Service area is replacing the 6-inch water line along Mercer Lake Rd. with a 12-inch pipe, and installing a fire flow pump at the Enchanted Valley Pump Station. The larger water line will minimize pressure losses through the water line under high flow conditions, and allow 1,000 gpm to be drawn through the 12-inch line without dropping system pressures below 20 psi.

8.5 Pump Stations

The pump stations within the District are responsible for conveying water from the low level service area to their respective water reservoirs. The exception to this is the raw water intake pump station. Including the raw water intake there are three pump stations.

Pumping Station Assessments

The viability of the District's existing pumping systems is analyzed by examining the condition of the pump stations, and their capacity relative to the demands of the system. All the pump stations capacities versus projected demands are shown in Table 8.5.1. The condition of the pump stations is discussed in Section 5.

TABLE 8.5.1
PUMP CAPACITY VS. MAXIMUM DAILY DEMAND

Station	Current MDD (gallons per day)	Current MDD (gpm)	2037/2038 MDD (gallons per day)	2037/2038 MDD (gpm)	Current PS Capacity (gpm)
Clear Lake Intake PS	806,000	560	914,630	635	1000
Plant Finished Water Pumps	748,000	519	848,813	589	1000
Sutton Lake PS	131,778	92	160,794	112	200
Collard Lake PS	83,038	58	103,359	72	240
Enchanted Valley PS	8,304	6	10,336	7	50

Pump Station Improvements

Table 8.5.1 demonstrates that all the pump stations have adequate capacity to meet the maximum daily demands. Other factors discussed below outline the reasoning for pump station improvements.

Sutton Lake Pump Station

The Sutton Lake Pump Station was constructed in 1974 and due to its age the pump station is in need of replacement. In 2005 one of the two pump control panels was replaced. The other control panel still needs to be replaced. The pumps have been rebuilt on several occasions, and are well past their intended service life. The two pumps within the pump station pump at different flow rates. The 36-inch clearance between electrical panels and pump and piping components required for maintenance does not exist. Due to the alignment of the access hatch and the pumps, removing a pump is laborious and awkward. This process presents an opportunity for an accident to occur. The pump station is currently manually operated with no Supervisory Control and Data Acquisition (SCADA) control. This pump station is in need of replacement, and is currently under design with construction scheduled for the summer of 2019.

Enchanted Valley Pump Station

Currently the pump station is in poor condition, and in need of replacement. Additionally, the Enchanted Valley service area does not have sufficient fire flow coverage. One alternative to providing flow would be to add a fire flow pump to the Enchanted Valley Pump Station. In order to achieve fire flows the 8 and 6 inch line extending from US Highway 101 to the pump station would need to be replace with a 12 inch water line.

8.6 Distribution System

A hydraulic model was utilized to assist in evaluating the capability of the District's existing water system in providing proper water flows (primarily fire flow) to selected areas. The basis for and results from the hydraulic model along with proposed water distribution system improvements are discussed below.

AC Pipe Replacement

The distribution system was primarily constructed in the 1960s, and is therefore beyond its design service life. Although these components are not currently creating large problems for the District, the number of pipe system failures will increase as time continues if these components are not replaced. The Asbestos Cement (AC) pipes needing upsizing to meet fire flow requirements; this should take priority when replacing AC water lines.

Hydraulic Modeling

With the advent of computer hydraulic models, an entire municipal water system can be mathematically analyzed with respect to existing hydraulic characteristics and "what if" scenarios. The mapping, calibration, and analysis of the District's water distribution system using a computer hydraulic model are discussed below.

The existing distribution piping network was evaluated with a computer model; specifically, WaterCAD software by Haestad Methods. WaterCAD is a state-of-the art software tool primarily used in the analysis and modeling of water distribution systems. This program employs mathematical algorithms based on hydraulic principles to predict system pressures and flow rates within a water system. Fire flows are of particular interest since the magnitude of these flows dictates the necessary hydraulic capacity of the water system.

Mapping

The District provided a map of the existing distribution system in an AutoCAD 2016 format. Elevation data of the District was determined using Google Earth, and County GIS contours. The contours were, transferred into AutoCAD format, and overlaid on the existing distribution system piping map. In addition to the District's existing maps, as-builts for subdivisions and water improvements constructed after 2008, plans for the District's WTP, Sutton Lake Rd. and Mercer Lake Rd. were also consulted and utilized in developing an overall base map.

Calibration of Computer Model

Information on the current operating parameters of the distribution system were entered into the computer model. Input parameters included daily system flows, pump flow rates, flow curves, and operating pressures at pump stations and water treatment plants. User demand was more or less allocated evenly to each node of the existing system. A more refined allocation of the demand is not necessary based upon the projected user demand, even at peak flows, is substantially less than fire flow requirements.

A model is a representation of an existing system used to predict the behavior of the system based upon real changes. A model is only useful if it can be calibrated and validated. The accuracy of the model output with existing conditions was checked or calibrated using water pressures and flows observed and collected in the field by the District's fire department. The hydraulic model solves for pressures and flows available in the main lines and not from hydrants. Pressures were calibrated for the system first by adjusting friction factors until the pressures in the model closely approximated measured pressures in the real system. In general, calibration is within approximately plus or minus ten percent; which is considered a reasonable level of accuracy given the uncertainties in the model data.

Hydraulic Analysis of the Existing System

The existing distribution system was modeled using a hydraulic computer modeling software. This model included current piping, pump stations, reservoirs, and water treatment plant. The model contained 333 pipe elements and 254 nodes or junctions. Due to adequate system pressures and a relatively well-looped distribution network, hydraulic performance of the system is adequate in most areas. Residual pressures of 20 psi were used as a constraint on the system. This is a requirement of the Oregon Health Authority. Greater fire flows may be attained due to the lack of this constraint in the physical system.

Performance of the distribution system with respect to maximum available fire flow capabilities was specifically examined at selected vital areas within the District that were identified with the assistance of the District's Fire Department staff. The locations examined were chosen for a number of reasons including potential fire suppression, representation of a portion of the District, and identification of potentially undersized lines. The actual fire flow requirements for each of these vital areas were determined using the 2018 International Fire Code, and compared to the available fire flow.

The fire flow model was ran with the requirement of maintaining minimum residual pressures of 20 psi throughout the system during a fire flow event. A map displaying existing fire hydrant locations can be found in Figure 8.6.1. Existing fire flows throughout the District are shown in Figure 8.6.2.

Fire Flow Water Line Improvements

Based on the results from the computer hydraulic model, and discussions with District Staff, several proposed improvements were identified for the District's distribution system. These proposed improvements are discussed below.

Sharktail Drive

Residences at the east end of Joshua Lane, and the southeast end of Sharktail Drive are lacking sufficient fire flows. To address this, the 6-inch water line starting at the 4th Ave. and Joshua Lane intersection to the southeast end of Sharktail Drive need to be replaced with a 8-inch water line.

Bay Berry Drive

Several of the residences along Knoll Way and Sand Dune Park Dr. do not currently have sufficient fire flows. By upsizing the water line along Bay Berry Dr. from a 6-inch to 8-inch line, and upsizing the water line along Knoll Way from a 2-inch to an 8-inch line, the area will have sufficient fire flows to meet State requirements. This improvement would require approximately 2,300 linear feet of pipe.

Heceta Beach Road

The Driftwood Shores Resort and Conference Center is a commercial complex that is required to have a fire flow of 2,200 gpm. Assuming MDD, the fire flow at the hydrant in front of the resort is 1,100 gpm. To achieve 2,200 gpm, the 10-inch water line running from the intersection of Heceta Beach Rd. and US Highway 101 to the intersection of Heceta Beach Rd. and Falcon St. would need to be upsized to a 14-inch pipe. Upsizing this water line will increase the fire flows throughout the Heceta Beach area.

Mercer Lake Road

The Enchanted Valley residential area currently has no means of reaching required fire flows. To achieve this, a larger storage tank would be required, or a fire flow pump would need to be added to the pump station. Due to limited space, a larger reservoir is not an option. If a fire flow pump was added with the current piping configuration, the pump would experience cavitation. To increase the supply to the pump station enough to facilitate fire flows a 12-inch line extending along Mercer Lake Road, from US Highway 101 to the Enchanted Valley Pump Station would need to be constructed.

Rustic Lane Replacement and Loop

Several of the residences along the southeast fork of Rustic Ln. do not currently have sufficient fire flows. By looping the Rustic Ln. water line with a 10-inch extension, the fire flows will be increased sufficiently to meet local requirements. Looping would require approximately 2,000 linear feet of 10-inch pipe.

View Road

The fire flows in the southern regions of the area served by the Collard Reservoir are lacking due to the 6-inch pipe extending from the reservoir. In order to meet the residential fire flow requirements of 1,000 gpm, the diameter of this pipe needs to be increased. This pipe would extend from Collard storage tank along View Rd. to the intersection of View Rd. and Chapman Rd. North. This pipe would need to be upsized to a 12-inch water line.

Fire flow Improvement Impacts

A WaterCAD model was developed with the recommended fire flow improvements. Fire flows at the critical areas within the system were re-evaluated. Figure 8.6.3 displays the District's fire flows following the completion of the recommended projects.

8.7 SCADA System

The HWPUD SCADA system is comprised of several radio telemetry units located at each reservoir and pump station sites as well as the intake and WTP. These units are primarily powered by solar energy collected via solar panels. This system was installed in 2015 and was intended to automate the pump stations, and deliver real time system information back to the WTP.

Since its installment, the SCADA system has experienced continual failures, and does not currently function as intended. Below is a list of deficiencies, or lacking control features.

Sutton Lake Reservoir: The radio signal from the reservoir to the WTP is delayed and inaccurate. Currently there is no signal to the Sutton Lake Pump Station. The solar power supply is not functioning and the signal to the WTP is delayed and inaccurate.

Mercer Lake Reservoir: The radio signal from the reservoir to the WTP is delayed and inaccurate. Currently there is no signal to Mercer Lake Pump Station.

Enchanted Valley Reservoir: The radio signal from the reservoir to the WTP is delayed and inaccurate. Currently there is no signal to the Enchanted Valley Pump Station.

Sutton Lake Pump Station: The pump station is currently operated manually based upon elevation of Sutton Lake Reservoir. The pump station cannot be operated from the WTP, or with a control system using reservoir elevation data.

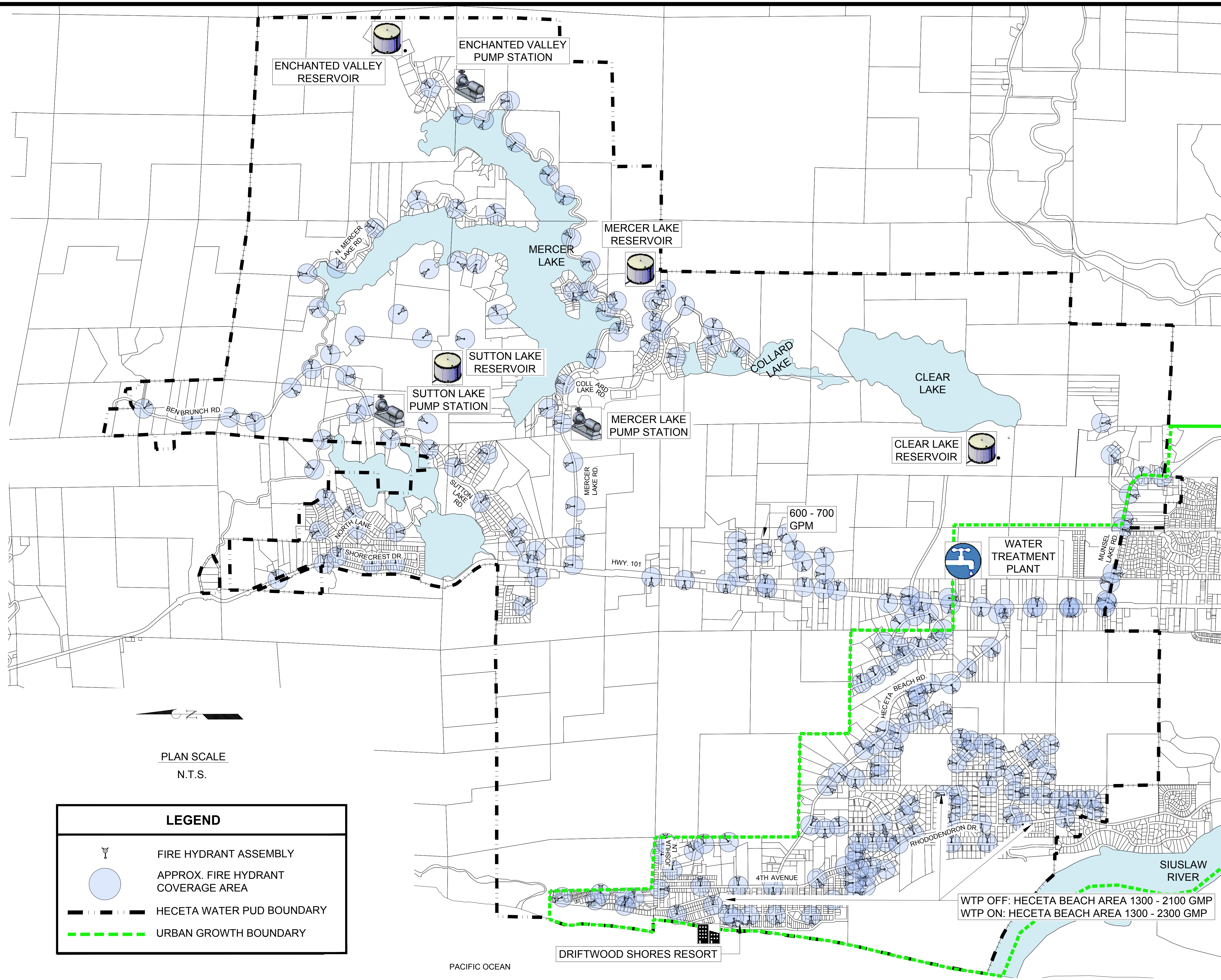
Mercer Lake Pump Station: The pump station is currently operated manually based upon elevation of Mercer Lake Reservoir. The pump station currently does not receive any operating signal from the WTP or elevation data from the reservoir. However, when those systems are in place, the pump station will be able to operate automatically using the reservoir elevations, or remotely from the WTP.

Enchanted Valley Pump Station: The pump station is currently operated manually based upon elevation of Sutton Lake Reservoir. The pump station cannot be operated from WTP, or with a control system using reservoir elevation data.

HECETA WATER PUD WATER MASTER PLAN

FIRE HYDRANT MAP

FIGURE NO. **8.6.1**



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DATE: JULY, 2019

PROJECT NO.: 188.05

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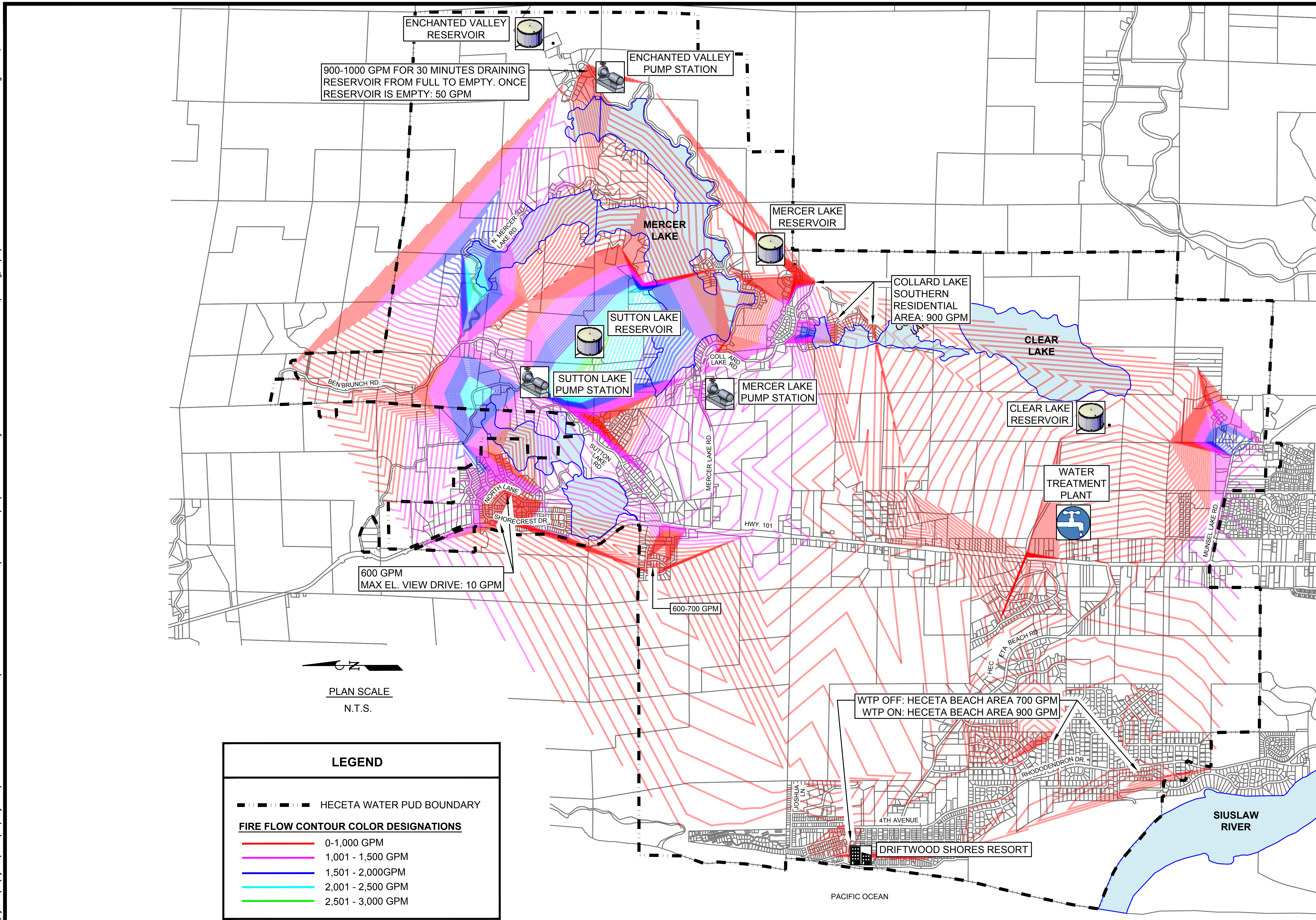

FIGURE NO. **8.6.2**

HECETA WATER PUD WATER MASTER PLAN

FIRE FLOW MAP-EXISTING DISTRIBUTION SYSTEM

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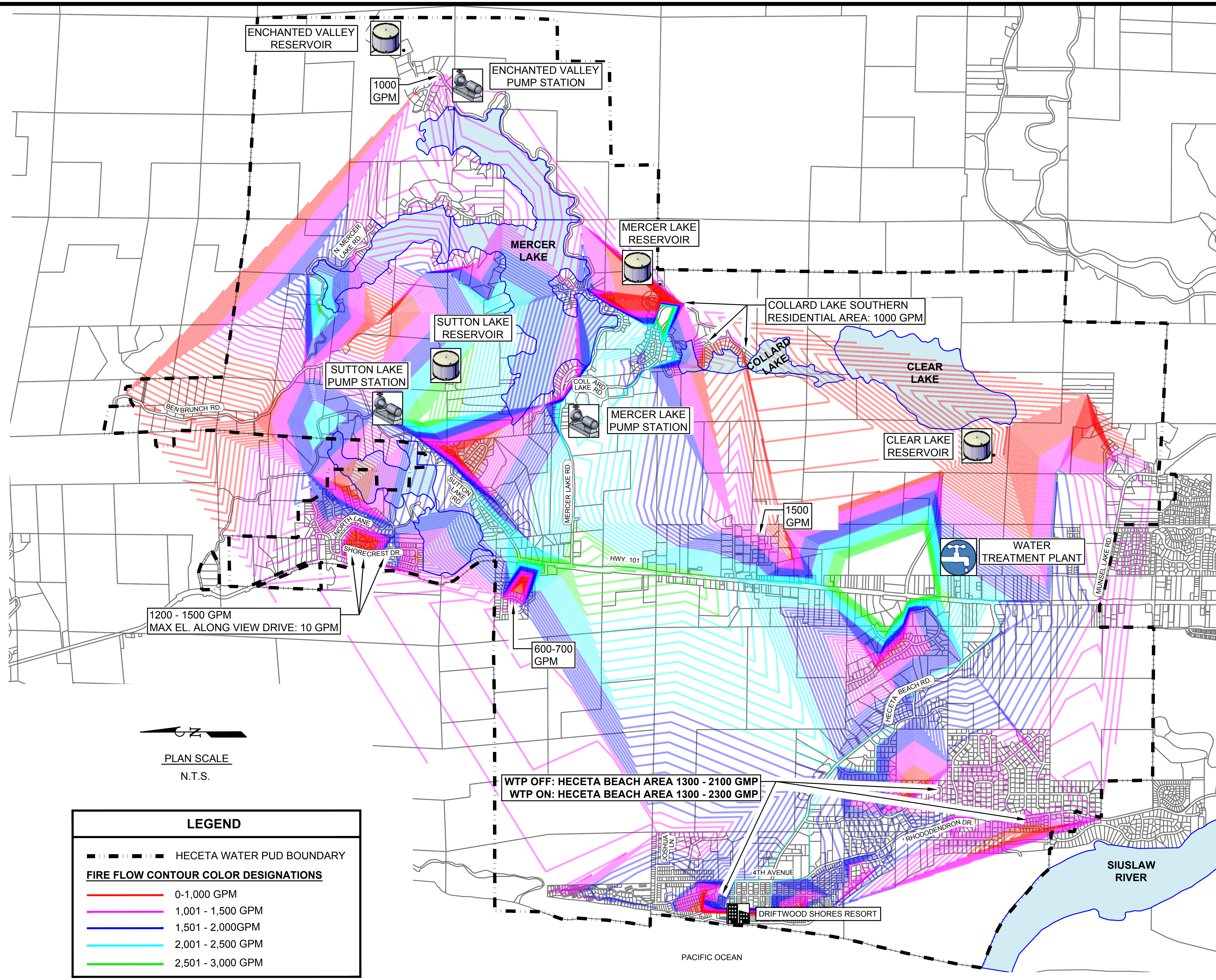

FIGURE NO. 8.6.3

HECETA WATER PUD WATER MASTER PLAN

FIRE FLOW MAP-PROPOSED DISTRIBUTION SYSTEM

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DATE: JULY, 2019

PROJECT NO.: 188.05

SECTION 9:

SEISMIC RISK ASSESSMENT & MITIGATION PLAN

SECTION 9: **SEISMIC RISK ASSESSMENT AND MITIGATION PLAN**

The Heceta Water People's Utility District (HWPUD) will be required to develop a seismic risk assessment and mitigation plan. According to Oregon Administrative Rules (OAR) 333-061-0060-5-A-J: A seismic risk assessment and mitigation plan for water systems fully or partially located in areas identified as VII to X using the Map of Earthquake and Tsunami Damage Potential for a Simulated Magnitude 9 Cascadia Earthquake. The HWPUD lies in a level IX area and therefore is required to develop this documentation.

The primary seismic threat in this region is the Cascadia Subduction Zone. This is a 680-mile long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of four centimeters (cm) per year. Over the last 5,400 years numerous large earthquakes have occurred within this zone with an average interval of 500 years. The last recorded event was 1700 A.D. If the next large scale earthquake occurs within the average interval, another large scale event is expected by 2200 A.D.

The average time between magnitude 9+ Cascadia earthquakes is approximately 530 years with a standard deviation of 221 years. The average time between magnitude 8+ Cascadia earthquakes is approximately 240 years with a standard deviation of 119 years. Data suggests that a large earthquake is possibly overdue. Large seismic events will have major impacts to the District's water supply and distribution system. The District's reservoirs and system may be damaged and or lose the ability to store water after a large earthquake event.

The Seismic risk assessment must:

- Identify critical facilities capable of supplying key community needs: including fire suppression, health and emergency response, and community drinking water supply points.

- Identify and evaluate the likelihood and consequences of seismic failures for each critical facility.

The mitigation plan may:

- Encompass a 50-year planning horizon.

- Include recommendations to minimize water loss from each critical facility, capital improvements, or recommendations for further study or analysis.

9.1 Critical Facilities

The HWPUD primarily serves residential areas; therefore the critical facilities to which it supplies water are minimal. Currently the critical facilities are limited to the Siuslaw Valley Fire and Rescue (SVFR) Fire Station, and the District's treatment and distribution facilities. These facilities are listed and described below.

Sutton Station #4 Fire Station. The SVFR provides fire protection to the District's users. This is done via the Sutton Station #4 Fire Station. The building is a metal framed structure with cement hardi-plank covering the exterior of the building. The majority of the building is one large bay in which the fire trucks are stored while not being used. The structure was constructed in 2013 and shows no visible signs of loss in structural integrity. It was designed to withstand wind and snow loads, but not a seismic event.

District Raw Water Intake. The District's raw water supply is pumped to the Water Treatment Plant (WTP) through the raw water intake. The intake building housing the raw water pumps is constructed of CMU Block and sits on a concrete slab. The pumps are mounted on a skid and connected to ductile iron raw water piping. There are currently no signs of structural failure or decay. This building was not designed specifically to withstand seismic loads.

District WTP. The fresh water drinking supply comes from the District Water Treatment Plant. The building that houses the treatment plant is a metal framed structure with sheet metal covering the exterior of the building. The majority of the building is one large open area in which the treatment units are located. The other rooms within the facility are the office, bathroom, mechanical room, and electrical room. The chemical areas are currently in the open area with the treatment units. The WTP was constructed in 2002, and shows no visible signs of structural failure or compromise other than the corrosion of the roof girders on the exterior section of the building. The structure was designed to withstand wind and snow loads, but not a seismic event.

District Reservoirs. The District currently has four reservoirs. Two are welded steel, one is stainless steel, and one is concrete. These reservoirs are described in detail in Section 5. With the exception of the Enchanted Valley Reservoir, none of the District's reservoirs are currently equipped with seismic anchoring or valving, and all but the Enchanted Valley Reservoir are at least 40 years old. The Enchanted Valley Reservoir is equipped with seismic anchoring. None of the tanks are showing visible signs of structural failure or compromise, but given their age, these may be developing below the surface.

9.2 Likelihood of Seismic Failures

All critical facility locations lie in a Level 8 or 9 damage area as specified by the Department of Geology and Mineral Industries (DOGAMI) Map of Earthquake and Tsunami Damage Potential. Additionally, these facilities were all designated as having a very high risk for seismic hazards by O-HELP. The O-HELP is a program developed by Oregon State University to display seismic hazards and ground deformation hazard ratings for given addresses. It is interactive map found at http://ohelp.oregonstate.edu/. O-Help reports for the WTP and Sutton Station #4 can be found in Appendix G.

There is a high probability that seismic failure will occur at most of the critical facilities in the event of a large-scale seismic event. The contributing factors are lacking seismic design, and in some cases aged structures that may be more prone to structural failure. These conclusions are not obtained from structural analysis, and should be further investigated to provide the District with a better idea of where their seismic mitigation efforts should be placed. The Capital Improvement Plan will include structural investigation to all critical facilities.

9.3 Consequences of Seismic Failures

The potential consequences resulting from seismic failure at each of the critical facilities are discussed below.

Sutton Station #4 Fire Station. If the Sutton Station #4 suffered a seismic failure resulting with the entrapment of the fire engines within the building wreckage, there is a potential that the District could be left without any protection from fires. During a large-scale seismic event, fires are common, and without a means of combating fire, considerable damage to properties and human life could occur.

District Raw Water Intake. In the event of seismic failure at the raw water intake, the WTPs ability to continue to produce water would cease. Although the system would still have stored water in the tanks for emergency use, no additional water would be available to the users within the District. Once the emergency source was depleted the District would have no means to fight fires, or provide water to its users. This would pose a health risk to the community.

District WTP. In the event of seismic failure at the WTP, the production capabilities of the plant would be compromised. Given that there is redundancy in many of the WTP components it is possible that the damage may not shut down the WTP completely, but rather limit its capacity. If the structural failure did cause complete shutdown or minimizes the capacity so much that the demand greatly exceeds the supply, the District will eventually be left without water to fight fires, and to keep its users hydrated. This would pose a health risk to the community.

District Reservoirs. In the event that any of the reservoirs or associated piping experienced seismic failure it is likely that the reservoirs could no longer provide water to their service area. Based upon the arrangement of Pressure Reducing Valves (PRVs) throughout the District water system it is possible for the higher level tanks to provide water to the lower level service areas. This has both its advantages and disadvantages. The ability of the system to supply water to areas that have a failed reservoir is a benefit. However, as the service areas are all linked through PRVs, a large leak in the lowest service area could eventually drain all the upper tanks if immediate action is not taken to close valves, and repair the leak or leaks.

Depending on the degree of seismic failure in a tank, or its associated piping, water loss may occur, and/or the flows from the tank may be limited or cut off entirely. If the outlet or inlet pipe is broken near the perimeter of the reservoir, before the isolation valve, the entire reservoir could be drained, as could any upper service levels connected to the tank. This would leave the users with no emergency water source to fight fires or hydrate users. This would pose a health risk to the community.

9.4 Seismic Mitigation Plan

The District recognizes the threat of being located so close to the Cascadia Subduction Zone. Currently, the District has limited information on the ability of their system to withstand a large seismic event. Current system assessments have been the result of visual inspections by District Staff, and non-structural engineers. Before the District can develop a refined plan to mitigate all the known threats within their system, more evaluations need to be completed that will determine: all structural failure points, the potential for these failures to occur, and the structural improvements that would minimize any impacts due to a large-scale seismic event. It is recommended that the District develop a schedule for the evaluations of their critical facilities, and develop a seismic mitigation priority list. Funds for the evaluations should be added to the District budget, and the evaluations should be completed within the next five years.

In addition to further evaluations, we recommend the District add the construction of seismic actuated valving at each reservoir to their current mitigation plan. These projects and associated cost estimates will be discussed further in Section 10.

SECTION 10:

CAPITAL IMPROVEMENT PLAN

SECTION 10: **CAPITAL IMPROVEMENT PLAN**

10.1 Background

A Capital Improvement Plan (CIP) is a long-term plan for replacement of existing or installation of new infrastructure required to improve a system's function or maintenance. The CIP, for water systems, provides the District Staff, and residents with a systematic approach to dealing with its short-term and long-term infrastructure needs and demands.

Under ORS 223.309(1), a capital plan, public facilities plan, master plan or comparable plan must be prepared before the adoption of System Development Charges (SDCs). This plan must list the capital improvements that may be funded with improvement fee revenues and include the estimated cost and timing of each improvement. Oregon Revised Statutes discuss which improvements may be funded by SDC revenues (ORS 223.307) and what types of projects qualify for credit purposes. The Capital Improvement Plan may be modified at any time pursuant to ORS 223.309 (2).

Water system improvements recommended in the District are provided in this Plan along with associated costs. The recommended improvements for the District's Capital Improvement Plan were derived from the analysis presented in Sections 8 and 9.

10.2 Project Improvement Priorities

The project priorities are ranked from Priority 1 through Priority 4, with Priority 1 being the highest priority projects. The numbering sequence in each classification group does not dictate the priority order of the project. Each classification group is loosely defined as follows:

Priority 1: These are the highest priority projects that should be undertaken as soon as adequate funding is available. It is recommended that these projects be undertaken within the next five years with the highest projects on the list to be addressed in the next year or two.

Priority 2: These projects have significant priority and should be in the District's capital improvement planning schedule beyond the five-year timeline. As Priority 1 projects are completed, Priority 2 projects should be upgraded to Priority 1 status. System degradation or failures, project coordination, or other occurrences may require the movement of Priority 2 projects to Priority 1 status ahead of schedule. New projects that are developed that are not critical should be grouped in Priority 2 until funding is available.

Priority 3: Priority 3 projects are either of low priority or are dependent on development. If development in an area necessitates the implementation of a Priority 3 Improvement, the project should be moved to Priority 1 status, assuming that adequate funding is available. Some projects may remain in Priority 3 indefinitely if the need for the project or the development requiring it never arises.

Priority 4: Priority 4 projects are the lowest priority projects that are dependent upon development and or funding. These projects are long term projects that would improve water supply or fire flows in areas, however the improvements cost to improvement ratio is low, meaning the benefit of the improvement to the system is low when compared to the cost of the improvement. These projects should be monitored and evaluated as long term and or significant developments occur. There is not urgency to construct or start these projects until Priority 1 through 3 projects are complete; and only if the cost to improvement ratio is warranted upon further review and analysis.

The priority of each improvement was presented and discussed with District Staff. The estimates presented are preliminary and are based on the level and detail of planning presented in this Water Master Plan (WMP). As projects proceed and as site-specific information becomes available, the estimates may require updating.

Compilation of an Environmental Report is typically a requirement of government organizations funding infrastructure improvements. The purpose of this Environmental Report is to consider any adverse effects that the project may have on the surrounding environment and propose mitigation measures to minimize these impacts. The estimated cost for compiling an Environmental Report for each phase was included in this WMP.

A brief description and cost estimate for each project provided on the following pages. Detailed cost estimates for the CIP project are located in Appendix D.

Priority 1 Improvements

Priority 1 Improvements include improvements to: the Water Treatment Plant (WTP), District office, distribution piping, pump station, reservoir seismic systems, and the Supervisory Control and Data Acquisition (SCADA) system. Priority 1 Improvements also include an easement/water line locate project.

Project Descriptions

1. WTP Improvements (Approx. Cost: $588,000)

Given the age of the WTP, there are pieces of equipment that require maintenance or replacement. This project addresses those issues. This project would include removal and replacement of finished water pump Variable Frequency Drives (VFDs), outdated controls, effluent steel piping, filter media in all treatment units and recoating of treatment units interior. The District is currently testing the filter media.

2. District Office Building and Shop Replacement (Approx. Cost: $551,000)

This project would include the removal of the existing District office building, development of temporary office facilities, and construction of a new office building. The new office should contain a breakroom, two offices, a conference room, an entrance-sitting room, and two bathrooms. Given the space requirements, it is recommended that the new office be 1,500 square feet. The dimensions for the detached shop/garage structure are 30 x 100 feet. A depiction of this improvement is given in Figure 10.2.1.

FIGURE 10.2.1
DISTRICT OFFICE BUILDING IMPROVEMENTS

3. SCADA Improvements (Approx. Cost: $96,000)

Currently the District's SCADA system is in disrepair. There are pump stations that are no longer automated because the SCADA system is failing to send the required data. As a result District Staff have to manually operate these pump stations.

This project would include installing a hard-wired SCADA/telemetry system designed to relay reservoir elevations, pump station status, and intrusion alarm signals to the WTP. Additionally, all pump stations would be controlled by their respective reservoir levels, and could also be remotely controlled from the WTP. Controls at the intake pump would remain as currently configured.

4. Driftwood Shores Water Line Improvement (Approx. Cost: $3,639,000)

In order to provide fire flow to Driftwood Shores and meet anticipated growth in the area, approximately 12,600 feet of 10-inch Asbestos Cement (AC) water line needs to be replaced with 14-inch water line from the intersection of Heceta Beach Rd. and US Highway 101 to the intersection of Heceta Beach Rd. and Falcon Street. In addition to pipe removal and new pipe construction, this improvement would require numerous service, fire hydrant, and valve and fitting replacements.

Currently the City of Florence is exploring the expansion of their sewer system into this area. Should sewer be extended into this area, growth may increase substantially, and the need and timing for the project should be re-evaluated.

5. Enchanted Valley Pump Station Improvement Phase I (Approx. Cost: $256,000)

The Enchanted Valley Pump Station was originally constructed in 1973. In 2005 one of the two pumps and control panel were replaced in the pump station. The replacement pump was not a match to the existing pump, and therefore the pump station does not have complete redundancy. This project will include replacement of the Enchanted Valley Pump Station with a packaged pump station housed in a fiberglass enclosure.

A summary of Priority 1 Improvements is shown in Table 10.2.1.

TABLE 10.2.1
SUMMARY OF PRIORITY 1 WATER SYSTEM PROJECTS

No.	Project Description	Est. Cost ($)
1	WTP Improvements: Project No. 1	$588,000
2	District Office and Shop Replacement: Project No. 2	$551,000
3	SCADA Improvements: Project No. 3	$96,000
4	Driftwood Shores Water Line Improvements: Project No. 4	$3,639,000
5	Enchanted Valley PS: Project No. 5	$256,000
Priority 1 Projects Total		$5,130,000

Priority 2 Improvements

Priority 2 Improvements of this WMP represent important projects that require addressing once the Priority 1 Improvements have been addressed and financing is available. These improvements are discussed in detail below.

Project Descriptions

6. AC Pipe Replacement (Approx. Cost: $12,921,000)

The existing AC pipe within the District's water system needs to be replaced. There is considerable AC pipe within the District and therefore it may be costly to replace all water lines in one project. Therefore the AC pipe replacement was broken into several priority projects. Once the priority projects are completed the District should replace the remaining AC pipe as needed based upon condition. The priority projects and associated costs are shown in Table 10.2.2. Figure 10.3.1 displays the location of the priority projects and gives a brief description. Figure 10.2.2 shows the AC Pipe Replacement Projects.

Please note that the District is currently performing leak detection as part of the normal yearly inspection budget and the priorities of AC replacement projects will change upon review of the leak inspections and data from the water lines.

HECETA WATER PUD WATER MASTER PLAN

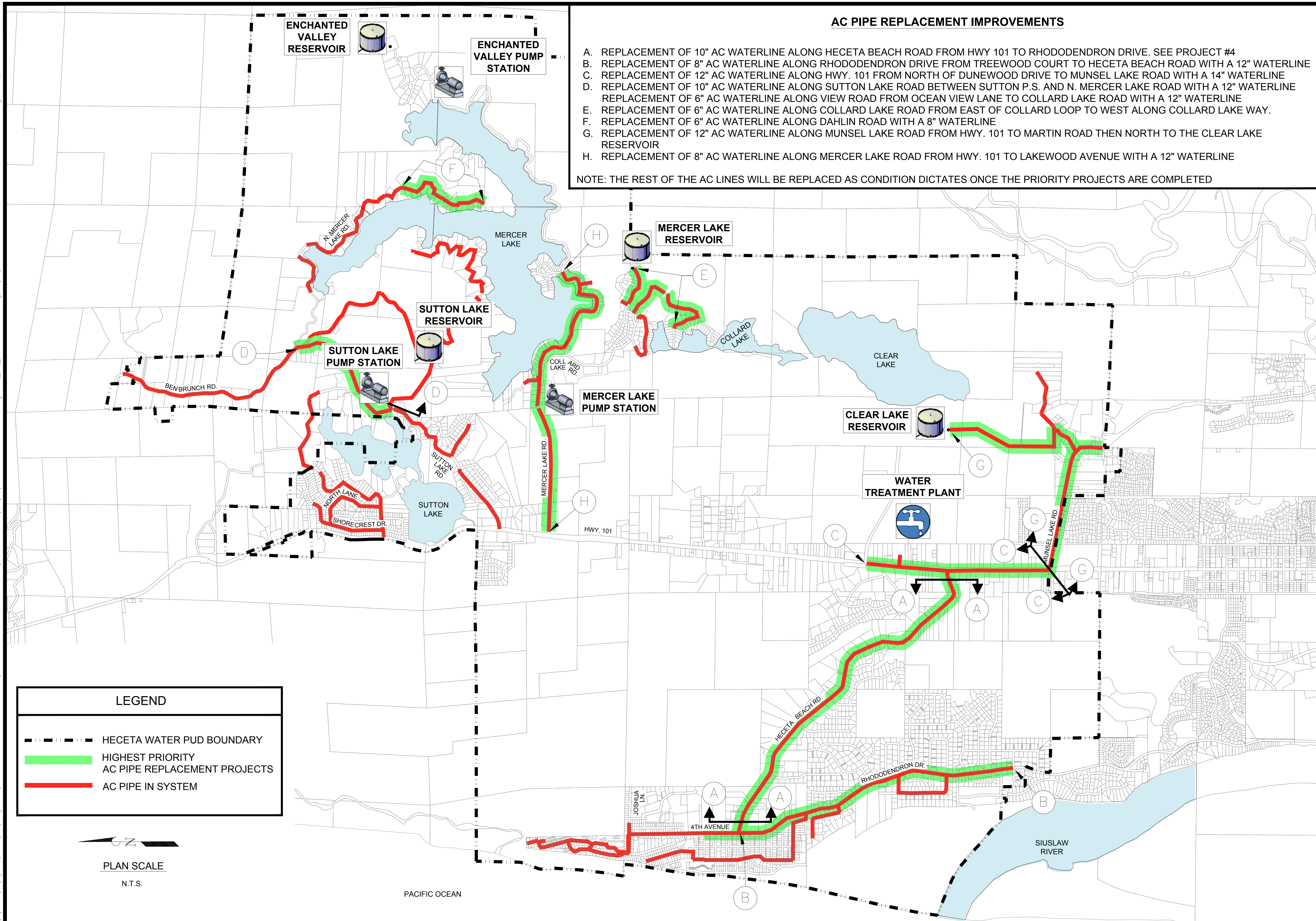
AC PIPE REPLACEMENT PROJECTS

FIGURE NO. 10.2.2

AC PIPE REPLACEMENT IMPROVEMENTS

A. REPLACEMENT OF 10" AC WATERLINE ALONG HECETA BEACH ROAD FROM HWY 101 TO RHODODENDRON DRIVE. SEE PROJECT #4
B. REPLACEMENT OF 8" AC WATERLINE ALONG RHODODENDRON DRIVE FROM TREEWOOD COURT TO HECETA BEACH ROAD WITH A 12" WATERLINE
C. REPLACEMENT OF 12" AC WATERLINE ALONG HWY. 101 FROM NORTH OF DUNEWOOD DRIVE TO MUNSEL LAKE ROAD WITH A 14" WATERLINE
D. REPLACEMENT OF 10" AC WATERLINE ALONG SUTTON LAKE ROAD BETWEEN SUTTON P.S. AND N. MERCER LAKE ROAD WITH A 12" WATERLINE
REPLACEMENT OF 6" AC WATERLINE ALONG VIEW ROAD FROM OCEAN VIEW LANE TO COLLARD LAKE ROAD WITH A 12" WATERLINE
E. REPLACEMENT OF 6" AC WATERLINE ALONG COLLARD LAKE ROAD FROM EAST OF COLLARD LOOP TO WEST ALONG COLLARD LAKE WAY.
F. REPLACEMENT OF 6" AC WATERLINE ALONG DAHLIN ROAD WITH A 8" WATERLINE
G. REPLACEMENT OF 12" AC WATERLINE ALONG MUNSEL LAKE ROAD FROM HWY. 101 TO MARTIN ROAD THEN NORTH TO THE CLEAR LAKE RESERVOIR
H. REPLACEMENT OF 8" AC WATERLINE ALONG MERCER LAKE ROAD FROM HWY. 101 TO LAKEWOOD AVENUE WITH A 12" WATERLINE

NOTE: THE REST OF THE AC LINES WILL BE REPLACED AS CONDITION DICTATES ONCE THE PRIORITY PROJECTS ARE COMPLETED



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DATE: JULY, 2019
PROJECT NO.: 188.05

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TABLE 10.2.2
AC REPLACEMENT IMPROVEMENT COST EST. SUMMARY

AC Replacement Cost Est. Summary	
Reservoir Name	**Cost Est.**
A-Rhododendron Drive	$1,926,000
B-Hwy. 101 North	$987,000
C-Hwy. 101 South	$1,483,000
D-Sutton Lake Drive	$2,612,000
E-Collard Lake Improvements	$905,000
F-Dahlin Road	$567,000
G-Munsel Lake Road to Clear Lake Reservoir	$2,284,000
H-Mercer Lake Road	$2,157,000
TOTAL	$12,921,000

Note: Heceta Beach Road: Project 5 has significant amounts of AC pipe and replacement and is not included with this project.

7. US Highway 101 Water Line Improvements (Approx. Cost: $224,000)

There is currently a section of 12-inch AC pipe along US Highway 101, north of Driftwood Drive that extends west off the highway, then north, then east back onto US Highway 101. This run of pipe was originally placed beyond the edge of the US Highway 101 right of way. A portion of the line is in a marshy area, and another section of this pipe is partially exposed due to grading. This project will include removal and replacement of 900 feet of 12-inch pipe, service reconnections, and fire hydrant replacements.

8. Reservoir Improvements (Approx. Cost: $1,335,000)

This improvement would address the reservoirs lacking seismic and cathodic protection, as well as maintaining the interior coatings of the reservoirs. The seismic improvements would enable the reservoir and associated piping to withstand the impacts of a large seismic event without compromising the stored water within the reservoirs. These improvements will include outfitting the reservoirs with seismic actuated valves, and flex-joint fittings. Adding cathodic protection and recoating the interior of the tanks will reduce the impacts of corrosion on the reservoir, and increase the life cycle of the structure. Sutton Lake Reservoir will not require cathodic protection, or interior coating.

The total estimate amounts for each reservoir are shown in Table 10.2.3. The Sutton Lake Reservoir Seismic Improvement project includes replacement of the 10-inch AC water line between the reservoir and Sutton Pump Station. This improvement will not protect the concrete foundation of the reservoirs. Additional structural analysis would need to be completed to assess the ability of the concrete slabs floors to withstand a large seismic event.

TABLE 10.2.3
RESERVOIR IMPROVEMENT COST EST. SUMMARY

Reservoir Improvements	
Reservoir Name	**Cost Est.**
Collard Lake Reservoir	$499,000
Clear Lake Reservoir	$409,000
Sutton Lake Reservoir	$427,000
Total	**$1,335,000**

A summary of the Priority 2 Improvements is given in Table 10.2.4.

TABLE 10.2.4
SUMMARY OF PRIORITY 2 WATER SYSTEM PROJECTS

No.	Project Description	Est. Cost ($)
6	AC Pipe Replacement	$12,921,000
7	Hwy. 101 Water Line Improvements	$224,000
8	Reservoir Improvements	$1,335,000
Priority 2 Projects Total		$14,480,000

Priority 3 Improvements

Priority 3 Improvements of this WMP represent important projects that require addressing once the Priority I and 2 Improvements have been addressed and financing is available. These improvements are discussed in detail below.

Project Descriptions

9. View Road Improvement (Approx. Cost: $270,000)

The fire flows in the Mercer Reservoir service area are low. To address this issue the pipe extending from Collard storage tank along View Rd. to the intersection of View Rd. and Chapman Rd. north should be upsized from 6-inch to 12-inch water line. This project would include the construction of approximately 1,200 lineal feet of 12-inch water line. This project would also improve the resilience of the water line to damage in the event of a seismic event.

10. Hydrant Replacement (Approx. Cost: $120,000 annually)

Many of the existing hydrants within the District were put in place during the original development of the distribution system in the 1960s. These hydrants, and those installed in the next couple of decades have reached the end of their life cycle, and should be replaced. The project includes the replacement of 20 hydrants a year. Alternatively this project could be phased, and an annual budget could be provided for replacing a designated amount of hydrants each year. Fire hydrant replacements cost approximately $6,000 per hydrant. Hydrant replacement cost per year would be $120,000.

A summary of the Priority 3 Improvements is given in Table 10.2.5.

TABLE 10.2.5
SUMMARY OF PRIORITY 3 WATER SYSTEM PROJECTS

No.	Project Description	Est. Cost ($)
9	View Road Improvement	$270,000
10	Hydrant Replacement	$120,000
Priority 3 Projects Total		$390,000

Priority 4 Improvements

Priority 4 Improvements of this WMP represent important projects that require addressing once the Priority 1, 2, and 3 Improvements have been addressed and financing is available. These improvements are discussed in detail below.

Project Descriptions

11. Sharktail Drive Water Line Improvements (Approx. Cost: $545,000)

Residences at the east of Joshua Lane, and the southeast end of Sharktail Drive are lacking sufficient fire flows. To address this, the 6-inch water line starting at the 4th Ave. and Joshua Lane intersection to the southeast end of Sharktail Drive need to be replaced with 8-inch water line. This project would include approximately 2,000 feet of 8-inch water line, 26 service reconnections, and three fire hydrant replacements.

12. Enchanted Valley Pump Station Improvement Phase II (Approx. Cost: $5,017,000)

In order to provide fire flow to the Enchanted Valley Reservoir service area, a 12-inch line would need to be installed along Mercer Lake Rd. from US Highway 101 to the pump station. Also, a fire flow pump would need to be added to the pump station. This project includes replacement of 19,300 feet of 6-inch to 8-inch water line with 12-inch line along Mercer Lake Road. Additionally the project will include installment of an Enchanted Valley Pump Station fire flow pump, numerous service reconnections and fire hydrant replacements. Further planning and is recommended for this project due to the potential for stale water at the end of the Enchanted Water Reservoir area.

A summary of the Priority 4 Improvements is given in Table 10.2.6.

TABLE 10.2.6
SUMMARY OF PRIORITY 4 WATER SYSTEM PROJECTS

No.	Project Description	Est. Cost ($)
11	Sharktail Drive Water Line Improvements	$545,000
12	Enchanted Valley PS Phase II	$5,017,000
Priority 4 Projects Total		$5,562,000

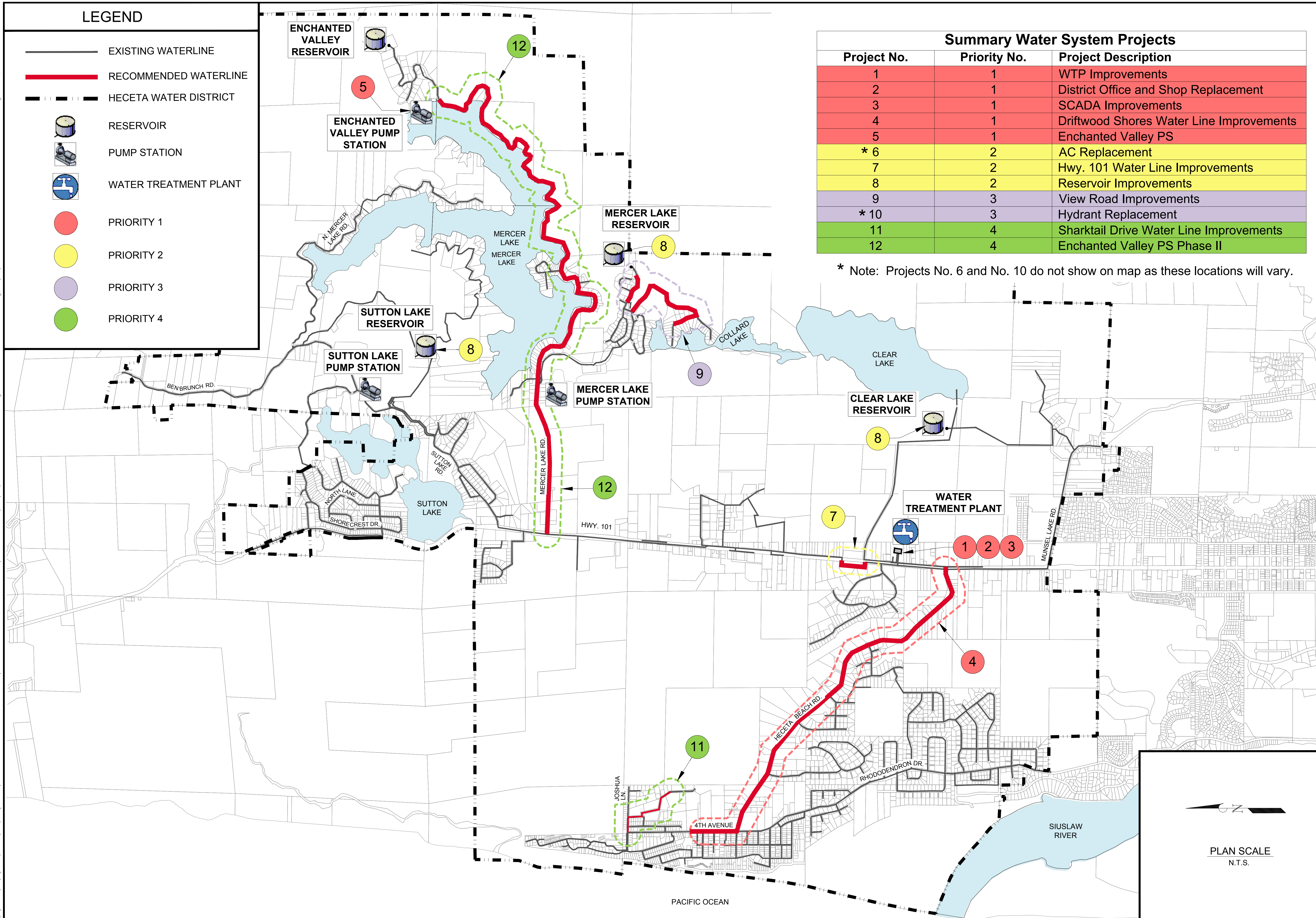
10.3 Summary of Improvements

A summary of all the project priorities and costs of the recommended capital improvements (Priority 1 through 4) is provided in Table 10.3.1. A map showing the distribution improvements is given in Figure 10.3.1.

TABLE 10.3.1
PROJECT PRIORITIES AND COSTS

No.	Project Description	Est. Cost ($)
Summary of Priority 1 Water System Projects		
No.	**Project Description**	**Est. Cost ($)**
1	WTP Improvements: Project No. 1	$588,000
2	District Office and Shop Replacement: Project No. 2	$551,000
3	SCADA Improvements: Project No. 3	$96,000
4	Driftwood Shores Water Line Improvements: Project No. 4	$3,639,000
5	Enchanted Valley PS: Project No. 5	$256,000
Priority 1 Projects Total		$5,130,000
Summary of Priority 2 Water System Projects		
No.	**Project Description**	**Est. Cost ($)**
6	AC Pipe Replacement: Project No. 6	$12,921,000
7	Hwy. 101 Water Line Improvements: Project No. 7	$224,000
8	Reservoir Improvements: Project No. 8	$1,335,000
Priority 2 Projects Total		$14,480,000
Summary of Priority 3 Water System Projects		
No.	**Project Description**	**Est. Cost ($)**
9	View Road Improvement: Project No. 9	$270,000
10	Hydrant Replacement	$120,000
Priority 3 Projects Total		$390,000
Summary of Priority 4 Water System Projects		
No.	**Project Description**	**Est. Cost ($)**
11	Sharktail Drive Water Line Improvements: Project No. 11	$545,000
12	Enchanted Valley PS Phase II: Project No. 12	$5,017,000
Priority 4 Projects Total		$5,562,000
Total Cost of all Priorities and All Projects		**$25,562,000**

Note: Projects No. 6 and No. 10 do not show on map as these locations will vary.



Summary Water System Projects		
Project No.	Priority No.	Project Description
1	1	WTP Improvements
2	1	District Office and Shop Replacement
3	1	SCADA Improvements
4	1	Driftwood Shores Water Line Improvements
5	1	Enchanted Valley PS
* 6	2	AC Replacement
7	2	Hwy. 101 Water Line Improvements
8	2	Reservoir Improvements
9	3	View Road Improvements
* 10	3	Hydrant Replacement
11	4	Sharktail Drive Water Line Improvements
12	4	Enchanted Valley PS Phase II

* Note: Projects No. 6 and No. 10 do not show on map as these locations will vary.

FIGURE NO. 10.3.1

HECETA WATER PUD WATER MASTER PLAN

RECCOMENDED SYSTEM IMPROVEMENTS

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019
PROJECT NO.: 188.05

SECTION 11:

IMPROVEMENT PHASING AND FINANCING

SECTION 11: **IMPROVEMENT PHASING AND FINANCING**

11.1 Grant and Loan Programs

Outside funding assistance, in the form of grants or low interest loans, will be necessary to make some of the proposed improvements affordable to the residents of the Heceta Water People's Utility District (HWPUD). The amount and types of outside funding will dictate the amount of local funding the District will have to secure. In evaluating grant and local programs, the major objective is to select a program, or a combination of programs, which are most applicable and available for the intended project.

A brief description of the major federal and state funding programs, which are typically utilized to assist qualifying communities in the financing of major water system improvement programs, is given below. Each of the government assistance programs has particular prerequisites and requirements. With each program having its specific requirements, not all communities or projects may qualify for each of these programs.

Economic Development Administration Public Works Grant Program

The Economic Development Administration (EDA) Public Works Grant Program, administered by the U.S. Department of Commerce, is aimed at projects which directly create permanent jobs or remove impediments to job creation in the project area. Thus, to be eligible for this grant, a community must be able to demonstrate the potential to create jobs from the project. Potential job creation is assessed with a survey of businesses to demonstrate the prospective number of jobs that might be created if the proposed project was completed.

Proposed projects must be located within an EDA-designated Economic Development District. Priority consideration is given to projects that improve opportunities for the establishment or expansion of industry and projects that create or retain private sector jobs in both the near term and long term. Communities, which can demonstrate that the existing system is at capacity (i.e. moratorium on new connections), have a greater chance of being awarded this type of grant. The EDA grants are usually in fifty percent or less of the project cost; therefore some type of local funding is also required. Grants typically do not exceed one million dollars.

Rural Water Loans and Grants

The Rural Development Administration (Rural Development) manages the loans and grants for water programs that were formerly overseen by the Farmers Home Administration. While these programs are administered by a new agency, the program requirements are essentially the same. The Rural Utilities Service (RUS) is one of three entities that comprise the US Department of Agriculture's (USDA) Rural Development mission area. The RUS supports various programs that provide financial and technical assistance for development and operation of safe and affordable water supply systems.

Rural Development has the authority to make loans to public bodies and non-profit corporations to construct or improve essential community facilities, including water systems. Grants are also available to applicants who meet the Median Household Income (MHI) requirements. While eligible applicants must have a population less than 10,000, priority is given to public entities in areas smaller than 5,500 people to restore a deteriorating water conveyance system, or to improve, enlarge, or modify a water facility. Preference is also given to requests that involve the merging of small facilities and those serving low-income communities.

In addition, borrowers must meet the following stipulations:

- Be unable to obtain needed funds from other sources at reasonable rates and terms.

- Legal capacity to borrow and repay loans, to pledge security for loans, and to operate and maintain the facilities or services.

- Financially sound and able to manage the facility effectively.

- Financially sound facility based on taxes, assessments, revenues, fees, or other satisfactory sources of income to pay all facility costs including Operation and Maintenance (O&M), and to retire the indebtedness and maintain a reserve.

- Water and waste disposal systems must be consistent with any development plans of state, multi-jurisdictional area, county, or municipality in which the proposed project is located. All facilities must comply with federal, state, and local laws including those concerned with zoning regulations, health and sanitation standards, and the control of water pollution.

  Loan and grant funds may be used for the following types of improvements:

- Construct, repair, improve, expand, or otherwise modify waste collection, conveyance, treatment, storage, or other disposal facilities.

- Legal and engineering costs connected with the development of facilities, and other costs associated with facility development including the acquisition of right-of-way and easements, and the relocation of roads and utilities.

- Water and waste disposal systems must be consistent with any development plans of state, multi-jurisdictional area, county, or municipality in which the proposed project is located. All facilities must comply with federal, state, and local laws including those concerned with zoning regulations, health and sanitation standards, and the control of water pollution.

- Finance facilities in conjunction with funds from other agencies or those provided by the applicant.

Interim commercial financing will normally be used during construction and Rural Development funds will be available when the project is completed. If interim financing is not available or if the project cost is less than $50,000, multiple advances of Rural Development funds may be made as construction progresses.

The maximum term on all loans is 40 years. However, no repayment period will exceed any statutory limitation on the organization's borrowing authority, nor the useful life of the improvement of the facility to be financed. Interest rates are set quarterly and are based on current market yields for municipal obligations. Current interest rates may be obtained from any Rural Development office.

The following rates currently apply for the Rural Development program:

> ***Market Rate.*** Those applicants pay the market rate whose MHI of the service area is more than the $53,270 (Oregon non-metropolitan MHI). The market rate is currently 3.375 percent.

Intermediate Rate. Those applicants whose MHI of the service area is between $42,616 through $53,270 (eighty percent of the State MHI) pay the lowest rate. The intermediate rate is paid by those applicants whose MHI of the service area is less than eighty percent of the Oregon non-metropolitan MHI.

Poverty Line Rate. Those applicants whose MHI of the service area is below $42,616 (eighty percent of the State MHI) pay the lowest rate. Improvements must also be required by a governing agency to correct a regulatory violation or health risk. The current poverty line rate is 2.25 percent.

The grants are calculated on the basis of eligible costs that do not include the costs attributable to reserve capacity or interim financing. In addition, grant funds cannot be used to reduce total user costs below that of comparable communities funded by RUS.

TABLE 11.1.1
RURAL DEVELOPMENT GRANT FUNDS/INTEREST RATES

Median Household Income (MHI)	Maximum Grant (a)	Interest Rate (b)
<$42,616	75%	2.35%
$42,616 - $53,270	45%	3.25%
>$53,270	0%	4.00%

(a) MHI<42,616 may be considered for a grant up to 75% of eligible project cost if the project is needed to alleviate a health or sanitary problem.
(b) Rates are current as of October of 2018.

Eligibility for the Rural Water and Waste Disposal grants and loans is currently based on 2016 Census data. The 2016 MHI for Lane County is $45,222. At this MHI, HWPUD may be eligible for a maximum grant of up to 45 percent. The remaining 55% of the funding package would be a loan at 2.75 percent.

Other restrictions and requirements may be associated with these loans and grants. If the District becomes eligible for grant assistance, the grant will apply only to eligible project costs and is only available after a District has incurred long-term debt resulting in an annual debt service obligation equal to one-half of one percent of the MHI. To receive a Rural Utilities Service Loan, the District must secure bonding authority, usually in the form of General Obligation or Revenue Bonds.

Applications for financial assistance are made at area offices of Rural Development. For additional information on Rural Development loans and grant programs, call 1-541-673-0136 or visit the RUS website at http://www.rurdev.usda.gov/UWEP_HomePage.hmtl. The Oregon Rural Development website is http://www.rurdev.usda.gov/OR_Home.html.

Technical Assistance Grants (TAG)

Available through the USDA RUS as part of the water and waste disposal programs, technical assistance grants are intended to provide technical assistance to associations on a wide range of issues relating to the delivery of water and waste disposal services.

Rural communities with populations of less than 10,000 persons are eligible along with private, nonprofit organizations that have been granted tax-exempt status by the Internal Revenue Service (IRS). Technical Assistance Grant funds may be used for the following activities:

- Identify and evaluate solutions to water and/or waste-related problems for associations in rural areas.
- Assist entities with preparation of applications for water and waste disposal loans and grants.
- Provide training to association personnel in order to improve the management, operation and maintenance of water and/or waste disposal facilities.
- Pay expenses related to providing the technical assistance and/or training.

Grants may be made for up to 100 percent of the eligible project costs. Applications are filed with any USDA Rural Development office. For additional information on Rural Development loans and grant programs, call 1-541-673-0136 or visit the RUS website at http://www.rurdev.usda.gov/UWP-wwtat.htm.

Oregon Community Development Block Grant (CDBG) Program

The Community Development Block Grant Program (CDBG) section of the Infrastructure Finance Authority (IFA) administers the CDBG Program. Grants and technical assistance are available to develop livable urban communities for persons of low and moderate incomes by expanding economic opportunities and providing housing and suitable living environments.

Non-metropolitan cities and counties in rural Oregon can apply for and receive grants. Oregon Tribes, urban cities (Ashland, Bend, Corvallis, Eugene, Gresham, Hillsboro, Medford, Portland, Salem and Springfield) and counties (Clackamas, Multnomah, Washington) receive funds directly from HUD. This would only be a funding option if the County was involved with the funding process.

All projects must meet one of three national objectives:

- The proposed activities must benefit low and moderate income individuals.
- The activities must aid in the prevention or elimination of slums or blight.
- There must be an urgent need that poses a serious and immediate threat to the health or welfare of the community.

Funding amounts are based on:

- The applicant's need;
- The availability of funds; and
- Other restrictions defined in the program's guidelines.

The following are the maximum grants possible for any individual project, by category:

- Economic Development: $750,000
- Microenterprise: $100,000
- Public Works

  - Water and Wastewater Improvements: $2,500,000 except preliminary/engineering planning grants: $150,000
  - Downtown Revitalization: $400,000
  - Offsite Infrastructure: $225,000
- Community/Public Facilities: $1,500,000
- Community Capacity/Technical Assistance: no specific per-award-limit but limited overall funds
- Emergency Grants: $500,000
- Regional Housing Rehabilitation: $400,000
- Emergency Projects: $500,000

For additional information on the CDBG programs, call 1-866-467-3466 or visit the IFA website at http://www.orinfrastructure.org/Infrastructure-Programs/CDBG/ttp://www.orinfrastructure.org/Learn-About-Infrastructure-Programs/Interested-in-a-Community-Development-Project/Community-Development-Block-Grant/**.**

Oregon Special Public Works Fund

The Special Public Works Fund (SPWF) provides funds for publically owned facilities that support economic and community development in Oregon**.** Special Public Works Funds provide funding for construction and/or improvement of infrastructure needed to support industrial, manufacturing and certain types of commercial development. Funds are available to public entities for:

- Planning;
- Designing;
- Purchasing;
- Improving and constructing publically owned facilities;
- Replacing publically owned essential community facilities; and
- Emergency projects as a result of a disaster.

Public agencies that are eligible to apply for funding are:

- Cities;
- Counties;
- People's Utility District;
- County service districts (organized under ORS Chapter 451);

- Tribal councils;
- Ports;
- Districts as defined in ORS 198.010; and
- Airport districts (ORS 838).
- Facilities and infrastructure projects that are eligible for funding are:
- Airport facilities;
- Buildings and associated equipment;
- Restoration of environmental conditions on publically owned industrial lands;
- Port facilities, wharves and docks;
- The purchase of land, rights-of-way and easements necessary for a public facility;
- Telecommunications facilities;
- Railroads;
- Roadways and bridges;
- Solid waste disposal sites;
- Storm drainage systems; and
- Water and wastewater systems.

Loans
Loans for development (construction) projects range from less than $100,000 to $10 million. The Infrastructure Finance Authority offers very attractive interest rates that reflect tax-exempt market rates for highly qualified borrowers. Current SPWF interest rates for borrowers that do not qualify is 3.97 percent (December 2018). Initial loan terms can be up to 25 years or the useful life of the project, whichever is less.

Grants
Grants are available for construction projects that create or retain trade sector jobs. They are limited to $500,000 or 85 percent of the project cost, whichever is less. The grants are based on up to $5,000 per eligible job created or retained. As this grant is dependent on job creation, it is not ideal for municipal water infrastructure projects.

Limited grants are available to plan industrial site development for publically owned sites and for feasibility studies. For additional information on IFA programs, call 1-503-986-0123 or visit the IFA website at: http://www.orinfrastructure.org/Learn-About-Infrastructure-Programs/Interested-in-a-Community-Development-Project/Special-Public-Works-Fund/**.**

Water/Wastewater Financing Program

Water/wastewater financing is available for construction and/or improvement of water and wastewater systems to meet state and federal standards. This loan program funds the design and construction of public infrastructure needed to ensure compliance with the Safe Drinking Water Act or the Clean Water Act.
The public entities that are eligible to apply for the program are:

- Cities;
- Counties;
- People's Utility District;
- County service districts (organized under ORS Chapter 451);
- Tribal councils;
- Ports; and
- Special districts as defined in ORS 198.010.

The proposed project must be owned and operated by a public entity as listed above. Allowable funded project activities may include:

- Reasonable costs for construction improvement or expansion of drinking water system, wastewater system or stormwater system;
- Water source, treatment, storage and distribution;
- Wastewater collection, treatment and disposal facilities;
- Storm water system;
- Purchase of rights-of-way and easements necessary for construction;
- Design and construction engineering; or
- Planning/technical assistance for small communities.

To be eligible for funding:

- A system must have received, or is likely to soon receive, a Notice of Non-Compliance by the appropriate regulatory agency or is for a facility plan or study required by a regulatory agency; and
- A registered Professional Engineer will be responsible for the design and construction of the project.

Funding and Uses
Loan and grant amounts are determined by a financial analysis of the applicant's ability to afford a loan (debt capacity, repayment sources, and other factors).

Loans
Program guidelines, project administration, loan terms and interest rates are similar to the Special Public Works Fund program. The maximum loan term is 25 years or the useful life of the infrastructure financed, whichever is less. The maximum loan amount is $10 million per project through a combination of direct and/or bond-funded loans. Recently IFA, was offering lower, reduced interest rates for municipalities whose household income is less than the statewide median income. The current (December 2018) terms of this loan are for 25 years at 3.97 percent interest.

Loans are generally repaid with utility revenues or voter-approved bond issues. A limited tax general obligation pledge also may be required. "Creditworthy" borrowers may be funded through the sale of state Revenue Bonds.

Grants
Grant awards up to $750,000 may be awarded based on a financial review.

An applicant is not eligible for grant funds if the applicant's annual MHI is equal to or greater than 100 percent of the state average MHI for the same year.

Funding for Technical Assistance
The Infrastructure Finance Authority offers technical assistance with financing for municipalities with populations of less than 15,000. The funds may be used to finance preliminary planning, engineering studies, and economic investigations.

Technical assistance projects must be in preparation for a construction project that is eligible and meets the established criteria.

- Grants up to $20,000 may be awarded per project.
- Loans up to $50,000 may be awarded per project.

Interested applicants should contact the Oregon Business Development Department (OBDD) prior to submitting an application. Applications are accepted year-round.

Safe Drinking Water Revolving Loan Fund (SDWRLF)

Each year the State of Oregon Health Authority receives an allotment from the federal government for the Safe Drinking Water Revolving Loan Fund. The funds along with a twenty percent State match are used to make low interest loans to finance needed drinking water system improvements. Funds may be used for the following types of activities:

Planning
Master Plans, pilot studies, and feasibility studies that are part of compliance related construction project.

Preliminary and Final Engineering and Design
Surveying, legal review, preparation of engineering drawings, and specifications for construction. Costs necessary for recipients to contract environmental review services are included.

Construction Costs
All aspects of a public water system from source of supply, filtration, treatment, storage, transmission, and metering.

Source Water Protection
As part of a source water management plan for a watershed or a delineated source water protection area for a well.

Property Acquisition
The acquisition of real property directly related to or necessary for the proposed project including rights-of-way, easements, and facility sites.

While many activities are eligible for SDWRLF financing, the following activities are considered ineligible activities. These activities include dams or rehabilitation of dams, purchase of water rights unless owned on a system that is being purchased through a consolidation project, finished water reservoirs, administrative costs, operation and maintenance expenses, and projects primarily intended to supply or attract future growth.

The program's financing is available to all sizes of water systems. Municipal, nonprofit and privately owned community water systems are eligible, as well as nonprofit non-community systems. Terms of the loan are 20 years at eighty percent of the state/local bond rate. This rate is currently 3.17 percent (December 2018). Financially disadvantaged applicants can get up to a 30-year loan at an interest rate of one percent, as well as the possibility of some principal forgiveness.

The Oregon Health Authority and the Organization for Economic Cooperation and Development (OECDD) rate proposed projects. Highest ratings are given to projects that present the following:

- Addresses the most serious risk to human health.
- Necessary to ensure Safe Drinking Water Act compliance.
- Applicant has the greatest financial need, on a per household basis, according to affordability criteria.

Special consideration is given to projects at small water systems that serve 10,000 or fewer people, consolidating or merging with another system as a solution to a compliance problem, and which have an innovative solution to the stated problem.

Additional consideration will be given to disadvantaged communities. The definition of a disadvantaged community has changed to one in which the average annual water rate will exceed 1.25 percent of local MHI. The above ratio is subject to adjustment with the availability of 2010 Census figures and inflation indexing thereafter (see Section 10.5).

Applicants with 300 or more service connections are eligible for assistance with final design and construction projects; only if they maintain a current, approved master plan that evaluates the needs of the water system for at least a twenty-year period and includes the major elements outlined in Oregon Administrative Rules (OAR) 333-061-0060(5). Systems with less than 300 service connections may receive funding for an engineering feasibility analysis instead of a master plan.

11.2 Local Funding Sources

The amount and type of local funding obligations for water system improvements will depend, in part, on the amount of grant funding anticipated and the requirements of potential loan funding. Local revenue sources for capital expenditures include various types of bonds, water service charges, connection fees, and System Development Charges (SDC). Local revenue sources for operating costs include water service charges. The following sections identify those local funding sources and financing mechanisms that are most common and appropriate for the improvements identified in this study.

Revenue Bonds

Revenue Bonds are becoming a frequently used option for long-term debt. These bonds are an acceptable alternative and offer some advantages to General Obligation Bonds. Revenue Bonds are payable solely from charges made for the services provided. These bonds cannot be paid from tax levies or special assessments; their only security is the borrower's promise to operate the system in a way that will provide sufficient net revenue to meet the debt service and other obligations of the bond issued.

Many communities prefer Revenue Bonds because the debt obligation will be limited to system users since repayment is derived from user fees. Another advantage of Revenue Bonds is that they do not count against a municipality's direct debt, but instead are considered "overlapping debt.” This feature can be a crucial advantage for a municipality near its debt limit or for the rating agencies, which consider very closely the amount of direct debt when assigning credit ratings. Revenue Bonds also may be used in financing projects extending beyond normal municipal boundaries. These bonds may be supported by a pledge of revenues received in any legitimate and ongoing area of operation, within or without the geographical boundaries of the issuer.

Successful issuance of Revenue Bonds depends on the bond market evaluation of the revenue pledged. Revenue Bonds are most commonly retired with revenue from user fees. Recent legislation has eliminated the requirement that the revenues pledged to bond payment have a direct relationship to the services financed by Revenue Bonds. Revenue Bonds may be paid with all or any portion of revenues derived by a public body or any other legally available monies. In addition, if additional security to finance Revenue Bonds was needed, a public body may mortgage grant security and interests in facilities, projects, utilities or systems owned or operated by a public body.

Normally, there are no legal limitations on the amount of Revenue Bonds to be issued; but excessive issue amounts are generally unattractive to bond buyers because they represent high investment risks. In rating Revenue Bonds, buyers consider the economic justification for the project, reputation of the borrower, methods and effectiveness for billing and collecting, rate structures, provision for rate increases as needed to meet debt service requirements, and track record in obtaining rate increases historically. In addition, other factors considered include adequacy of reserve funds provided in the bond documents, supporting covenants to protect projected revenues, and the degree to which forecasts of net revenues are considered sound and economical.

Municipalities may elect to issue Revenue Bonds for revenue producing facilities without a vote of the electorate (ORS 288.805-288.945). In this case, certain notice and posting requirements must be met and a 60-day waiting period is mandatory. A petition signed by five percent of the municipality's registered voters may cause the issue to be referred to an election.

Capital Construction (Sinking) Fund

Sinking funds are often established by budget for a particular construction purpose. Budgeted amounts from each annual budget are carried in a sinking fund until sufficient revenues are available for the needed project. Such funds can also be developed with revenue derived from SDC.

A District may wish to develop sinking funds for each sector of the public services. This fund can be used to rehabilitate or maintain existing infrastructure, construct new infrastructure elements, or to obtain grant and loan funding for larger projects.

The disadvantage of a sinking fund is that it is usually too small to undertake any significant projects. Also, setting aside money generated from user fees without a designated and specified need is not generally accepted in municipal or public utility budgeting processes.

Connection Fees

Most districts charge connection fees to cover the cost of connecting new development to water systems. Based on recent legislation, connection fees can no longer be programmed to cover a portion of capital improvement costs.

System Development Charges

A SDC is a fee collected as each piece of property is developed and is used to finance the necessary capital improvements and municipal services required by the development. Such a fee can only be used to recover only the capital costs of infrastructure. Operating, maintenance, and replacement costs cannot be financed through SDC.

Two types of charges are permitted under the Oregon Systems Development Charges Act: improvement fees, and reimbursement fees. The SDCs charged before construction are considered improvement fees and are used to finance capital improvements to be constructed. After construction, SDCs are considered reimbursement fees and are collected to recapture the costs associated with capital improvements already constructed or under construction. A reimbursement fee represents a charge for utilizing excess capacity in an existing facility paid for by others. The revenue generated by this fee is typically used to pay back existing loans for improvements.

Under the Oregon SDC Act, methodologies for deriving improvement and reimbursement fees must be documented and available for review by the public. A Capital Improvement Plan (CIP) must also be prepared which lists the capital improvements that may be funded with improvement fee revenues and the estimated cost and timing of each improvement. Thus, revenue from the collection of SDCs can only be used to finance specific items listed in a CIP. In addition, SDCs cannot be assessed on portions of the project paid for with grant funding. The current SDC and rate structure should be re-evaluated and adjusted to account for the improvements described herein.

User Fees

User fees can be used to retire General Obligation Bonds, and are commonly the sole source of revenue to retire Revenue Bonds and to finance operation and maintenance. User fees represent monthly charges of all residences, businesses, and other users that are connected to the water system. These fees are established by resolution and can be modified, as needed, to account for increased or decreased operating and maintenance costs. The monthly charges are usually based on the class of user (e.g. single family dwelling, multiple family dwelling, schools, etc.) and the quantity of water through a user's connection.

Assessments

Under special circumstances, the beneficiary of a public works improvement may be assessed for the cost of a project. For example, a district may provide some improvements or services that directly benefit a particular development. A district may choose to assess the industrial or commercial developer to provide up-front capital to pay for the administered improvements.

11.3 Financing Strategy

A financing strategy or plan must provide a mechanism to generate capital funds in sufficient amounts to pay for the proposed improvements over the relatively short duration in design and construction, generally two years. The financing strategy must also identify the manner in which annual revenue will be generated to cover the expense for long-term debt repayment and the on-going operation and maintenance of the system. The objectives of a financial strategy include the following:

- Identify the capital improvement cost for the project and the estimated expense for O&M.
- Evaluate the potential funding sources and select the most viable program.
- Determine the availability of outside funding sources and identify the local cost share.
- Determine the cost to system users to finance the local share and the annual cost for O&M.

With any of the proposed funding sources within the financial strategy, the District is advised to confirm specific funding amounts with the appropriate funding agencies prior to making financing arrangements.

A financial strategy to address financing of the Phase I Improvements within the Capital Improvement Plan is discussed below.

Grants and Low Interest Loans

Four types or programs of project funding were identified as viable for funding the District's proposed Phase I Improvements: 1) Rural Development Rural Water and Waste Disposal Grants and Loans, 2) OECDD Water/Wastewater Financing Program, 3) Drinking Water State Revolving Fund, and 4) Private Financing. Based on these funding programs, four alternative funding packages were compiled and evaluated. These alternatives are designated as A, B, C and D alternatives. Due to the size of the proposed Phase I Improvements, anticipated funding from Rural Development was supplemented with funding from OECDDs Water/Wastewater Financing Program. A summary of the funding alternatives for these improvements is given in Table 11.3.1.

The projected rate increases anticipated from the funding options range from $5.00 to $10.65 per Equivalent Dwelling Unit (EDU) per month. These rate increases are very similar in magnitude and should be investigated further at a "One-Stop" meeting with the funding agencies and with discussions with private funding sources. For the purposes of this financing plan, further evaluation will be made with the most conservative value, which is $10.65 per EDU per month.

Local Financing Requirements

The financing plan for the Priority I Improvements is based on the District securing authorization to issue bonds ranging from $3,380,000 to $5,130,000. A breakdown of approximate monthly water user costs for the improvements, based on present worth costs and including current water O&M budget and debt reserve is given in Table 11.3.2. For this table, it was assumed that the District's debt service for the Priority I Improvements would be $5,130,000 with private loan funding (Alternative D). The estimated total monthly average cost to each EDU is anticipated to be approximately $51.42.

TABLE 11.3.1
FUNDING ALTERNATIVES FOR PHASE I IMPROVEMENTS

Funding Source	Grant Amount, $ (1)	Loan Amount, $ (1)	Loan Term, yrs	Interest Rate, %	Rate Increase, $/EDU/mth (2)
Alternative A – Rural Development (RD)/Water/Wastewater Financing Program Grants & Loans					
RD 25/75 (Grant/Loan)	$1,000,000	$3,000,000	40	3.25	$4.24
W/WW Financing Program	$750,000	$380,000	25	3.97	$0.76
Total	$1,750,000	$3,380,000	25	--	**$5.00**
Alternative B – Water/Wastewater Financing Program Grants & Loans					
RD 25/75 (Grant/Loan)	$1,282,500	$3,847,500	40	3.25	**$5.44**
Alternative C – Drinking Water SRF Loan					
SDWRLF	--	$5,130,000	30	3.17	**$8.39**
Alternative D – Private Loan					
Private Funding	--	$5,130,000	25	4.35	**$10.65**

(1) Amount based on current dollars.
(2) Based on 2,628 EDUs. EDUs associated with non-profit or District use was not included in the total EDU tabulation.

TABLE 11.3.2
APPROXIMATE MONTHLY USER COSTS

Item	Annual Cost	Monthly User Cost/EDU (1)
Debt Service on $22,164,000	$1,450,525	$10.65
Existing Debt Service	$197,563	$6.26
2018 Operational O & M	$1,088,192	$34.51
Total	$2,736,280	$51.42

(1)Based on 2,628 EDUs

Affordability

One major consideration in deciding on any proposed capital improvements is the user's ability to support the full cost, including debt repayment, of utility service. Several measures of household affordability or ability-to-pay have been proposed or are currently being utilized.

The majority of affordability indicators are largely a function of income and rates. One of the most common affordability indicators is the ratio of annual user charges to the MHI. The threshold of affordability for this ratio varies from 1.5 to 2.5 percent of MHI. The OECDD utilizes 1.39 percent of the MHI as a threshold for qualifying for grant monies.

Affordability of rates and projected rate increases are also factors when bond rating agencies are determining credit quality. Fitch Ratings generally considers combined water and sewer service rates higher than two percent of MHI (or one percent for individual water and wastewater utilities) to be financially taxing (Water and Sewer Revenue Bond Rating Guidelines, Fitch Ratings September 3, 2015).

A summary of affordability measures and thresholds from selected studies is provided in Table 11.3.3. One limitation of using the ratio of annual user charges to the MHI is determination of a representative MHI for a community. Currently, most funding agencies still utilize the 2010 Census data for making this determination. We have chosen to use the estimated 2017 MHI value from the Census Bureau in combination with the Consumer Price Index (CPI) for all urban consumers (CPI-U) to approximate current MHI. The underlying assumption is that wages in the area have increased in a similar manner to that of the CPI-U. Data for the CPI-U was taken for the Years 2017 through 2018 for the month of December. The percentage increase in the CPI-U between 2017 and 2018 was applied to the estimated 2017 MHI. This resulted in an estimated 2018 MHI of $48,917. The affordability of existing and future water rates within the District is summarized in Table 11.3.4.

TABLE 11.3.3
SUMMARY OF AFFORDABILITY MEASURES AND THRESHOLDS

Source	Indicator(s)	Threshold
Future Investment in Drinking Water & Wastewater Infrastructure (2002)	Ratio of annual user charge & MHI	2.5% of MHI
Rural Utilities Service Water & Waste Disposal Loans & Grants	Debt service portion of annual user charge & MHI	>0.5% & MHI below poverty line or >1.0% & MHI between 80 & 100% of statewide non-metropolitan MHI
Department of Housing & Urban Development	Ratio of water & sewer bills, & household income	1.3 to 1.4%
National Consumer Law Center "The Poor and the Elderly – Drowning in the High Cost of Water", circa 1991	Ratio of sum of water & sewer bills & household income	>2.00 %
EPA Economic Guidance for Water Quality Standards Workbook (1995)	Ratio of annual user charge & MHI	<1.0% - no hardship expected 1.0 – 2.0% - mid-range >2.0% may be unreasonable burden
Affordability Criteria For Small Drinking Water Systems: An EPA Science Advisory Board Report (2002)	Discussion of affordability threshold, expenditure baselines, and differences in cost, income, and benefits	<1.0% must provide additional security. >2.5% - system probably cannot issue debt
National Drinking Water Advisory Council Affordability Recommendations (2003)	EPA national affordability threshold given size category	grounds for consideration of measures other than median income
State of Oregon Assessment Tools for SRF Loans	Ratio of annual user charge & MHI	1.5% MHI

Abbreviations: AUC – Annual User Charge
MHI – Median Household Income

TABLE 11.3.4
AFFORDABILITY OF PROJECTED WATER USER COSTS FOR THE HWPUD

AFFORDABILITY TABULATIONS	
Median Household Bi-Monthly Income (MHI)	$97,834
Current Bi-Monthly Rates	
Estimated Bi-Monthly User Charge/EDU ($)	$82
Annual User Charge/ MHI (%)	1.00%
Projected Bi-Monthly Rates	
Estimated Bi-Monthly User Charge/EDU ($)	$103
Annual User Charge/ MHI (%)	**1.26%**

11.4 Recommendations

The following recommendations are made to the District to implement the elements of this Water Master Plan (WMP).

1. Submit Plan to the Oregon Health Authority and Department of Water Resources for review and approval.

2. Schedule and attend "One-Stop" meeting to discuss financing options for the proposed Phase I Improvements.

3. Submit system information to private funding sources for consideration of private financing.

4. Submit necessary applications to the funding agencies requesting a loans and grants to finance the Phase I Improvements.

5. Following favorable review by the selected financing agencies, secure the authority to issue revenue or General Obligation Bonds in the amount needed to finance the Phase I Improvements.

6. Authorize detailed design of recommended improvements and preparation of plans and specifications for the Phase I Improvements. Secure the necessary special use permits.

7. Receive construction bids and award contracts for Phase I Improvements.

8. Initiate study of user rates for water system and implement proposed changes.

9. Revise SDCs and rates for the water system based on the CIP given in this WMP.

11.5 Project Implementation

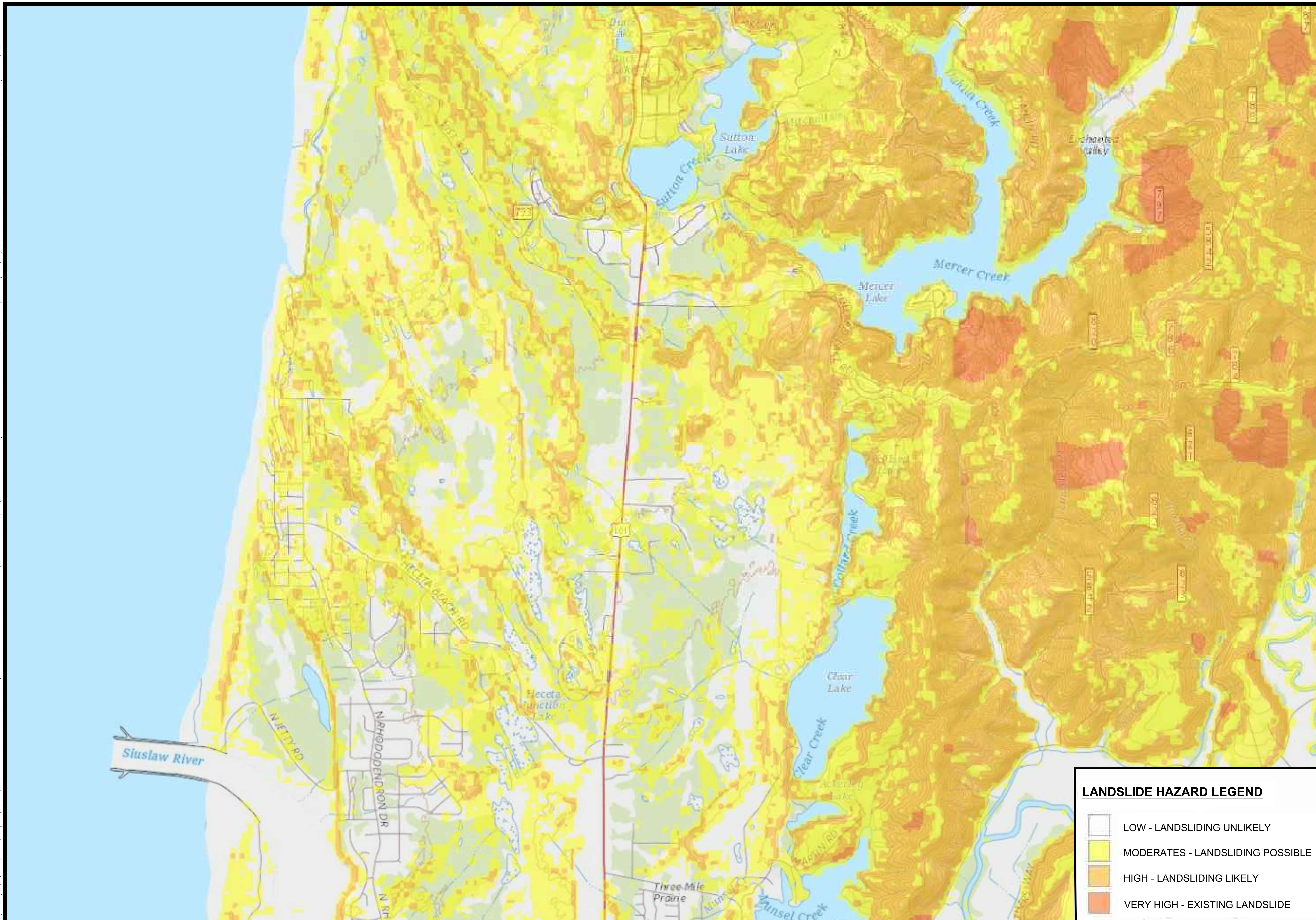
A tentative schedule, identifying the key activities and approximate implementation date for the Water Master Plan over the next three years, is presented in Table 11.5.1 on the following page.

TABLE 11.5.1
PROJECT IMPLEMENTATION SUMMARY

Item No.	Key Activity	Implementation Date
1	Board Adopt Water Master Plan-Submit Plan to OHA for Review and Approval	August 2019
2	Submit Plan to Health Authority & Department of Water Resources	September 2019
3	Approval of Plan by Health Authority & Department of Water Resources	May 2019
4	Start Environmental Evaluation/Notice	August 2019
5	Submit Application for Financing for Phase I and Associated Environmental Evaluation/Notice for Project	December 2019
6	Obtain Financing for Phase I	January 2020
7	Start Preparation of Plans, Specifications for Phase I	July 2019 - February 2020
8	Complete Design & Preparation of Plans, Specifications, & Contract	February 2020
9	Health Authority Approval of Plans & Specifications	April 2020
10	Advertise for Phase I Construction Bids	May 2020
11	Receive Construction Bids for Phase I	June 2020
12	Start Construction of Phase I	July 2020
13	Complete Construction of Phase I Improvements	November 2021

APPENDICES

APPENDIX A: STUDY AREA INFORMATION



LANDSLIDE HAZARD LEGEND

- LOW - LANDSLIDING UNLIKELY
- MODERATES - LANDSLIDING POSSIBLE
- HIGH - LANDSLIDING LIKELY
- VERY HIGH - EXISTING LANDSLIDE

FIGURE NO. **A.1**

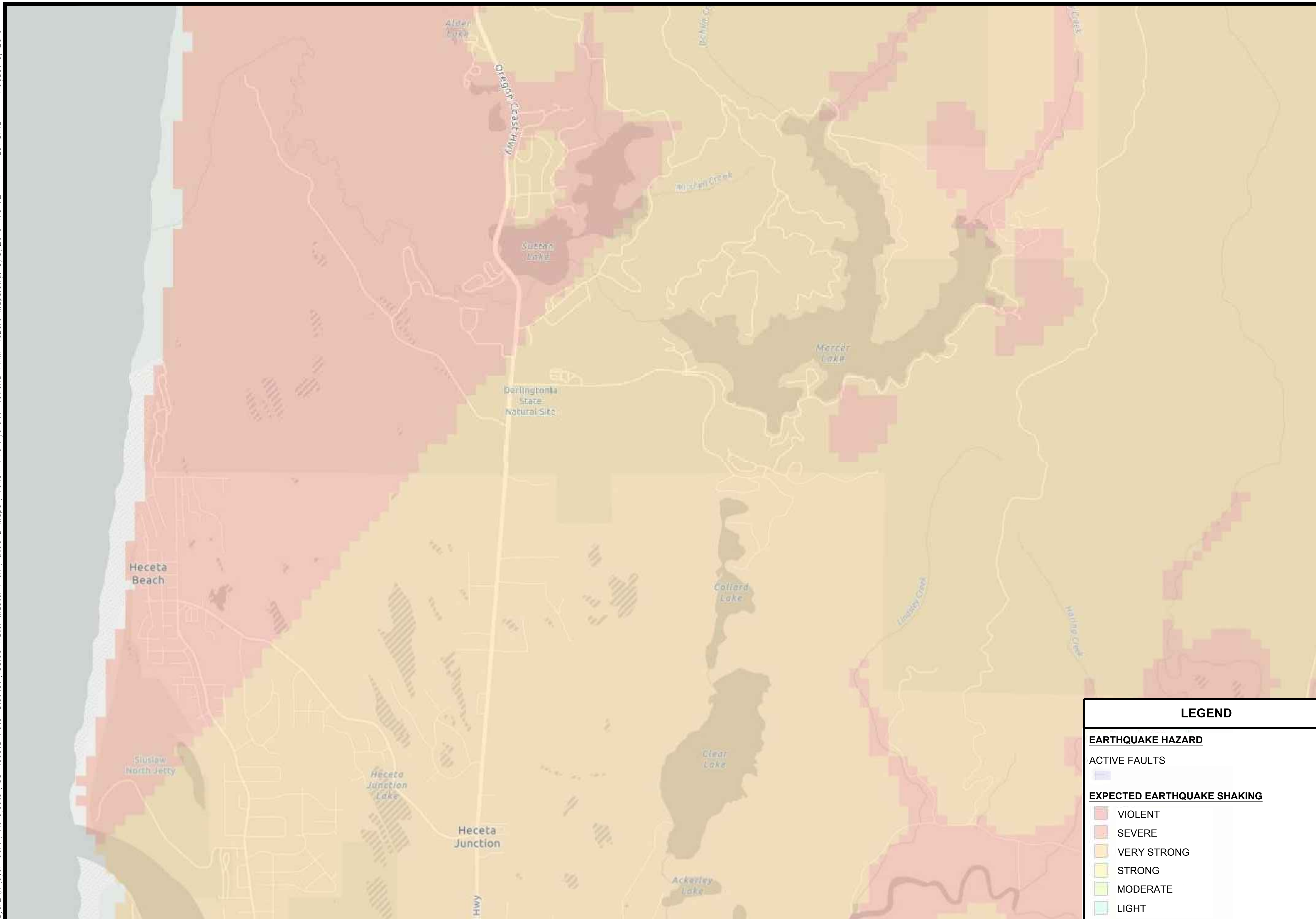
HECETA WATER PUD WATER MASTER PLAN

LAND SLIDE HAZARD MAP

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05



LEGEND

EARTHQUAKE HAZARD

ACTIVE FAULTS

EXPECTED EARTHQUAKE SHAKING

- VIOLENT
- SEVERE
- VERY STRONG
- STRONG
- MODERATE
- LIGHT

FIGURE NO. **A.2**

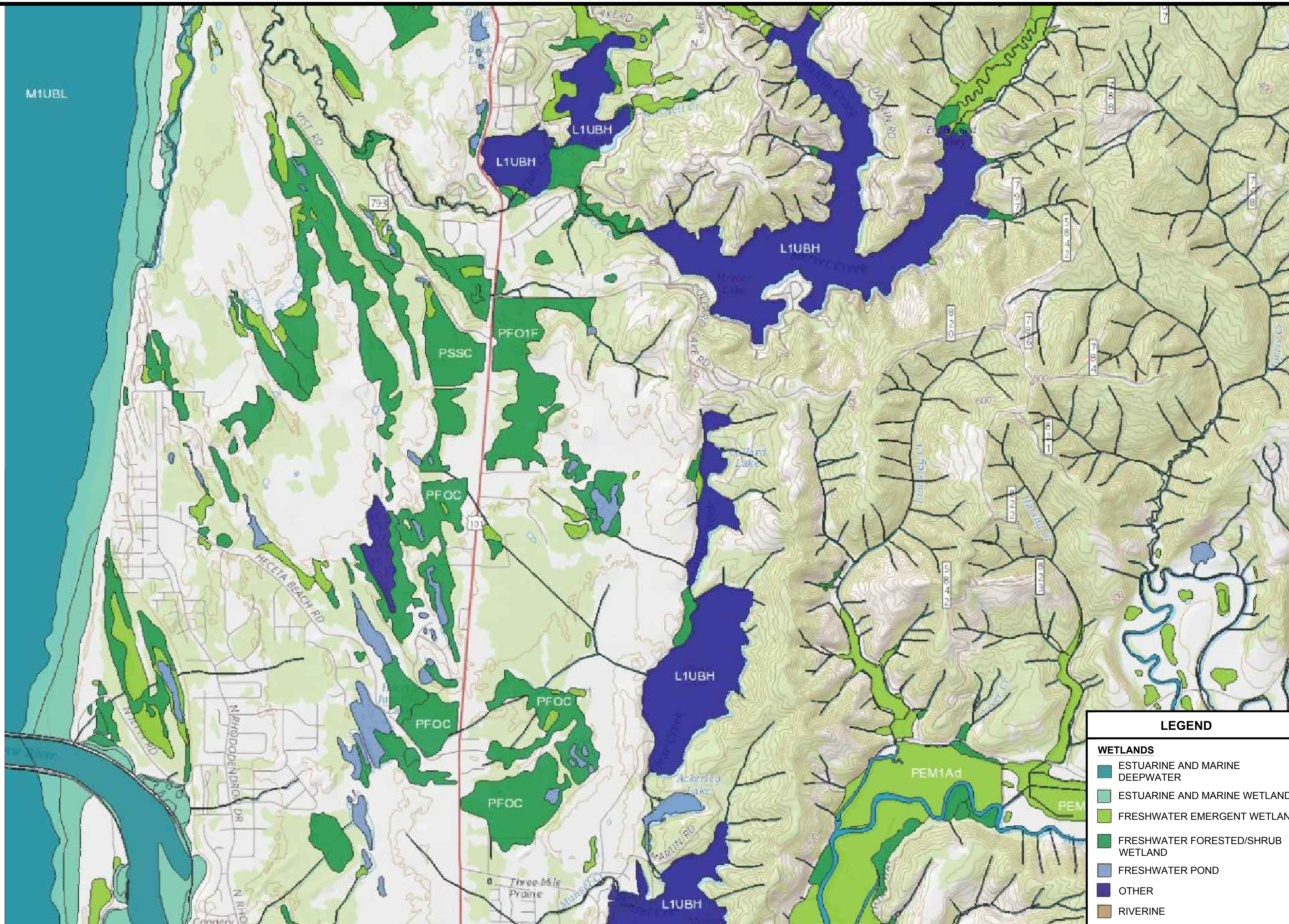
HECETA WATER PUD WATER MASTER PLAN

EARTHQUAKE HAZARD MAP

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05



LEGEND

WETLANDS

- ESTUARINE AND MARINE DEEPWATER
- ESTUARINE AND MARINE WETLAND
- FRESHWATER EMERGENT WETLAND
- FRESHWATER FORESTED/SHRUB WETLAND
- FRESHWATER POND
- OTHER
- RIVERINE

HECETA WATER PUD WATER MASTER PLAN

WETLAND MAP

FIGURE NO. **A.3**

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

\\dyer2\h\dyer-part\AAprojects\188 Heceta Water District\188.05 Water Master Plan\AutoCAD Maps\Fireflow-Fire Hydrant-Wetland-FIRM-Hazard Maps.dwg, 8/8/2019 4:57:27 PM PLOT DATE August 9, 2019

\\dyer2\h\dyer-part\AAprojects\188 Heceta Water District\188.05 Water Master Plan\AutoCAD Maps\Fireflow-Fire Hydrant-Wetland-FIRM-Hazard Maps.dwg, 8/8/2019 4:57:27 PM PLOT DATE August 9, 2019

LEGEND

1% ANNUAL CHANCE FLOOD HAZARD

NOTES:
DESIGNATED FLOOD PLAIN AREAS WERE DEVELOPED FROM FEMA FLOOD PLAIN MAPS. THIS FIGURE DISPLAYS APPROXIMATE LOCATIONS OF FLOOD PLAINS, AND IS NOT TO BE USED FOR ANY FLOOD PLAIN DETERMINATIONS.

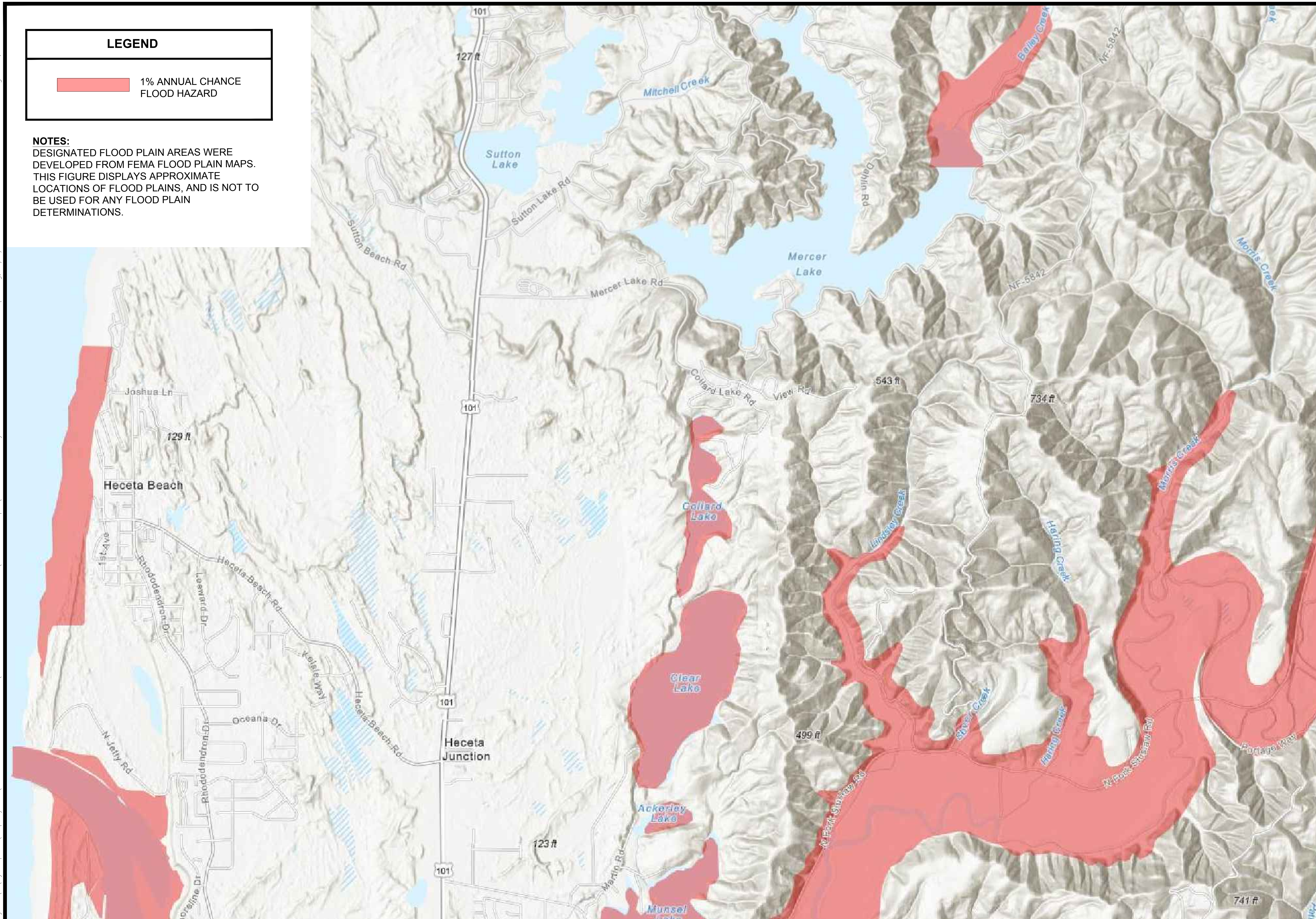


FIGURE NO. **A.4**

HECETA WATER PUD WATER MASTER PLAN

FIRM MAP

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JULY, 2019

PROJECT NO.: 188.05

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Lane County Area, Oregon

Heceta Water PUD Soils Report

October 9, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

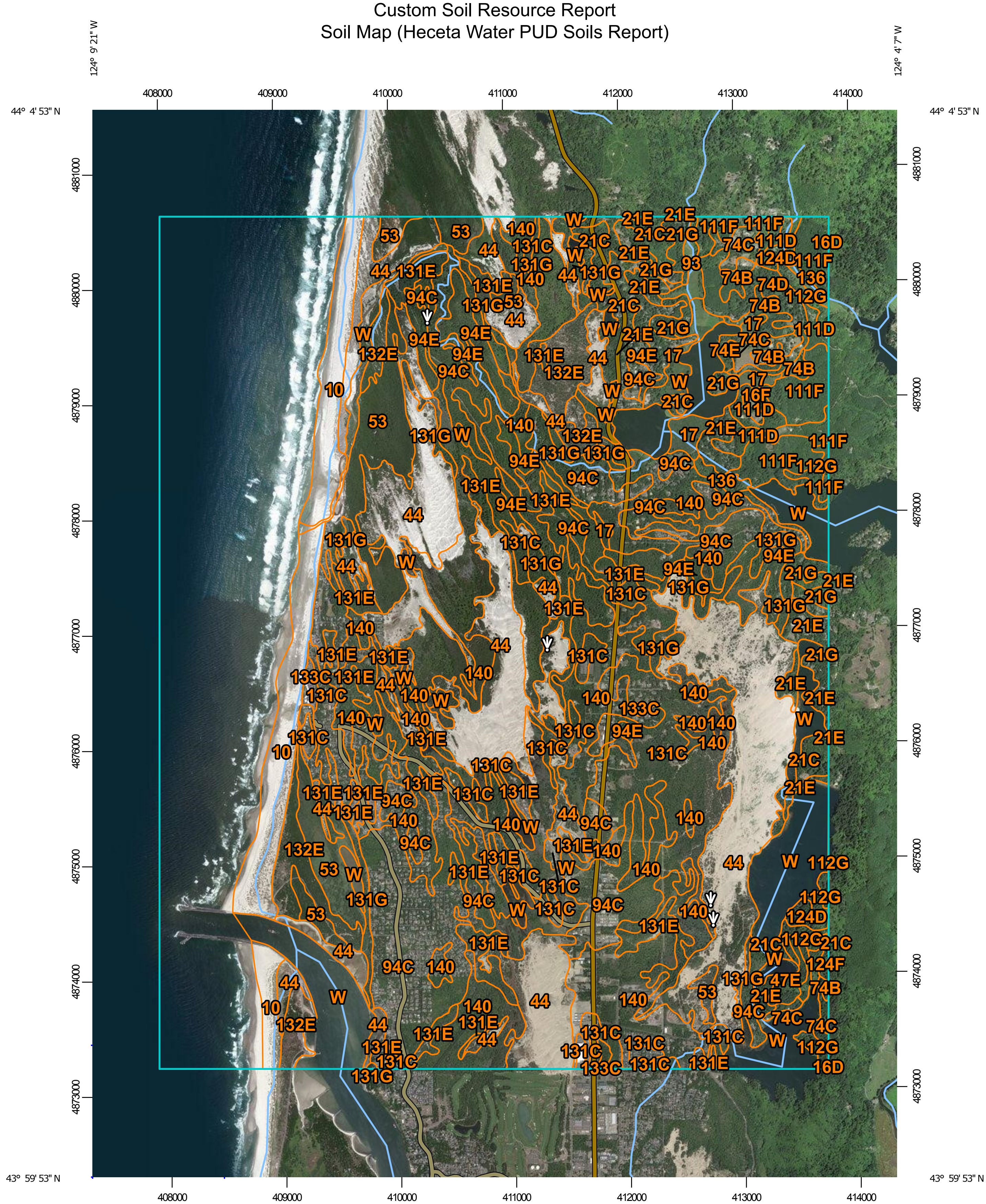
The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Heceta Water PUD Soils Report)



Map Scale: 1:45,100 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lane County Area, Oregon
Survey Area Data: Version 15, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 27, 2007—Sep 15, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Heceta Water PUD Soils Report)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10	Beaches	376.0	3.5%
16D	Bohannon gravelly loam, 3 to 25 percent slopes	0.8	0.0%
16F	Bohannon gravelly loam, 25 to 50 percent slopes	24.5	0.2%
17	Brallier muck, drained	90.3	0.8%
21C	Bullards-Ferrelo loams, 7 to 12 percent slopes	153.6	1.4%
21E	Bullards-Ferrelo loams, 12 to 30 percent slopes	241.0	2.3%
21G	Bullards-Ferrelo loams, 30 to 60 percent slopes	89.3	0.8%
44	Dune land	1,562.1	14.6%
47E	Fendall silt loam, 3 to 30 percent slopes	14.0	0.1%
53	Heceta fine sand	355.9	3.3%
74B	Lint silt loam, 0 to 7 percent slopes	68.9	0.6%
74C	Lint silt loam, 7 to 12 percent slopes	58.8	0.6%
74D	Lint silt loam, 12 to 20 percent slopes	84.4	0.8%
74E	Lint silt loam, 20 to 40 percent slopes	9.1	0.1%
93	Nestucca silt loam	23.0	0.2%
94C	Netarts fine sand, 3 to 12 percent slopes	917.9	8.6%
94E	Netarts fine sand, 12 to 30 percent slopes	258.0	2.4%
111D	Preacher loam, 0 to 25 percent slopes	57.6	0.5%
111F	Preacher loam, 25 to 50 percent slopes	192.7	1.8%
112G	Preacher-Bohannon-Slickrock complex, 50 to 75 percent slopes	85.7	0.8%
124D	Slickrock gravelly loam, 3 to 25 percent slopes	26.9	0.3%
124F	Slickrock gravelly loam, 25 to 50 percent slopes	4.8	0.0%
131C	Waldport fine sand, 0 to 12 percent slopes	700.9	6.6%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
131E	Waldport fine sand, 12 to 30 percent slopes	454.5	4.3%
131G	Waldport fine sand, 30 to 70 percent slopes	205.0	1.9%
132E	Waldport fine sand, thin surface, 0 to 30 percent slopes	234.6	2.2%
133C	Waldport-Urban land complex, 0 to 12 percent slopes	15.6	0.1%
136	Willanch fine sandy loam	23.1	0.2%
140	Yaquina loamy fine sand	1,587.4	14.9%
W	Water	719.8	6.7%
Totals for Area of Interest		**10,677.5**	**100.0%**

Map Unit Descriptions (Heceta Water PUD Soils Report)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Lane County Area, Oregon

10—Beaches

Map Unit Setting

National map unit symbol: 2337
Elevation: 0 to 10 feet
Farmland classification: Not prime farmland

Map Unit Composition

Beaches: 95 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Beaches

Typical profile

H1 - 0 to 60 inches: stratified sand to gravel

Properties and qualities

Slope: 0 to 3 percent
Depth to water table: About 0 to 72 inches
Frequency of flooding: Very frequent

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

16D—Bohannon gravelly loam, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: 235h
Elevation: 100 to 3,000 feet
Mean annual precipitation: 60 to 120 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 140 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Bohannon and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bohannon

Setting

Landform: Mountains, mountains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from sandstone and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 12 inches: gravelly loam
H2 - 12 to 25 inches: cobbly loam
H3 - 25 to 35 inches: weathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

16F—Bohannon gravelly loam, 25 to 50 percent slopes

Map Unit Setting

National map unit symbol: 235j
Elevation: 100 to 3,000 feet
Mean annual precipitation: 60 to 120 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 140 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Bohannon and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bohannon

Setting

Landform: Mountains, mountains
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Mountaintop, mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from sandstone and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 12 inches: gravelly loam
H2 - 12 to 25 inches: cobbly loam
H3 - 25 to 35 inches: weathered bedrock

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

17—Brallier muck, drained

Map Unit Setting

National map unit symbol: 235l
Elevation: 0 to 100 feet
Mean annual precipitation: 50 to 100 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 150 to 300 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Brallier, drained, and similar soils: 85 percent
Minor components: 11 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brallier, Drained

Setting

Landform: Flood plains, tidal flats
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fibrous organic material

Typical profile

H1 - 0 to 60 inches: mucky peat

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent

Frequency of ponding: Frequent
Available water storage in profile: Very high (about 20.9 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Willanch

Percent of map unit: 4 percent
Landform: Flood plains
Hydric soil rating: Yes

Fibrists, woody

Percent of map unit: 4 percent
Landform: Flood plains
Hydric soil rating: Yes

Brallier, loamy substratum

Percent of map unit: 3 percent
Landform: Flood plains
Hydric soil rating: Yes

21C—Bullards-Ferrelo loams, 7 to 12 percent slopes

Map Unit Setting

National map unit symbol: 235t
Elevation: 20 to 300 feet
Mean annual precipitation: 65 to 80 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Bullards and similar soils: 50 percent
Ferrelo and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bullards

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium and eolian sands

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material

Oe - 2 to 3 inches: moderately decomposed plant material
H1 - 3 to 7 inches: loam
H2 - 7 to 61 inches: gravelly loam
H3 - 61 to 64 inches: loamy fine sand

Properties and qualities

Slope: 7 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Forage suitability group: Well Drained <15% Slopes (G004AY014OR)
Hydric soil rating: No

Description of Ferrelo

Setting

Landform: Marine terraces
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine deposits over eolian sands

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
H1 - 2 to 12 inches: loam
H2 - 12 to 49 inches: silt loam
H3 - 49 to 60 inches: fine sandy loam

Properties and qualities

Slope: 7 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Forage suitability group: Well Drained <15% Slopes (G004AY014OR)
Hydric soil rating: No

21E—Bullards-Ferrelo loams, 12 to 30 percent slopes

Map Unit Setting

National map unit symbol: 235v
Elevation: 20 to 300 feet
Mean annual precipitation: 65 to 80 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Bullards and similar soils: 45 percent
Ferrelo and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bullards

Setting

Landform: Marine terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium and eolian sands

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
Oe - 2 to 3 inches: moderately decomposed plant material
H1 - 3 to 7 inches: loam
H2 - 7 to 61 inches: gravelly loam
H3 - 61 to 64 inches: loamy fine sand

Properties and qualities

Slope: 12 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Forage suitability group: Well Drained >15% Slopes (G004AY013OR)
Hydric soil rating: No

Description of Ferrelo

Setting

Landform: Marine terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine deposits over eolian sands

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
H1 - 2 to 12 inches: loam
H2 - 12 to 49 inches: silt loam
H3 - 49 to 60 inches: fine sandy loam

Properties and qualities

Slope: 12 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

21G—Bullards-Ferrelo loams, 30 to 60 percent slopes

Map Unit Setting

National map unit symbol: 235w
Elevation: 20 to 300 feet
Mean annual precipitation: 65 to 80 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Bullards and similar soils: 45 percent
Ferrelo and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bullards

Setting

Landform: Marine terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium and eolian sands

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
Oe - 2 to 3 inches: moderately decomposed plant material
H1 - 3 to 7 inches: loam
H2 - 7 to 61 inches: gravelly loam
H3 - 61 to 64 inches: loamy fine sand

Properties and qualities

Slope: 30 to 60 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Ferrelo

Setting

Landform: Marine terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine deposits over eolian sands

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
H1 - 2 to 12 inches: loam
H2 - 12 to 49 inches: silt loam
H3 - 49 to 60 inches: fine sandy loam

Properties and qualities

Slope: 30 to 60 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

44—Dune land

Map Unit Setting

National map unit symbol: 236z
Elevation: 0 to 150 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 165 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Dune land: 95 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dune Land

Setting

Parent material: Eolian sands

Typical profile

C - 0 to 60 inches: fine sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Yaquina

Percent of map unit: 2 percent
Landform: Marine terraces
Hydric soil rating: Yes

Heceta

Percent of map unit: 1 percent
Landform: Interdunes
Hydric soil rating: Yes

47E—Fendall silt loam, 3 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2372
Elevation: 50 to 650 feet
Mean annual precipitation: 60 to 80 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 180 to 225 days
Farmland classification: Not prime farmland

Map Unit Composition

Fendall and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fendall

Setting

Landform: Hills, terraces
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Nose slope, interfluve, crest, tread, riser
Down-slope shape: Concave, linear, convex
Across-slope shape: Linear, convex
Parent material: Old alluvium, residuum, and colluvium derived from sedimentary rock

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 16 inches: clay loam
H3 - 16 to 26 inches: clay
H4 - 26 to 36 inches: weathered bedrock

Properties and qualities

Slope: 3 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Forage suitability group: Well Drained >15% Slopes (G004AY013OR)
Hydric soil rating: No

53—Heceta fine sand

Map Unit Setting

National map unit symbol: 237d
Elevation: 0 to 130 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 165 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Heceta and similar soils: 90 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Heceta

Setting

Landform: Dune slacks
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sands derived mainly from sandstone

Typical profile

H1 - 0 to 5 inches: fine sand
H2 - 5 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Forage suitability group: Poorly Drained (G004AY018OR)
Hydric soil rating: Yes

Minor Components

Yaquina

Percent of map unit: 3 percent
Landform: Marine terraces
Hydric soil rating: Yes

74B—Lint silt loam, 0 to 7 percent slopes

Map Unit Setting

National map unit symbol: 238n
Elevation: 30 to 600 feet
Mean annual precipitation: 60 to 75 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lint and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lint

Setting

Landform: Marine terraces, marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and mixed alluvium

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
H1 - 2 to 18 inches: silt loam
H2 - 18 to 69 inches: silty clay loam

Properties and qualities

Slope: 0 to 7 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 21.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Forage suitability group: Well Drained <15% Slopes (G004AY014OR)
Hydric soil rating: No

Minor Components

Aquands, poorly drained

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

74C—Lint silt loam, 7 to 12 percent slopes

Map Unit Setting

National map unit symbol: 238p
Elevation: 30 to 600 feet
Mean annual precipitation: 60 to 75 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lint and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lint

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and mixed alluvium

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
H1 - 2 to 18 inches: silt loam
H2 - 18 to 69 inches: silty clay loam

Properties and qualities

Slope: 7 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 21.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B
Forage suitability group: Well Drained <15% Slopes (G004AY014OR)
Hydric soil rating: No

Minor Components

Aquands, somewhat poorly drained

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

74D—Lint silt loam, 12 to 20 percent slopes

Map Unit Setting

National map unit symbol: 238q
Elevation: 30 to 600 feet
Mean annual precipitation: 60 to 75 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lint and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lint

Setting

Landform: Marine terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and mixed alluvium

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
H1 - 2 to 18 inches: silt loam
H2 - 18 to 69 inches: silty clay loam

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 21.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Forage suitability group: Well Drained >15% Slopes (G004AY013OR)
Hydric soil rating: No

Minor Components

Aquands, somewhat poorly drained

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

74E—Lint silt loam, 20 to 40 percent slopes

Map Unit Setting

National map unit symbol: 238r
Elevation: 30 to 600 feet
Mean annual precipitation: 60 to 75 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lint and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lint

Setting

Landform: Marine terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and mixed alluvium

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
H1 - 2 to 18 inches: silt loam
H2 - 18 to 69 inches: silty clay loam

Properties and qualities

Slope: 20 to 40 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water storage in profile: Very high (about 21.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Forage suitability group: Well Drained >15% Slopes (G004AY013OR)
Hydric soil rating: No

93—Nestucca silt loam

Map Unit Setting

National map unit symbol: 239r
Elevation: 10 to 750 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 160 to 265 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Nestucca and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nestucca

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Recent silty alluvium

Typical profile

H1 - 0 to 17 inches: silt loam
H2 - 17 to 43 inches: silty clay loam
H3 - 43 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: C/D
Forage suitability group: Somewhat Poorly Drained (G004AY017OR)
Hydric soil rating: No

Minor Components

Brenner

Percent of map unit: 3 percent
Landform: Flood plains
Hydric soil rating: Yes

94C—Netarts fine sand, 3 to 12 percent slopes

Map Unit Setting

National map unit symbol: 239s
Elevation: 0 to 300 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 165 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Netarts and similar soils: 85 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Netarts

Setting

Landform: Dunes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sand deposits

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
H1 - 2 to 8 inches: fine sand
H2 - 8 to 49 inches: fine sand
H3 - 49 to 60 inches: fine sand

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Heceta

Percent of map unit: 5 percent
Landform: Interdunes
Hydric soil rating: Yes

Yaquina

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

94E—Netarts fine sand, 12 to 30 percent slopes

Map Unit Setting

National map unit symbol: 239t
Elevation: 10 to 300 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 165 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Netarts and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Netarts

Setting

Landform: Dunes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sand deposits

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
H1 - 2 to 8 inches: fine sand
H2 - 8 to 49 inches: fine sand
H3 - 49 to 60 inches: fine sand

Properties and qualities

Slope: 12 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Yaquina

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

111D—Preacher loam, 0 to 25 percent slopes

Map Unit Setting

National map unit symbol: 233p
Elevation: 30 to 2,500 feet
Mean annual precipitation: 80 to 120 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Preacher and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Preacher

Setting

Landform: Mountains, mountains
Landform position (two-dimensional): Toeslope, footslope, summit
Landform position (three-dimensional): Mountaintop, mountainbase
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Colluvium and residuum derived from sedimentary rock

Typical profile

H1 - 0 to 18 inches: loam
H2 - 18 to 52 inches: loam
H3 - 52 to 58 inches: loam
H4 - 58 to 68 inches: weathered bedrock

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Forage suitability group: Well Drained > 15% Slopes (G001XY003OR)
Hydric soil rating: No

111F—Preacher loam, 25 to 50 percent slopes

Map Unit Setting

National map unit symbol: 233q
Elevation: 30 to 2,500 feet
Mean annual precipitation: 80 to 120 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Preacher and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Preacher

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Mountainflank, mountainbase
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Colluvium and residuum derived from sedimentary rock

Typical profile

H1 - 0 to 18 inches: loam
H2 - 18 to 52 inches: loam
H3 - 52 to 58 inches: loam
H4 - 58 to 68 inches: weathered bedrock

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

112G—Preacher-Bohannon-Slickrock complex, 50 to 75 percent slopes

Map Unit Setting

National map unit symbol: 233r
Elevation: 30 to 2,500 feet
Mean annual precipitation: 70 to 120 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 150 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Preacher and similar soils: 35 percent
Bohannon and similar soils: 30 percent
Slickrock and similar soils: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Preacher

Setting

Landform: Mountains
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex, concave
Across-slope shape: Convex, concave
Parent material: Colluvium and residuum derived from sedimentary rock

Typical profile

H1 - 0 to 18 inches: loam
H2 - 18 to 52 inches: loam
H3 - 52 to 58 inches: loam
H4 - 58 to 68 inches: weathered bedrock

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Bohannon

Setting

Landform: Mountains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex
Parent material: Colluvium derived from sandstone and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 12 inches: gravelly loam
H2 - 12 to 25 inches: cobbly loam
H3 - 25 to 35 inches: weathered bedrock

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Slickrock

Setting

Landform: Mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex
Parent material: Colluvium and residuum derived from sandstone

Typical profile

Oi - 0 to 4 inches: slightly decomposed plant material
H1 - 4 to 9 inches: gravelly loam
H2 - 9 to 17 inches: gravelly loam
H3 - 17 to 44 inches: gravelly loam

H4 - 44 to 59 inches: very cobbly loam
H5 - 59 to 69 inches: weathered bedrock

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

124D—Slickrock gravelly loam, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: 234c
Elevation: 50 to 2,500 feet
Mean annual precipitation: 70 to 120 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 145 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Slickrock and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Slickrock

Setting

Landform: Mountains, mountains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Mountainbase
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Colluvium and residuum derived from sandstone

Typical profile

Oi - 0 to 4 inches: slightly decomposed plant material
H1 - 4 to 9 inches: gravelly loam
H2 - 9 to 17 inches: gravelly loam
H3 - 17 to 44 inches: gravelly loam
H4 - 44 to 59 inches: very cobbly loam

H5 - 59 to 69 inches: weathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

124F—Slickrock gravelly loam, 25 to 50 percent slopes

Map Unit Setting

National map unit symbol: 234d
Elevation: 50 to 2,500 feet
Mean annual precipitation: 70 to 120 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 145 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Slickrock and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Slickrock

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium and residuum derived from sandstone

Typical profile

Oi - 0 to 4 inches: slightly decomposed plant material
H1 - 4 to 9 inches: gravelly loam
H2 - 9 to 17 inches: gravelly loam
H3 - 17 to 44 inches: gravelly loam
H4 - 44 to 59 inches: very cobbly loam
H5 - 59 to 69 inches: weathered bedrock

Properties and qualities

Slope: 25 to 50 percent

Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

131C—Waldport fine sand, 0 to 12 percent slopes

Map Unit Setting

National map unit symbol: 234r
Elevation: 0 to 150 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 165 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Waldport and similar soils: 85 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waldport

Setting

Landform: Dunes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sand of mixed origin

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 3 inches: moderately decomposed plant material
H1 - 3 to 8 inches: fine sand
H2 - 8 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Heceta

Percent of map unit: 4 percent
Landform: Interdunes
Hydric soil rating: Yes

Yaquina

Percent of map unit: 4 percent
Landform: Marine terraces
Hydric soil rating: Yes

131E—Waldport fine sand, 12 to 30 percent slopes

Map Unit Setting

National map unit symbol: 234s
Elevation: 0 to 150 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 165 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Waldport and similar soils: 85 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waldport

Setting

Landform: Dunes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sand of mixed origin

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 3 inches: moderately decomposed plant material
H1 - 3 to 8 inches: fine sand
H2 - 8 to 60 inches: fine sand

Properties and qualities

Slope: 12 to 30 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Heceta

Percent of map unit: 3 percent
Landform: Interdunes
Hydric soil rating: Yes

Yaquina

Percent of map unit: 3 percent
Landform: Marine terraces
Hydric soil rating: Yes

131G—Waldport fine sand, 30 to 70 percent slopes

Map Unit Setting

National map unit symbol: 234t
Elevation: 10 to 150 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 165 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Waldport and similar soils: 85 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waldport

Setting

Landform: Dunes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sand of mixed origin

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 3 inches: moderately decomposed plant material
H1 - 3 to 8 inches: fine sand
H2 - 8 to 60 inches: fine sand

Properties and qualities

Slope: 30 to 70 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Yaquina

Percent of map unit: 4 percent
Landform: Marine terraces
Hydric soil rating: Yes

132E—Waldport fine sand, thin surface, 0 to 30 percent slopes

Map Unit Setting

National map unit symbol: 234v
Elevation: 0 to 150 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 180 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Waldport, thin surface, and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waldport, Thin Surface

Setting

Landform: Dunes
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Eolian sand of mixed origin

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 3 inches: moderately decomposed plant material
H1 - 3 to 5 inches: fine sand
H2 - 5 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Heceta

Percent of map unit: 5 percent
Landform: Interdunes
Hydric soil rating: Yes

133C—Waldport-Urban land complex, 0 to 12 percent slopes

Map Unit Setting

National map unit symbol: 234w
Elevation: 10 to 150 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 165 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Waldport and similar soils: 50 percent
Urban land: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waldport

Setting

Landform: Dunes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sand of mixed origin

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 3 inches: moderately decomposed plant material
H1 - 3 to 8 inches: fine sand
H2 - 8 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Yaquina

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

136—Willanch fine sandy loam

Map Unit Setting

National map unit symbol: 2352
Elevation: 0 to 50 feet

Mean annual precipitation: 55 to 100 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 180 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Willanch and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Willanch

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 11 inches: fine sandy loam
H2 - 11 to 34 inches: fine sandy loam
H3 - 34 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Forage suitability group: Poorly Drained (G004AY018OR)
Hydric soil rating: Yes

Minor Components

Brallier

Percent of map unit: 3 percent
Landform: Flood plains
Hydric soil rating: Yes

Fluvents

Percent of map unit: 2 percent
Landform: Flood plains
Hydric soil rating: Yes

140—Yaquina loamy fine sand

Map Unit Setting

National map unit symbol: 2359
Elevation: 20 to 130 feet
Mean annual precipitation: 70 to 80 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 180 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Yaquina and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yaquina

Setting

Landform: Dune slacks
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sand of mixed origin

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 9 inches: loamy fine sand
H2 - 9 to 30 inches: fine sand
H3 - 30 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Forage suitability group: Somewhat Poorly Drained (G004AY017OR)
Hydric soil rating: Yes

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

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APPENDIX B: WATER RIGHTS CERTIFICATES & PERMITS

CERTIFICATE OF WATER RIGHT

This Is to Certify, *That* HECETA WATER DISTRICT

of 87845 Hwy. 101, Florence *, State of* OR 97439 *, has made proof to the satisfaction of the Water Resources Director, of a right to the use of the waters of* Clear Lake

a tributary of Siuslaw River *for the purpose of* municipal

under Permit No. 33171 *and that said right to the use of said waters has been perfected in accordance with the laws of Oregon; that the priority of the right hereby confirmed dates from* January 19, 1968

that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 1.55 cubic feet per second

or its equivalent in case of rotation, measured at the point of diversion from the stream. The point of diversion is located in the Lot 2 (NE 1/4 SE 1/4), Section 11, T18S, R12W, WM; 1650 feet North and 2500 feet East from S 1/4 corner Section 11.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, shall be limited to ------------ *of one cubic foot per second per acre,*

and shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use under the right hereby confirmed, and to which such right is appurtenant, is as follows:

SEE NEXT PAGE

All
Section 30

N 1/2
NE 1/4 SW 1/4
W 1/2 SW 1/4
NW 1/4 SE 1/4
Section 31
Township 17 South, Range 11 West, WM

All
Section 25

Lots 2, 3, 4
E 1/2 SE 1/4
Section 33

S 1/2 N 1/2
S 1/2
Section 34

S 1/2 NW 1/4
S 1/2
Section 35

All
Section 36
Township 17 South, Range 12 West, WM

W 1/2 E 1/2
W 1/2
Section 1

All
Section 2

All
Section 3

All
Section 4

All
Section 9

All
Section 10

All
Section 11

W 1/2 E 1/2
W 1/2
Section 12

NW 1/4
Section 13

N 1/2
SW 1/4
NW 1/4 SE 1/4
Section 14

All
Section 15

All
Section 16

N 1/2 N 1/2
Section 22

W 1/2
Section 23
Township 18 South, Range 12 West, WM

The right to the use of the water for the purposes aforesaid is restricted to the lands or place of use herein described. and is subject to minimum flows established by the Water Resources Commission with an effective date prior to this right.

WITNESS the signature of the Water Resources Director, affixed

this date. July 2, 1987

STATE OF OREGON

COUNTY OF LANE

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

HECETA WATER DISTRICT
87845 HIGHWAY 101 NORTH
FLORENCE, OREGON 97439

confirms the right to use the waters of CLEAR LAKE a tributary of the SIUSLAW RIVER for MUNICIPAL USE.

This right was perfected under Permit 37524. The date of priority is APRIL 30, 1974. This right is limited to 1.5 CUBIC FEET PER SECOND or its equivalent in case of rotation, measured at the point of diversion.

The point of diversion is located as follows:

NW 1/4 SW 1/4, SECTION 12, TOWNSHIP 18 SOUTH, RANGE 12 WEST, W.M.; 1557 FEET NORTH AND 5508 FEET EAST OF THE SOUTHWEST CORNER OF SECTION 11.

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use to which this right is appurtenant is as follows:

W 1/2 SW 1/4
SE 1/4 SW 1/4
SE 1/4
SECTION 30
W 1/2 NW 1/4
SECTION 31
TOWNSHIP 17 SOUTH, RANGE 11 WEST, W.M.

W 1/2 SW 1/4
SECTION 24
TOWNSHIP 17 SOUTH, RANGE 12 WEST, W.M.

This is a final order in other than contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review of the order must be filed within the 60 days of the date of service.

52076.GC

Certificate Number 80690

S 1/2 NE 1/4
W 1/2 NW 1/4
W 1/2 SW 1/4
E 1/2 SE 1/4
SECTION 25

SW 1/4 NE 1/4
E 1/2 NW 1/4
E 1/2 SW 1/4
N 1/2 SE 1/4
SE 1/4 SE 1/4
SECTION 26

S 1/2
SECTION 33

N 1/2 NE 1/4
SW 1/4 NE 1/4
NW 1/4
NE 1/4 SW 1/4
S 1/2 SW 1/4
NW 1/4 SE 1/4
SECTION 35

NE 1/4
W 1/2 NW 1/4
SE 1/4 NW 1/4
SW 1/4
N 1/2 SE 1/4
SW 1/4 SE 1/4
SECTION 36
TOWNSHIP 17 SOUTH, RANGE 12 WEST, W.M.

NW 1/4 NE 1/4
E 1/2 NW 1/4
NW 1/4 NW 1/4
SECTION 1

SW 1/4 NE 1/4
NW 1/4
N 1/2 SW 1/4
SW 1/4 SW 1/4
SECTION 2

S 1/2 SW 1/4
SECTION 3

ALL
SECTION 4
TOWNSHIP 18 SOUTH, RANGE 12 WEST, W.M.

E 1/2 NE 1/2
NW 1/4 NE 1/4
E 1/2 SE 1/4
SECTION 9

W 1/2 NE 1/4
SE 1/4 NE 1/4
NW 1/4
SW 1/4
E 1/2 SE 1/4
SECTION 10

W 1/4 NW 1/4
W 1/2 SW 1/4
SECTION 11

W 1/2 NW 1/4
SECTION 13

ALL
SECTION 14

W 1/2 NW 1/4
SW 1/4
SW 1/4 SE 1/4
SECTION 15

ALL OF SECTIONS 16, 22, 23, 26, AND 27

NE 1/4
SECTION 34

NW 1/4
SECTION 35
TOWNSHIP 18 SOUTH, RANGE 12 WEST, W.M.

Water may be applied to lands which are not specifically described above, provided the holder of this right complies with ORS 540.510(3).

The use confirmed herein may be made only at times when sufficient water is available to satisfy all prior rights, including rights for maintaining instream flows.

Issued April 22, 2004.

Paul R. Cleary, Director
Water Resources Department

Recorded in State Record of Water Right Certificates Number 80690.

52076.GC

STATE OF OREGON

COUNTY OF LANE

PERMIT TO APPROPRIATE THE PUBLIC WATERS

THIS PERMIT IS HEREBY ISSUED TO

HECETA WATER DISTRICT
87845 HIGHWAY 101 NORTH
FLORENCE, OREGON 97439

The specific limits for the use are listed below along with conditions of use.

APPLICATION FILE NUMBER: S-74717

SOURCE OF WATER: CLEAR LAKE, TRIBUTARY OF ACKERLY LAKE

PURPOSE OR USE: MUNICIPAL

MAXIMUM FLOW ALLOWED: 0.95 CUBIC FOOT PER SECOND

PERIOD OF USE: NOVEMBER 1 THROUGH SEPTEMBER 30

DATE OF PRIORITY: OCTOBER 13, 1994

POINT OF DIVERSION LOCATION: NE 1/4 SE 1/4, SECTION 11, T18S, R12W, W.M.; 1650 FEET NORTH AND 2500 FEET EAST FROM THE S 1/4 CORNER OF SECTION 11

THE PLACE OF USE IS LOCATED AS FOLLOWS:

HECETA WATER DISTRICT SERVICE AREA

Measurement, recording and reporting conditions:

A. Before water use may begin under this permit, the permittee shall install a meter or other suitable measuring device as approved by the Director. The permittee shall maintain the meter or measuring device in good working order.

B. The permittee shall allow the watermaster access to the meter or measuring device; provided however, where the meter or measuring device is located within a private structure, the watermaster shall request access upon reasonable notice.

C. The Director may require the permittee to keep and maintain a record of the amount (volume) of water used and may require the permittee to report water use on a periodic schedule as established by the Director. In addition, the Director may require the permittee to report general water use information, the periods of water use and the place and nature of use of water under the permit. The Director may provide an opportunity for the permittee to submit alternative reporting procedures for review and approval.

The permittee shall install, maintain, and operate fish screening and by-pass devices as required by the Oregon Department of Fish and Wildlife to prevent fish from entering the proposed diversion. The required screens and by-pass devices are to be in place, functional and approved by an ODFW representative prior to diversion of any water.

Within one year of permit issuance, the permittee shall submit a water management and conservation plan consistent with OAR Chapter 690, Division 86.

STANDARD CONDITIONS

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

Failure to comply with any of the provisions of this permit may result in action including, but not limited to, restrictions on the use, civil penalties, or cancellation of the permit.

This permit is for the beneficial use of water without waste. The water user is advised that new regulations may require the use of best practical technologies or conservation practices to achieve this end.

By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan.

The use of water allowed herein may be made only at times when sufficient water is available to satisfy all prior rights, including prior rights for maintaining instream flows.

The Director finds that the proposed use(s) of water described by this permit, as conditioned, will not impair or be detrimental to the public interest.

Actual construction work shall begin within one year from permit issuance and shall be completed on or before October 1, 1998. Complete application of the water to the use shall be made on or before October 1, 1999.

Issued April 26, 1996

Steven Applegate

for Martha O. Pagel, Director
Water Resources Department

STATE OF OREGON

County of LANE

PERMIT TO APPROPRIATE THE PUBLIC WATERS

This is to certify that I have examined APPLICATION 69079 and do hereby grant the same SUBJECT TO EXISTING RIGHTS INCLUDING THE APPROPRIATE MINIMUM FLOW POLICIES ESTABLISHED BY THE WATER POLICY REVIEW BOARD and the following limitations and conditions:

This permit is issued to Heceta Water District of PO Box 198, Florence, Oregon 97439, phone 997-2446, for the use of the waters of Clear Lake,

for the PURPOSE of Municipal,

that the PRIORITY OF THE RIGHT dates from May 4, 1987,

and is limited to the amount of water which can be applied to beneficial use and shall not exceed 2.25 cubic feet per second.

The POINT OF DIVERSION is to be LOCATED: 1650 feet North and 2500 feet East from the Southwest corner of the SE quarter, Section 11, being within the NE 1/4 SE 1/4, Section 11, Township 18 South, Range 12 West, WM, in the County of Lane.

A description of the PLACE OF USE under the permit, and to which such right is appurtenant, is as follows:

Township 17 South, Range 11 West, WM	Section 30	All
	Section 31	All
Township 17 South, Range 12 West, WM	Section 3	W 1/2
	Section 4	E 1/4
	Section 10	W 1/2
	Section 14	W 1/2
	Section 15	All
	Section 21	E 1/4
	Section 22	All
	Section 23	All
	Section 25	All
	Section 26	All
	Section 27	All
	Section 28	E 1/4
	Section 33	E 1/2
	Section 34	All
	Section 35	All
	Section 36	All
Township 18 South, Range 12 West, WM	Section 1	All
	Section 2	All
	Section 3	All
	Section 4	E 3/4

SEE NEXT PAGE

Township 18 South, Range 12 West, WM	Section 9	All
	Section 10	All
	Section 11	All
	Section 12	All
	Section 13	All
	Section 14	All
	Section 15	All
	Section 16	E 1/4
	Section 22	All
	Section 23	All
	Section 24	All
	Section 25	All
	Section 26	All
	Section 27	All
	Section 34	NE 1/4
	Section 35	NW 1/4

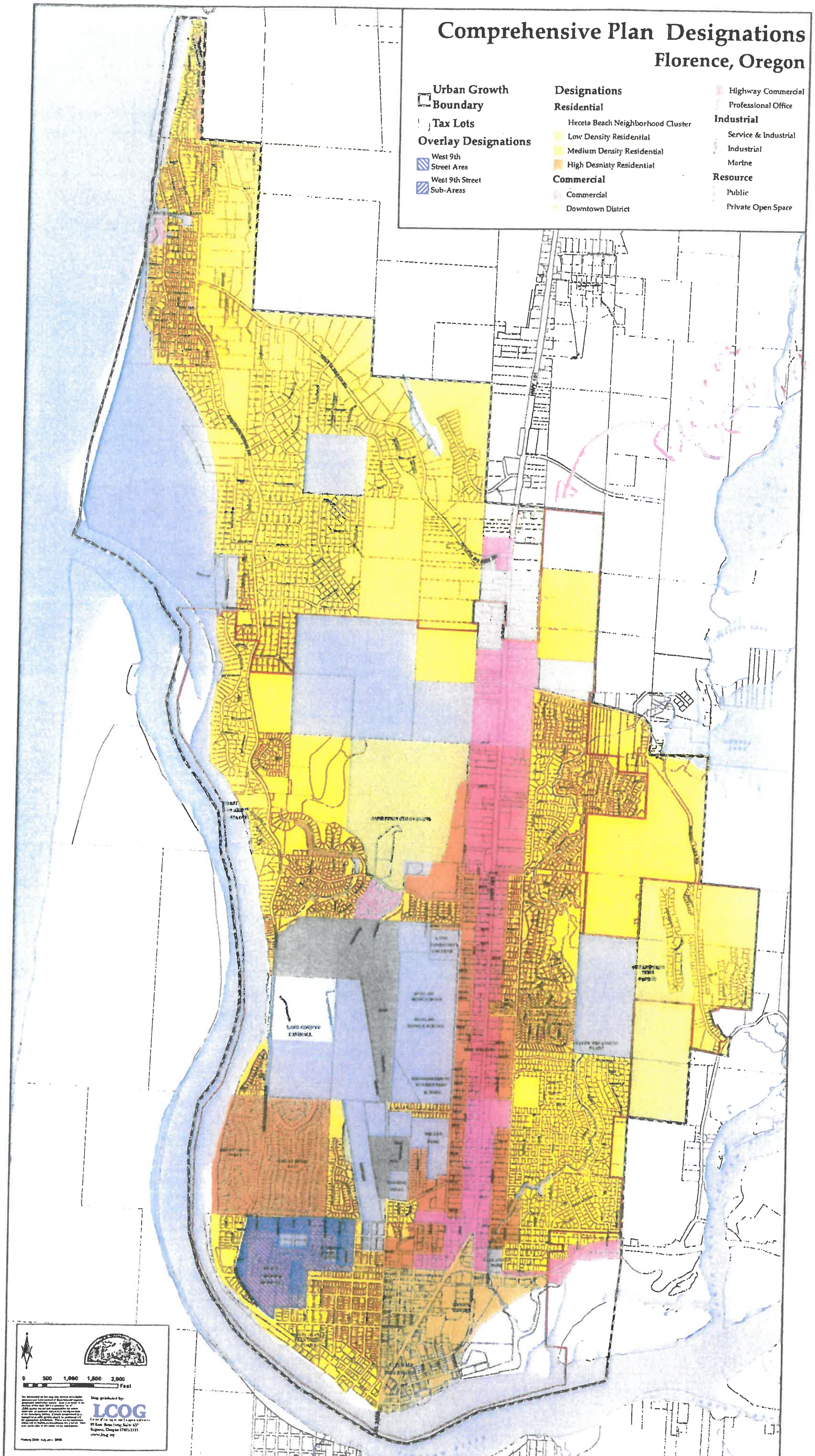
Actual construction work shall begin on or before August 18, 1988, and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 19 89 , 10-1-95, 10-1-2000

Complete application of the water to the proposed use shall be made on or before October 1, 19 90 , 10-1-95, 10-1-2000

Witness my hand this 18th day of August, 19 87 .

/s/ WILLIAM H. YOUNG

WATER RESOURCES DIRECTOR



Comprehensive Plan Designations
Florence, Oregon
Urban Growth Boundary
Tax Lots
Overlay Designations
West 9th Street Area
West 9th Street Sub-Areas
Designations
Residential
Heceta Beach Neighborhood Cluster
Low Density Residential
Medium Density Residential
High Desnisty Residential
Commercial
Commercial
Downtown District
Highway Commercial
Professional Office
Industrial
Service & Industrial
Industrial
Marine
Resource
Public
Private Open Space
0 500 1,000 1,500 2,000 Feet
Map produced by:
LCOG

APPENDIX C: WATER TREATMENT PLANT FLOW DATA

Water Pumped to City (MG)

Month	2015-2016	2016-2017	2017-2018	Ave
November	10.38	9.22	9.90	9.83
December	9.25	9.01	8.16	8.81
January	8.65	10.01	8.62	9.09
February	8.02	7.71	9.10	8.27
March	8.82	8.27	9.11	8.73
April	9.98	9.02	9.37	9.45
May	12.22	12.28	12.23	12.24
June	13.26	12.98	15.03	13.76
July	16.16	18.63	19.24	18.01
August	17.54	16.85	17.55	17.31
September	12.76	13.63	15.09	13.82
October	9.83	10.45	12.07	10.78
Total	136.85	138.04	145.46	140.12

WTP Backwash (MG)

Month	2015-2016	2016-2017	2017-2018	Ave
November	0.96	0.63	0.64	0.74
December	1.01	0.62	1.04	0.89
January	0.68	0.68	0.77	0.71
February	1.14	0.55	0.90	0.86
March	0.68	0.91	0.94	0.85
April	0.68	0.39	0.97	0.68
May	0.88	0.97	1.09	0.98
June	0.72	1.13	1.43	1.09
July	0.86	1.53	1.50	1.30
August	0.90	1.52	0.94	1.12
September	0.56	0.92	1.05	0.85
October	0.53	1.33	0.48	0.78
Total	9.60	11.18	11.75	10.85

WTP Water Production (MG)

Month	2015-2016	2016-2017	2017-2018	Ave
November	11.34	9.84	10.54	10.57
December	10.26	9.63	9.21	9.70
January	9.32	10.70	9.39	9.80
February	9.16	8.26	10.00	9.14
March	9.50	9.18	10.05	9.58
April	10.66	9.41	10.33	10.13
May	13.10	13.25	13.32	13.22
June	13.98	14.11	16.46	14.85
July	17.02	20.16	20.74	19.31
August	18.44	18.38	18.49	18.44
September	13.32	14.55	16.14	14.67
October	10.35	11.77	12.55	11.56
Total	146.45	149.23	157.22	150.97

WTP % Backwash

Month	2015-2016	2016-2017	2017-2018	Ave
November	8.5%	6.4%	6.4%	7.1%
December	9.8%	6.4%	11.3%	9.2%
January	7.3%	6.4%	8.2%	7.3%
February	12.5%	6.7%	9.0%	9.4%
March	7.2%	10.0%	9.3%	8.8%
April	6.4%	4.2%	9.4%	6.6%
May	6.7%	7.3%	8.2%	7.4%
June	5.1%	8.0%	8.7%	7.3%
July	5.1%	7.6%	7.3%	6.6%
August	4.9%	8.3%	5.1%	6.1%
September	4.2%	6.4%	6.5%	5.7%
October	5.1%	11.3%	3.8%	6.7%
Average	6.9%	7.4%	7.8%	7.4%

APPENDIX D: IMPROVEMENT ALTERNATIVE COST ANALYSIS

Summary of Priority 1 Water System Projects		
No.	**Project Description**	**Est. Cost ($)**
1	WTP Improvements: Project No. 1	$588,000
2	District Office and Shop Replacement: Project No. 2	$551,000
3	SCADA Improvements: Project No. 3	$96,000
4	Driftwood Shores Water Line Improvements: Project No	$3,639,000
5	Enchanted Valley PS: Project No. 5	$256,000
Priority 1 Projects Total		$5,130,000
Summary of Priority 2 Water System Projects		
No.	**Project Description**	**Est. Cost ($)**
6	AC Replacement: Project No. 6	$12,921,000
7	Hwy. 101 Water Line Improvements: Project No. 7	$224,000
8	Reservoir Improvements: Project No. 8	$1,335,000
Priority 2 Projects Total		$14,480,000
Summary of Priority 3 Water System Projects		
No.	**Project Description**	**Est. Cost ($)**
9	View Road Improvement: Project No. 9	$270,000
10	Hydrant Replacement	$120,000
Priority 3 Projects Total		$390,000
Summary of Priority 4 Water System Projects		
No.	**Project Description**	**Est. Cost ($)**
11	Sharktail Drive Water Line Improvements: Project No. 1	$545,000
12	Enchanted Valley PS Phase II: Project No. 12	$5,017,000
Priority 4 Projects Total		$5,562,000
Total Cost of all Priorities and All Projects		**$25,562,000**

Heceta Water PUD

WTP Improvements: Project No. 1

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Construction Facilities & Temporary Controls	LS	1	$ 50,439	$ 50,439
2	Mobilization/Demobilization	LS	1	$ 17,149	$ 17,149
3	Site Preparation	LS	1	$ 16,013	$ 16,013
4	Filter Media Replacement	EA	3	$ 25,000	$ 75,000
5	Pump VFD	EA	1	$ 77,500	$ 77,500
6	Recoating Filtration Units	EA	3	$ 37,500	$ 112,500
	Effluent Steel Piping				
6	6" 90 degree Flg. Elbow	EA	3	$ 700	$ 2,100
7	10" x 6" Wye Flg. DI	EA	3	$ 950	$ 2,850
8	6" Flg. Butterfly Valve	EA	6	$ 1,500	$ 9,000
9	6" Flg. Check Valve	EA	3	$ 2,500	$ 7,500
10	6" Flg. Spool	EA	12	$ 400	$ 4,800
11	10" x 8" Flg. Reducer	EA	2	$ 1,200	$ 2,400
12	10" Blind Flg.	EA	1	$ 400	$ 400
13	10" Flg.DI Pipe	LF	60	$ 90	$ 5,400
14	8" Flg. DI Pipe	LF	40	$ 75	$ 3,000
15	10" 90 degree Flg. Elbow	EA	1	$ 900	$ 900
16	10" Flg. Spool	EA	1	$ 1,900	$ 1,900
17	Misc. Piping/Headers/Fittings	LS	1	$ 15,000	$ 15,000
				Subtotal	$ 403,851
		Contingency @ 15%			$ 60,578
		Engineering @ 20%			$ 80,770
		Administration @ 3%			$ 12,116
		Sampling-Water Quality Study			$ 30,000
				Total	$ 588,000

Heceta Water PUD

District Office and Shop Replacement: Project No. 2

Item	Description	Unit	Quantity	Unit Price	Total
1	Construct Facilities & Temporary Controls	LS	1	$ 49,125	$ 49,125
2	Site Preparation	LS	1	$ 31,113	$ 31,113
3	Demolition	LS	1	$ 8,000	$ 8,000
4	Shop Structure	SF	90	$ 3,000	$ 270,000
5	Office Building	SF	150	$ 180	$ 27,000
6	Office Equipment	LS	1	$ 7,500	$ 7,500
7	Temporary Office Facilities	LS	1	$ 15,000	$ 15,000
				Subtotal	$ 407,738
		Contingency @ 15%			$ 61,160
		Engineering @ 20%			81,550
		Administration @ 3%			$ 12,230
				Total	$ 551,000

Heceta Water PUD

SCADA Improvements: Project No. 3

Item	Description	Unit	Quantity	Unit Price	Total
1	Electrical-SCADA System	LS	1	$63,000	$63,000
2	Monthly DSL Leased Lines	LS	1	$5,000	$5,000
3	Phone Line Connection Equipment and Installation	LS	1	$15,000	$15,000
				Subtotal	$83,000
		Contingency @ 15%			$12,450
				Total	$96,000

Heceta Water PUD

Driftwood Shores Water Line Improvements: Project No. 4

Item	Description	Unit	Quantity	Unit Price	Total
1	Construct Facilities & Temporary Controls	LS	1	$ 322,818	$ 322,818
2	Demolition & Site Preparation	LS	1	$ 161,409	$ 161,409
3	Foundation Stabilization	CY	20	$ 100	$ 2,000
4	AC Pavement R & R	TON	3,528	$ 165	$ 582,120
5	14-inch Water Line, Class C	LF	12,600	$ 105	$ 1,323,000
6	1" Service Connections	EA	117	$ 1,000	$ 117,000
7	12" Gate Valve	EA	20	$ 3,500	$ 70,000
8	12" Miscellaneous Fittings	EA	20	$ 800	$ 16,000
9	Combination Air Valve	EA	2	$ 3,000	$ 6,000
10	Hydrant Reconnection	EA	12	$ 3,000	$ 36,000
				Subtotal	$ 2,636,347
		Contingency @ 15%			$ 395,450
		Engineering @ 20%			$ 527,270
		Administration @ 3%			$ 79,090
				Total	**$ 3,639,000**

Heceta Water PUD

Enchanted Valley PS: Project No. 5

Item	Description	Unit	Quantity	Unit Price	Total
1	Construct Facilities & Temporary Controls	LS	1	$ 22,000	$ 22,000
2	Demolition & Site Preparation	LS	1	$ 11,000	$ 11,000
3	6" Water Line	LF	100	$ 65	$ 6,500
4	6" Elbow	EA	8	$ 500	$ 4,000
5	6" Tee	EA	2	$ 500	$ 1,000
6	Fire Hydrant Assembly	EA	1	$ 5,000	$ 5,000
7	6" Gate Valve	EA	4	$ 1,500	$ 6,000
8	Misc. Site Piping	LS	1	$ 5,000	$ 5,000
9	Packaged Pump Station with Enclosure	EA	1	$ 85,000	$ 85,000
10	Misc. Site Work and Electrical	LS	1	$ 30,000	$ 30,000
11	Phone/SCADA	LS	1	$ 10,000	$ 10,000
				Subtotal	$ 185,500
		Contingency @ 15%			$ 27,830
		Engineering @ 20%			$ 37,100
		Administration @ 3%			$ 5,570
				Total	$ 256,000

Heceta Water PUD

AC Replacement: Project No. 6

Item	Description	Unit	Quantity	Unit Price	Total
	HECETA BEACH				
	SEE DRIFTWOOD SHORES COST ESTIMATE				
Item	Description	Unit	Quantity	Unit Price	Total
	RHODODENDRON DRIVE				
1	Construct Facilities & Temporary Controls	LS	1	$ 170,847	$ 170,847
2	Demolition & Site Preparation	LS	1	$ 85,424	$ 85,424
3	AC Pavement R & R	TON	2,212	$ 165	$ 364,980
4	8-inch Water Line, Class B	LF	7900	$ 75	$ 592,500
5	1" Service Connections	EA	106	$ 1,000	$ 106,000
6	8" Valves	EA	24	$ 2,000	$ 48,000
7	6" Valves	EA	5	$ 1,500	$ 7,500
8	8" Tee	EA	8	$ 800	$ 6,400
9	8" 45 Degree Elbow	EA	11	$ 800	$ 8,800
10	Miscellaneous Fittings	EA	6	$ 800	$ 4,800
Subtotal					$ 1,395,251
Contingency @ 15%					$ 209,290
Engineering @ 20%					$ 279,050
Administration @ 3%					$ 41,860
Total					**$ 1,926,000**
	HWY. 101 NORTH				
1	Construct Facilities & Temporary Controls	LS	1	$ 112,080	$ 112,080
2	Demolition & Site Preparation	LS	1	$ 42,030	$ 42,030
3	AC Pavement R & R	TON	980	$ 165	$ 161,700
4	12-inch Water Line, Class B	LF	3500	$ 95	$ 332,500
5	1" Service Connections	EA	37	$ 1,000	$ 37,000
6	12" Tee	EA	1	$ 1,500	$ 1,500
7	12" Valves	EA	4	$ 3,500	$ 14,000
8	12" x 8" Reducer	EA	1	$ 1,500	$ 1,500
9	8" Valves	EA	1	$ 2,000	$ 2,000
10	12" 45 Degree Elbow	EA	4	$ 1,000	$ 4,000
11	8" 45 Degree Elbow	EA	2	$ 800	$ 1,600
12	8-inch Water Line, Class B	LF	40	$ 65	$ 2,600
13	Transition Couplings	EA	2	$ 1,000	$ 2,000
Subtotal					$ 714,510
Contingency @ 15%					$ 107,180
Engineering @ 20%					$ 142,900
Administration @ 3%					$ 21,440
Total					**$ 987,000**

HWY. 101 SOUTH							
1	Construct Facilities & Temporary Controls	LS	1	$	168,480	$	168,480
2	Demolition & Site Preparation	LS	1	$	63,180	$	63,180
3	AC Pavement R & R	TON	1,400	$	165	$	231,000
4	12-inch Water Line, Class B	LF	5,000	$	95	$	475,000
5	10-inch Water Line, Class B	LF	60	$	85	$	5,100
6	8-inch Water Line, Class B	LF	60	$	75	$	4,500
7	1" Service Connections	EA	60	$	1,000	$	60,000
8	12" Valves	EA	5	$	3,500	$	17,500
9	12" x 10" Tee	EA	1	$	2,500	$	2,500
10	12" x 8" Tee	EA	1	$	2,000	$	2,000
11	8" Valves	EA	1	$	2,000	$	2,000
12	10" Valves	EA	1	$	3,000	$	3,000
13	12" 45 Degree Elbow	EA	4	$	1,000	$	4,000
14	10" 45 Degree Elbow	EA	2	$	900	$	1,800
15	8" 45 Degree Elbow	EA	2	$	800	$	1,600
16	Transition Couplings	EA	2	$	1,200	$	2,400
17	Hydrant Reconnection	EA	10	$	3,000	$	30,000
Subtotal						$	1,074,060
Contingency @ 15%						$	161,110
Engineering @ 20%						$	214,810
Administration @ 3%						$	32,220
Total						**$**	**1,483,000**
SUTTON LAKE DRIVE							
1	Construct Facilities & Temporary Controls	LS	1	$	236,574	$	236,574
2	Demolition & Site Preparation	LS	1	$	78,858	$	78,858
3	AC Pavement R & R	TON	1,064	$	165	$	175,560
4	12-inch Water Line, Class B	LF	3,800	$	95	$	361,000
5	1" Service Connections	EA	1,000	$	1,000	$	1,000,000
6	12" Valves	EA	2	$	3,500	$	7,000
7	10" Valves	EA	2	$	3,000	$	6,000
8	12" x 6" Tee	EA	1	$	1,500	$	1,500
9	12" 45 Degree Elbow	EA	12	$	800	$	9,600
10	10" X 12" Reducer	EA	2	$	1,450	$	2,900
11	Miscellaneous Fittings	EA	2	$	800	$	1,600
12	Hydrant Reconnection	EA	4	$	3,000	$	12,000
Subtotal						$	1,892,592
Contingency @ 15%						$	283,890
Engineering @ 20%						$	378,520
Administration @ 3%						$	56,780
Total						**$**	**2,612,000**

		COLLARD LAKE IMPROVEMENTS					
1	Construct Facilities & Temporary Controls	LS	1	$	81,885	$	81,885
2	Demolition & Site Preparation	LS	1	$	27,295	$	27,295
3	AC Pavement R & R	TON	630	$	165	$	103,950
4	12-inch Water Line, Class B	LF	1,200	$	95	$	114,000
5	8-inch Water Line, Class B	LF	3,300	$	75	$	247,500
6	1" Service Connections	EA	23	$	1,000	$	23,000
7	12" Valves	EA	4	$	3,500	$	14,000
8	8" Valves	EA	4	$	2,000	$	8,000
9	6" Valves	EA	1	$	1,500	$	1,500
10	8" Tee	EA	1	$	800	$	800
11	12" Tee	EA	1	$	1,500	$	1,500
12	12" 45 Degree Elbow	EA	4	$	800	$	3,200
13	Hydrant Reconnection	EA	5	$	750	$	3,750
14	6" X 12" Reducer	EA	2	$	1,050	$	2,100
15	8"x 6" Reducer	EA	2	$	800	$	1,600
16	6" x 4" Reducer	EA	1	$	800	$	800
17	12" 45 Degree Elbow	EA	4	$	1,000	$	4,000
18	8" 45 Degree Elbow	EA	8	$	800	$	6,400
19	6" 45 Degree Elbow	EA	2	$	700	$	1,400
20	4" 45 Degree Elbow	EA	2	$	600	$	1,200
21	Transition Couplings	EA	6	$	1,200	$	7,200
Subtotal						$	655,080
Contingency @ 15%						$	98,260
Engineering @ 20%						$	131,020
Administration @ 3%						$	19,650
Total						**$**	**905,000**

		NORTH MERCER LAKE AND DAHLIN ROAD					
1	Construct Facilities & Temporary Controls	LS	1	$	58,614	$	58,614
2	Demolition & Site Preparation	LS	1	$	19,538	$	19,538
3	AC Pavement R & R	TON	784	$	165	$	129,360
4	8-inch Water Line, Class B	LF	2,800	$	75	$	210,000
5	1" Service Connections	EA	25	$	1,000	$	25,000
6	8" Valves	EA	3	$	2,000	$	6,000
7	8" 45 Degree Elbow	EA	13	$	600	$	7,800
8	Miscellaneous Fittings	EA	3	$	800	$	2,400
9	Transition Couplings	EA	1	$	1,200	$	1,200
10	Hydrant Reconnection	EA	3	$	3,000	$	9,000
Subtotal						$	410,298
Contingency @ 15%						$	61,540
Engineering @ 20%						$	82,060
Legal. Admin./Finan @ 7%						$	12,310
Total						**$**	**567,000**

MUNSEL LAKE ROAD TO CLEAR LAKE RESERVOIR								
1	Construct Facilities & Temporary Controls	LS	1	$	236,343	$	236,343
2	Demolition & Site Preparation	LS	1	$	78,781	$	78,781
3	AC Pavement R & R	TON	2,408	$	165	$	397,320
4	12-inch Water Line, Class B	LF	8,600	$	95	$	817,000
5	12-inch Water Line, Class A	LF	3,000	$	85	$	255,000
5	1" Service Connections	EA	18	$	1,000	$	18,000
6	12" Valves	EA	15	$	3,500	$	52,500
7	12" 45 Degree Elbow	EA	6	$	800	$	4,800
8	12" Tee	EA	2	$	1,500	$	3,000
9	Miscellaneous Fittings	EA	5	$	800	$	4,000
10	Hydrant Reconnection	EA	8	$	3,000	$	24,000
Subtotal						$	1,654,401
Contingency @ 15%						$	248,160
Engineering @ 20%						$	330,880
Administration @ 3%						$	49,630
Total						**$**	**2,284,000**
MERCER LAKE ROAD							
1	Construct Facilities & Temporary Controls	LS	1	$	218,007	$	218,007
2	Demolition & Site Preparation	LS	1	$	109,004	$	109,004
3	AC Pavement R & R	TON	2,492	$	165	$	411,180
4	12-inch Water Line, Class B	LF	8,900	$	95	$	845,500
5	1" Service Connections	EA	72	$	1,000	$	72,000
6	Hydrant Reconnection	EA	19	$	3,000	$	57,000
7	12" x 6" Tee	EA	3	$	1,100	$	3,300
8	12" 45 Degree Elbow	EA	8	$	1,000	$	8,000
9	12" Valves	EA	11	$	3,500	$	38,500
10	Transition Cplg.	EA	5	$	1,200	$	6,000
11	6" Valves	EA	3	$	1,500	$	4,500
12	6" 45 Degree Elbow	EA	6	$	700	$	4,200
13	Miscellaneous Fittings	EA	4	$	800	$	3,200
Subtotal						$	1,562,384
Contingency @ 15%						$	234,360
Engineering @ 20%						$	312,480
Administration @ 3%						$	46,870
Total						**$**	**2,157,000**
TOTAL						**$**	**12,921,000**

Heceta Water PUD

Hwy. 101 Water Line Improvements: Project No. 7

Item	Description	Unit	Quantity	Unit Price	Total
1	Construct Facilities & Temporary Controls	LS	1	$ 20,000	$ 20,000
2	Demolition & Site Preparation	LS	1	$ 10,000	$ 10,000
3	AC Pavement R & R	TON	126	$ 165	$ 20,790
4	12" Water Line, Class A	LF	900	$ 85	$ 76,500
5	1" Service Connections	EA	3	$ 1,000	$ 3,000
6	12" Valves	EA	2	$ 3,500	$ 7,000
7	12" 90 Degree Elbow	EA	4	$ 1,000	$ 4,000
8	Hydrant Reconnection	EA	2	$ 3,000	$ 6,000
9	Misc. Site Work	LS	1	$ 15,000	$ 15,000
				Subtotal	$ 162,290
		Contingency @ 15%			$ 24,340
		Engineering @ 20%			$ 32,460
		Administration @ 3%			$ 4,870
				Total	$ 224,000

Heceta Water PUD

Reservoir Improvements: Project No. 8

Item	Description	Unit	Quantity	Unit Price	Total
	Collard Lake Reservoir				
1	Construct Facilities & Temporary Controls	LS	1	$45,165	$45,165
2	Demolition & Site Preparation	LS	1	$15,055	$15,055
3	12" Flexible Joint	EA	2	$7,000	$14,000
4	12" Gate Valve w/Actuator	EA	2	$15,000	$30,000
5	12" and 16" Fittings	EA	20	$1,000	$20,000
6	12" Spools	EA	6	$600	$3,600
7	Seismic Controller	EA	1	$35,000	$35,000
8	Temporary Bypass	EA	1	$15,000	$15,000
9	Collar Fabrication and Installation	EA	2	$8,000	$16,000
10	Tank Disinfection	LS	1	$4,500	$4,500
11	Extg. Piping Plugs	EA	2	$1,500	$3,000
12	Interior Coating	LS	1	$120,000	$120,000
13	Cathodic Protection	LS	1	$40,000	$40,000
Subtotal					$ 361,320
Contingency @ 15%					$ 54,200
Engineering @ 20%					$ 72,260
Administration @ 3%					$ 10,840
Total					**$ 499,000**
	Clear Lake Reservoir				
1	Construct Facilities & Temporary Controls	LS	1	$42,240	$42,240
2	Demolition & Site Preparation	LS	1	$14,080	$14,080
3	12" Flexible Joint	EA	2	$7,000	$14,000
4	12" Butterfly Valve w/Actuator	EA	2	$15,000	$30,000
5	12" and 16" Fittings	EA	10	$1,000	$10,000
6	12" Spools	EA	6	$600	$3,600
7	Seismic Controller	EA	1	$35,000	$35,000
8	Temporary Bypass	EA	1	$20,000	$20,000
9	Collar Fabrication and Installation	EA	2	$8,000	$16,000
10	Tank Disinfection	LS	1	$4,500	$4,500
11	12" Hot Tap Saddle w/ Gate Valve	EA	1	$5,500	$5,500
12	Extg. Piping Plugs	EA	2	$1,500	$3,000
13	Interior Coating	LS	1	$100,000	$100,000
14	Cathodic Protection	LS	1	$40,000	$40,000
Subtotal					$ 295,680
Contingency @ 15%					$ 44,350
Engineering @ 20%					$ 59,140
Administration @ 3%					$ 8,870
Total					**$ 409,000**

	Sutton Lake Reservoir				
1	Construct Facilities & Temporary Controls	LS	1	$19,365	$19,365
2	Demolition & Site Preparation	LS	1	$6,455	$6,455
3	AC Pavement R & R	TON	216	$140	$30,229
4	12-inch Water Line, Class C	LF	1900	$65	$123,500
5	1" Service Connections	EA	1	$700	$700
6	12" Flexible Joint	EA	1	$7,000	$7,000
7	12" Butterfly w/Actuator	EA	2	$15,000	$30,000
8	12" and 16" Fittings	EA	10	$900	$9,000
9	12" Spools	EA	6	$600	$3,600
10	12" Butterfly Valve	EA	1	$1,500	$1,500
11	16" Butterfly Valve	EA	1	$2,500	$2,500
12	Seismic Controller	EA	1	$35,000	$35,000
13	Temporary Bypass	EA	1	$15,000	$15,000
14	Extg. Piping Plugs	EA	2	$1,500	$3,000
15	Tank Disinfection	LS	1	$4,500	$4,500
16	Valve Vault	EA	2	$9,000	$18,000
Subtotal					$ 309,349
Contingency @ 15%					$ 46,400
Engineering @ 20%					$ 61,870
Administration @ 3%					$ 9,280
Total					**$ 427,000**
TOTAL					**$ 1,335,000**

Heceta Water PUD

View Road Improvement: Project No. 9

Item	Description	Unit	Quantity	Unit Price	Total
1	Construct Facilities & Temporary Controls	LS	1	$ 18,000	$ 18,000
2	Demolition & Site Preparation	LS	1	$ 9,000	$ 9,000
3	Foundation Stabilization	CY	20	$ 100	$ 2,000
4	AC Pavement R & R	TON	136	$ 165	$ 22,501
5	12-inch Water Line, Class B	LF	1200	$ 95	$ 114,000
6	1" Service Connections	EA	2	$ 1,000	$ 2,000
7	12" Gate Valve	EA	5	$ 3,500	$ 17,500
8	12" Miscellaneous Fittings	EA	5	$ 800	$ 4,000
9	Combination Air Valve	EA	1	$ 3,000	$ 3,000
10	Hydrant Reconnection	EA	1	$ 3,000	$ 3,000
				Subtotal	$ 195,001
		Contingency @ 15%			$ 29,250
		Engineering @ 20%			$ 39,000
		Administration @ 3%			$ 5,850
				Total	$ 270,000

Heceta Water PUD

Hydrant Replacement: Project No. 10

Item	Description	Unit	Quantity	Unit Price	Total
1	Hydrant Replacement	1	20	$ 6,000	$ 120,000

*This project includes the District replacing approx. 20 hydrants per year. Assume that the District will solicit quotes and address the contract without engineering.

Heceta Water PUD

Sharktail Drive Water Line Improvements: Project No. 11

Item	Description	Unit	Quantity	Unit Price	Total
1	Construct Facilities & Temporary Controls	LS	1	$ 46,000	$ 46,000
2	Demolition & Site Preparation	LS	1	$ 23,000	$ 23,000
3	AC Pavement R & R	TON	560	$ 165	$ 92,400
4	8" Water Line, Class B	LF	2000	$ 75	$ 150,000
5	1" Service Connections	EA	26	$ 1,000	$ 26,000
6	8" Valves	EA	8	$ 2,000	$ 16,000
7	8" Tee	EA	3	$ 2,000	$ 6,000
8	8" 90 Degree Elbow	EA	3	$ 800	$ 2,400
9	8" 45 Degree Elbow	EA	7	$ 800	$ 5,600
10	8" x 6" Reducer	EA	5	$ 800	$ 4,000
11	8" x 6" Tee	EA	3	$ 700	$ 2,100
12	6" 45 Degree Elbow	EA	10	$ 700	$ 7,000
13	Transition Couplings	EA	4	$ 1,200	$ 4,800
14	Hydrant Reconnection	EA	3	$ 3,000	$ 9,000
				Subtotal	$ 394,300
		Contingency @ 15%			$ 59,150
		Engineering @ 20%			$ 78,860
		Administration @ 3%			$ 11,830
				Total	$ 545,000

Heceta Water PUD

Enchanted Valley PS Phase II: Project No. 12

Item	Description	Unit	Quantity	Unit Price	Total
1	Construct Facilities & Temporary Controls	LS	1	$ 444,596	$ 444,596
2	Demolition & Site Preparation	LS	1	$ 222,298	$ 222,298
3	Additional Fire Flow added to piping configuration	HR	80	$ 55	$ 4,400
4	AC Pavement R & R	TON	5,412	$ 165	$ 892,907
5	12-inch Water Line, Class B	LF	19,327	$ 95	$ 1,836,065
6	1" Service Connections	EA	10	$ 1,000	$ 10,000
7	Hydrant Reconnection	EA	8	$ 3,000	$ 24,000
8	Transition Cplg.	EA	2	$ 1,200	$ 2,400
9	12" Valve	EA	20	$ 3,500	$ 70,000
10	12" x 6" Reducer	EA	2	$ 1,300	$ 2,600
11	12" 45 Degree Elbow	EA	25	$ 1,000	$ 25,000
12	12" Miscellaneous Fittings	EA	5	$ 800	$ 4,000
13	Fire Flow Pump	LS	1	$ 97,000	$ 97,000
				Subtotal	$ 3,635,266
		Contingency @ 15%			$ 545,290
		Engineering @ 20%			$ 727,050
		Administration @ 3%			$ 109,060
				Total	$ 5,017,000

APPENDIX E: RAW WATER LINE EASEMENT

After recording, return to:

REC'D JAN 12 2007

Paul V. Vaughan
Hershner, Hunter
P. O. Box 1475
Eugene, OR 97440

UTILITY EASEMENT

PARTIES:

LANE COUNTY, a political subdivision of the State of Oregon (County)

HECETA WATER DISTRICT, an Oregon domestic water supply district (Water District)

RECITALS:

A. County is the owner of the following described property located in Lane County, Oregon and conveyed to County by a Sheriff's Deed recorded September 12, 1955, in Reel 66-55D, at Recorder's Reception No. 65851, a Relinquishment of Title from the State of Orgeon recorded October 16, 1970, in Reel 502-R, at Recorder's Reception No. 24588 and a Warrenty Deed from the Cascade Title Company recorded August 16, 1971, in Reel 545-R, Recorder's Reception No. 59353, all in Lane County Official Records (the County Property):

> Tax Lot 1 of Section 11; The Northeast Quarter of the Northeast Quarter of Section 11; and Lots 1 and 2 in Section 11; The Southeast Quarter of the Southeast Quarter of Section 2, all in Township 18, Range 12 West of the Willamette Meridian, Lane County, Oregon (Map #18-12-11-00-00100).

AND

A parcel of land lying in the South one-half of the Northwest one-quarter, and the Southwest one-quarter of the Northeast one-quarter of Section 11, Township 18 South, Range 12 West, Willamette Meridian, and being a portion of the strip of land of variable width on each side of the centerline of Taylor Road, said centerline being described as follows:

Beginning at Engineer's Centerline Station L^2 0+01.38, said station being South 0°09'40" West 1502.00 feet from a point on the North line of Section 11, Township 18 South, Range 12 West of the Willamette Meridian, which point is South 86°18'20" East 930.29 feet from the Northwest corner of said Section 11, said station also being Oregon Coast Highway Centerline Station 218+15.00 P.O.T.; thence South 82°50'20" East 304.61 feet; thence on a 1145.92 feet radius curve right (the long chord of which curve bears South 70°36'35" East 485.46 feet) a distance of 489.17 feet; thence South 58°22'50" East 25.85 feet to Station $L^2$8+21.01 P.O.T. Bk = L 8+21.01 P.T. Ah; thence South 58°22'50" East 866.10 feet; thence on a 1432.39 feet radius curve left (the long chord of which curve bears South 70°36'35" East 606.82 feet) a distance of 611.46 feet to Engineers' Centerline Station L 22+98.57 P.T.; thence South 82° 50' 20" East a distance of 1034.43 feet, more or less, to the west line of the Southeast 1/4 of the Northeast 1/4 of Section 11, Township 18 South, Range 12 West of the Willamette Meridian, excepting therefrom that portion which is accepted public road with an Easterly terminus at Engineer's Centerline Station L 20+50.00 P.O.C., in Lane County, Oregon (Map #18-12-11-00-00201).

B. County, as Grantor, and Water District, as Grantee, are parties to that certain Easement dated July 24, 1968 and recorded in the Lane County Official Records on July 26, 1968 in Reel 401-R, at Recorder's Reception No. 33112 (the 1968 Easement). Pursuant to the 1968 Easement, County granted to Water District easements for a pipeline and access road, a reservoir (the Reservoir), and a pump station as more particularly described therein.

C. Pursuant to Order No. 00-8-30-13 of the Lane County Board of Commissioners, County agreed to grant to Water District an additional easement across the County Property for a pipeline and access road between the Reservoir and the point at which the dedicated public road portion of Taylor Road intersects the westerly boundary of the County Property, on the terms described below.

AGREEMENTS:

1. GRANT. County hereby grants and conveys to Water District, its successors and assigns, a perpetual non-exclusive easement and right-of-way 60 feet in width (upon, across, over and/or under the real property) extending between the "Easement No. 2 reservoir site" described in the 1968 Easement and the point at which the dedicated public road portion of Taylor Road intersects the westerly boundary of the County Property (the Easement Strip), as more fully described in Paragraph 3. below. This easement is subject to the easements previously granted to Water District in the 1968 Easement and to the Central Lincoln People's Utility District described in the document recorded on July 26, 1968 in Reel 401-R, Reception No. 33113, Lane County Deed Records, Lane County, Oregon. The Easement Strip grant shall be subject to the following limitations and conditions in addition to the other terms provided below:

a. After calendar year 2001, not more than one million (1,000,000) gallons of water may be withdrawn by Water District from Clear Lake in any given 24-hour period and during calendar year 2001 the maximum withdrawal shall be one million five hundred thousand (1,500,000) gallons per day; and

b. Water District shall monitor withdrawal of water from Clear Lake and the daily rate of water withdrawal shall be recorded for a five-year period beginning on March 1, 2001; and

c. Monthly reports showing all of the water withdrawn by Water District from Clear Lake shall be provided within 15 days of the end of each month by Water District to County Board of Commissioners during the entire five-year monitoring period. Thereafter, Water District shall provide to County an annual report showing water withdrawals from Clear Lake for each year following the initial five-year monitoring period for as long as this easement continues; and

d. Withdrawal of water in excess of the per day limitation provided for in paragraph 1.a. above may only occur when emergency conditions require additional water for public health or safety as determined by County within five (5) calendar days following the emergency withdrawal. Water District shall notify County immediately of all emergency water withdrawals; and

e. The terms and restrictions contained in this easement are intended to benefit and may be enforced by interested persons, which shall mean any person owning property or living within the Clear Lake Watershed as defined in Exhibit "B" attached and incorporated here by this reference, or any person served by the Water District. If any of the terms or conditions of the easement are violated by Water District, then County or other interested persons may enforce those requirements and take other appropriate actions that will protect the public interest only after providing to Water District notice and an opportunity to cure the alleged violation. The notice shall contain a statement or description of the alleged violation that can be readily understood and shall include the date, time, place and provision of the easement for each alleged violation. Any violation of the water withdrawal limitation provided for in paragraph 1.a. above shall be cured within three (3) calendar days of receipt of the notice. For violation of any other terms and conditions of this easement, steps shall be taken by Water District to cure the alleged violation within 30 days of receipt of the notice. Any notice of alleged violation shall also be provided to County and failure of County to take steps indicating an intention to enforce the terms and conditions of this easement within 30 days of County receipt of the notice shall entitle any other interested person to proceed with appropriate enforcement action. An affirmative indication by the County Board of Commissioners declining to take enforcement steps in the face of an alleged violation at any time within the 30-day period for County action shall entitle any other interested person to proceed with appropriate enforcement action for that violation before expiration of the 30-day period. Enforcement shall not entitle any interested person other than County and Water District to an award of damages; provided, Water District may only seek damages from County and County may only seek damages from Water District. Enforcement by County, Water District or any interested person shall not entitle any award of costs or attorney fees; and

f. Notwithstanding any other provision of this easement, County reserves the exclusive right to terminate or modify the terms and conditions of this easement by agreement with Water District alone.

2. PURPOSE. Water District shall have the right to use the Easement Strip for access to the easement areas described in the 1968 Easement for the full and complete use, occupation and enjoyment of the easements and rights granted pursuant to the 1968 Easement, and in conjunction with such use, may construct, reconstruct, maintain and repair a road thereon. Water District shall also have the right to use the Easement Strip for (a) the construction, installation, operation, maintenance and repair of water transmission facilities (including pumping stations and distribution lines) and (b) the installation, operation, maintenance and repair of such electrical and communication lines (telephone, cable, fiber optic or similar technology) as the Water District deems necessary or appropriate for operating the water transmission facilities installed within the Easement Strip and for operating the facilities installed or constructed within the easement areas described in the 1968 Easement. Location and relocation of facilities installed within the Easement Strip shall be the sole responsibility of the Water District.

3. LEGAL DESCRIPTION OF THE EASEMENT STRIP. The approximate location of the centerline of the Easement Strip is described on the attached Exhibit A. The parties acknowledge that geologic conditions, wetlands, terrain and other natural and man-made features may affect the actual location of the Easement Strip between the "Easement No. 2 reservoir site" described in the 1968 Easement and the point at which the dedicated public road portion of Taylor Road intersects the westerly boundary of the County Property. Water District shall determine a suitable location for the centerline of the Easement Strip for the purposes described in the above paragraph 2. and shall have a survey made by a licensed engineer and/or surveyor of that centerline. After that survey is filed with the county surveyor's office, Water District shall record an instrument referencing this Utility Easement and describing the surveyed centerline of the Easement Strip. Upon recording, such instrument shall serve to amend this Utility Easement to provide the correct legal description of the centerline of the Easement Strip, and such amendment of the description

shall be effective without the signature of County. Upon recording, a copy of the instrument showing the recording information shall be provided by Water District to County's administrator, with a copy to County's legal counsel.

4. ABANDONMENT. The Easement Strip shall be used by the Water District only for the described public purposes and if not used for those public purposes for a period of one year or more after the initial installation of the water transmission facilities, this Utility Easement shall terminate and use of the Easement Strip shall revert to County.

5. COMPLIANCE WITH LAW. Water District shall build, operate and maintain the transmission facilities authorized by this Utility Easement and installed within the Easement Strip in conformance with all applicable laws and regulations.

6. CONSIDERATION. As consideration for this Utility Easement, Water District shall provide up to 1.5 million gallons of water per calendar year at no fee to County's park facilities at Harbor Vista Park, Heceta Beach and the Munsel and Mercer Lake boat landings.

7. INDEMNITY. Water District agrees to indemnify, defend and hold County, its Commissioners, officers, agents and employees acting in their capacity for the county harmless from any and all loss, liability or expense arising out of claims made by third parties against County as a result of County's execution of this Utility Easement. Water District also specifically agrees to defend and indemnify County, its Commissioners, officers, agents and employees acting in their capacity for the county from any claim, liability or damage resulting from the withdrawal, filtration, treatment and transmission of water from Clear Lake and use of the Easement Strip by Water District, including claims related to the water quality or level of the lake and effects on the adjacent property owners. Further, each of the parties hereto agree to indemnify and save the other harmless from any claim, liability or damage resulting from any error, omission or act of negligence on the part of the indemnifying party, its officers, agents or employees in the performance of its responsibilities under this agreement. The obligations under this paragraph are subject to the limitations of the Oregon Constitution and the Oregon Tort Claims Act.

8. RESERVATION OF RIGHTS. County reserves the right and privilege to use the Easement Strip at any time and in any manner for any purpose not inconsistent with the full use and enjoyment of the rights and privileges herein granted to Water District. Location and relocation of facilities installed within the Easement Strip shall be the sole responsibility of the Water District.

9. FUTURE ASSURANCES. Each of the parties shall, upon request of the other party, execute and deliver such additional documents as may be necessary or convenient for the purpose of evidencing or perfecting any rights or interests arising under this Utility Easement.

10. BINDING EFFECT. All of the covenants, agreements, conditions and terms contained in this Utility Easement shall be binding upon, apply and inure to the benefit of the successors and assigns of the respective parties hereto.

11. PARTIAL INVALIDITY. If any provision of this Utility Easement is held to be invalid or unenforceable, all other provisions shall nevertheless continue in full force and effect.

12. CAPTIONS. The captions are inserted only for convenience and are not part of this Utility Easement nor a limitation on the scope of the particular paragraph to which each refers.

13. TERMINATION FOR REPEATED VIOLATIONS OF EASEMENT. If Water District commits "Repeated Violations" of this easement, County shall have the right, at its option, to terminate this easement. The right to terminate this easement as provided in this paragraph shall be a remedy available exclusively to County and shall not apply to any third-party enforcement of the easement as provided herein. As used in this paragraph, "Repeated Violations" of this easement shall be defined to have occurred when:

a. Except as permitted in subparagraph 1.d., the water withdrawal limitation described in Paragraph 1. is exceeded on more than three (3) days in any calendar month; provided, however, that notice and an opportunity to cure as provided in subparagraph 1.e. must first have been given to Water District during that calendar month and Water District shall have failed to cure the violation within the time provided in subparagraph 1.e.; or

b. During any calendar year, on more than two occasions, Water District is provided with notice of a violation of any provision of this easement in accordance with subparagraph 1.e., and Water District fails to cure the violation within the time provided in subparagraph 1.e.

DATED: January 24, 2001

LANE COUNTY

By BOARD OF COUNTY COMMISSIONERS OF LANE COUNTY, OREGON

_____________________, Commissioner

_____________________, Commissioner

_____________________, Commissioner

_____________________, Commissioner

_____________________, Commissioner

APPROVED AS TO FORM
Date 1/24/2001 lane county
OFFICE OF LEGAL COUNSEL

Water District accepts this Utility Easement and authorizes its recording.

HECETA WATER DISTRICT

By: Ted Condo

Ted Condo, Chair

STATE OF OREGON)
) ss.
COUNTY OF LANE)

This instrument was acknowledged before me on JAN 24, 25, 30 2001, by Anna Morrison, Bobby Green, Cindy Weeldreyer, Bill Dwyer, and Peter Sorenson, County Commissioners of Lane County.

OFFICIAL SEAL
MELISSA A ZIMMER
NOTARY PUBLIC - OREGON
COMMISSION NO. 313320
MY COMMISSION EXPIRES JUNE 8, 2002

Melissa A. Zimmer

Notary Public for Oregon
My Commission Expires:

STATE OF OREGON)
) ss.
COUNTY OF LANE)

This instrument was acknowledged before me on 2-15, 2001, by Ted Condo, Chair of Heceta Water District.

Patricia A. Hughes

Notary Public for Oregon
My Commission Expires: 11-21-04

OFFICIAL SEAL
PATRICIA A HUGHES
NOTARY PUBLIC–OREGON
COMMISSION NO. 339178
MY COMMISSION EXPIRES NOV 21, 2004

EXHIBIT A

DESCRIPTION OF CENTERLINE OF 60 FOOT EASEMENT

Beginning at Engineer's Centerline Station L^2 0+01.38, said station being South 0°09'40" West 1502.00 feet from a point on the North line of Section 11, Township 18 South, Range 12 West of the Willamette Meridian, which point is South 86°18'20" East 930.29 feet from the Northwest corner of said Section 11, said station also being Oregon Coast Highway Centerline Station 218+15.00 P.O.T.; thence South 82°50'20" East 304.61 feet; thence on a 1145.92 feet radius curve right (the long chord of which curve bears South 70°36'35" East 485.46 feet) a distance of 489.17 feet; thence South 58°22'50" East 25.85 feet to Station $L^2$8+21.01 P.O.T. Bk = L 8+21.01 P.T. Ah; thence South 58°22'50" East 866.10 feet; thence on a 1432.39 feet radius curve left (the chord of which curve bears South 65°38'18" East 361.92 feet) a distance of 362.89 feet to Engineers' Centerline Station L 20+50.00 P.O.C., and the TRUE POINT OF BEGINNING of this centerline description;

thence on a 1432.39 feet radius curve left (the chord of which curve bears South 77°52'03" East 248.26 feet) a distance of 248.57 feet;

thence South 82° 50' 20" East a distance of 1034.43 feet, more or less, to the west line of the Southeast 1/4 of the Northeast 1/4 of Section 11, Township 18 South, Range 12 West of the Willamette Meridian;

thence South 82° 50' 20" East a distance of 667 feet to Engineers' Centerline Station L 40+00.00 P.O.T.;

thence leaving said Engineers' Centerline South 02°30'00" West a distance of 328.00 feet;

thence South 18°08'15" East a distance of 770.00 feet, more or less, to the existing water tank, the END POINT of this description.

The westerly boundary of the 60 foot wide easement strip shall be extended or shortened so as to terminate on the westerly line of the County Property described in this Utility Easement.

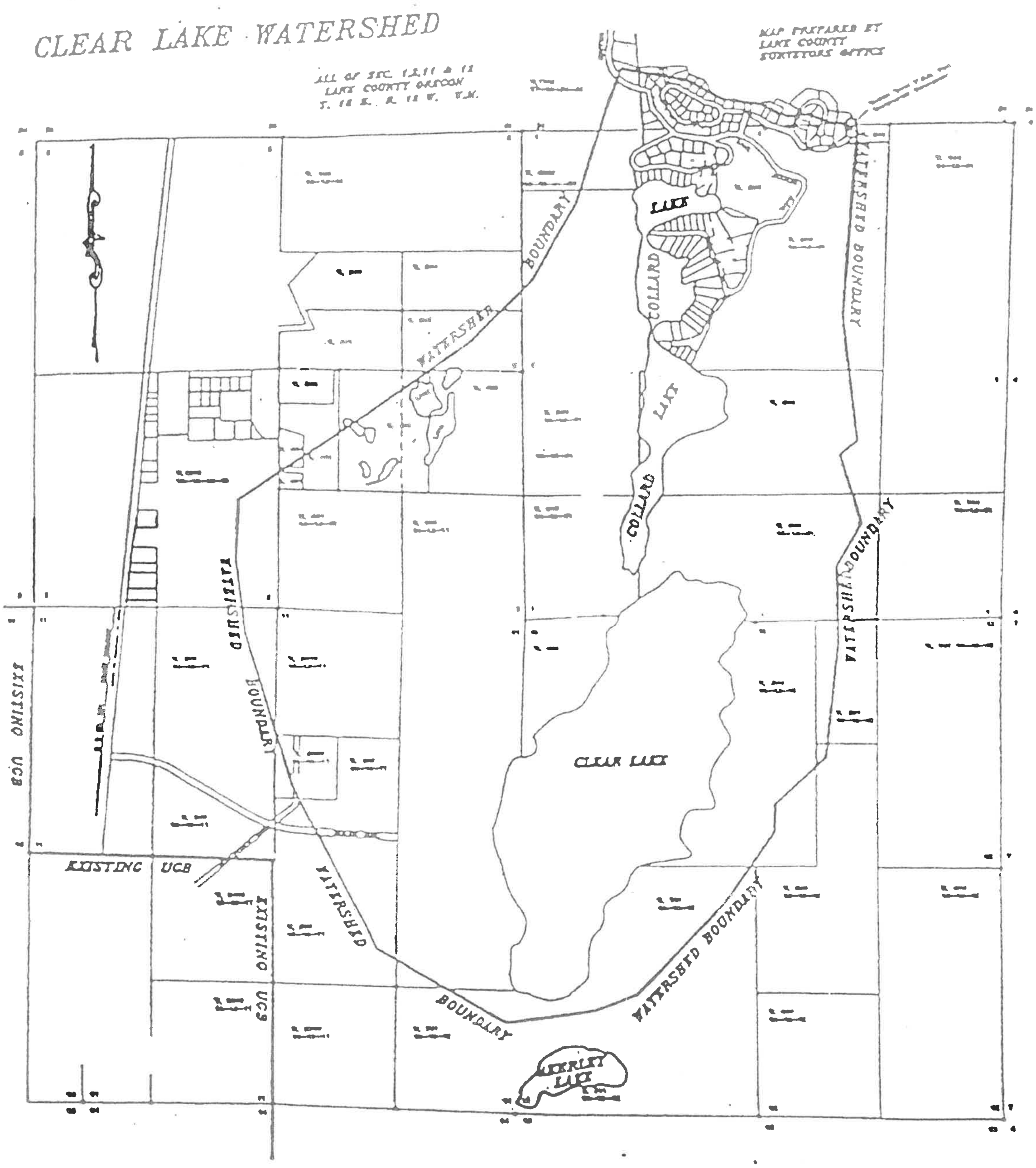
The bearings used herein are based upon the Oregon Coordinate System, South Zone.

All in Lane County, Oregon.

LEGAL DESCRIPTION OF CLEAR LAKE WATERSHED

Beginning at point known as Tank One, located in Section One, Township 18 South, Range 12 West, of the Willamette Meridian, Lane County Oregon;
Run thence S. 67° 50' 51.5" E. 97.8 ft. to the True Point of Beginning;
Run thence S. 05° 40' 43.0" W. 1960.62 ft. to a point,
Run thence S. 04° 58' 45.4" E. 1301.91 ft. to a point,
Run thence S. 52° 44' 01.0" W. 231.21 ft. to a point,
Run thence S. 15° 20' 45.4" E. 774.62 ft. to a point,
Run thence S. 31° 44' 14.0" W. 520.89 ft. to a point,
Run thence S. 00° 24' 43.9" W. 834.02 ft. to a point,
Run thence S. 07° 49' 01.8" W. 1191.07 ft. to a point,
Run thence S. 50° 26' 06.3" W. 73 1.61 ft. to a point,
Run thence S. 02° 51' 10.5" W. 301.37 ft. to a point,
Run thence S. 36° 37' 58.2" W. 918.41 ft. to a point,
Run thence S. 47° 12' 26.3" W. 1321.86 ft. to a point,
Run thence S. 72° 58' 54.2" W. 498.84 ft. to a point,
Run thence S. 85° 44' 21.3" W. 955.64 ft. to a point,
Which is N. 11° 39' 16.9" W5434.90 ft. from a point known as Green Two (located in section 13 in said Township and Range);
Run thence N. 58° 09' 44.1" W. 1630.28 ft. to a point,
Run thence N. 25° 23' 10.1" W. 1978.00 ft. to a point,
Run thence N. 16° 34' 21.0" W. 1731.95 ft. to a point,
Run thence N. 06° 13' 18.0" W. 747.40 ft. to a point,
Run thence N. 03° 50' 32.8" E. 671.51 ft. to a point,
Run thence N. 59° 33' 18.9" E. 1117.02 ft. to a point,
Run thence N. 59° 50' 06.0" E. 1894.56 ft. to a point,
Run thence N. 48° 28' 40.0" E. 897.56 ft. to a point,
Run thence N. 31° 29' 50.7" E. 920.64 ft. to a point,
Run thence N. 19° 46' 39.6" E. 1524.95 ft. to a point,
Run thence S. 76° 05' 37.1" E. 748.95 ft. to a point,
Run thence S. 57° 33' 30.2" E. 445.53 ft. to a point,
Run thence S. 78° 27' 44.9" E. 394.98 ft. to a point,
Run thence S. 61° 55' 39.0" E. 323;00 %. to a point,
Run thence N. 89° 04' 46.8" E. 249.03 ft. to a point,
Run thence S. 67° 43' 17.4" E. 245.31 ft. to a point,
Run thence S. 79° 55' 09.8" E. 45.71 ft. to a point,
Run thence S. 83° 59' 27.6" E. 95.52 ft. to a point,
Run thence N. 42° 02' 57.2" E 68.68 ft. to a point,
Run thence S. 80° 41' 24.2" E. 61.81 ft. to a point,
Run thence S. 10° 47' 03.5" E. 128.27 ft. to the True Point of Beginning.

APPENDIX "A" TO LANE CODE
CHAPTER 16 (LC 16.258(2))



APPENDIX "A" TO LANE CODE
CHAPTER 16 (LC 16.258(2))

? A of Controversy
easement from
Olen Lober -

PIPELINE EASEMENT DESCRIPTION

From George Martin to Heceta Water District

Map attached

For the purpose of constructing,servicing, maintaining and d access to pipeline, water works structures and other requirements necessary and incidental to the operation of a municipal water system.

BEGINNING at the Iron pipe which marks the Southwest corner of the SE¼,SE¼ of Section 11, Township 18 South, Range 12 West of the willamette Meridian, Lane County, Oregon, thence South along the 1/16th line a distance of 320 feet more or less to the South Boundary of the George Martin property, thence East along the said south boundary of the George Martin property a distance of 100.0 feet to the true point of beginning of the following described pipe line easement:

Thence North, parallel to the above described 1/16 line a distance of 1,689 feet more or less to the east-west 1/16 line between the NE¼,SE¼, Section 11, Township 18 South, Range 12 West of the Willamette Meridian and the SE¼, SE¼, Section 11, Township 18 South, Range 12 West of the Willamette Meridian, thence East along said 1/16 line a distance of 60.00 feet, thence South a distance of 1,689 feet more or less and parallel to the West line herein before described, to the South boundary of the George Martin property, thence West a distance of 60.0 feet along the South boundary of the George Marting property to the true point of beginning, being a portion of the SE¼,SE¼, S 11, T18S, R12 WWM and the NE¼,NE¼, Sec. 14, T18S, R12 WWM, Lane County, Oregon and containing 2.33 Acres more or less.

268

The center line description to which reference is made herein is as follows:

Beginning at a point on the South boundary of the George Martin property, which point being located South 77° 19' 45" East a distance of 1,520.44 feet from the 1/4 corner on the South boundary of Section 11, Town ship 18 South, Range 12 West of the Willamette Meridian, Lane County, Oregon; thence North 0°00'30" West a distance of 320.0 feet; thence North 31° 49' 30" East a distance of 1,504.70 feet; thence North 3° 03' 30" West a distance of 35 feet, more or less, to a point on the North boundary of the SE 1/4, SE 1/4, Section 11, Township 18 South, Range 12 West of the Willamette Meridian, said point also being the north boundary of the George Martin property.

This Correction Easement supersedes in all particulars that certain easement dated the 12th day of October, 1967, between George E. Martin and Rubie N. Martin, husband and wife, Grantors, and the same Grantee, recorded March 28, 1968, Reel 885R, Lane County Official Records, clerk's filing no. 18925.

Witness my hand and seal, this 27th day of May, 1968.

Rubie N. Martin

STATE OF OREGON)
) ss.
County of Lane)

BE IT REMEMBERED, that on this 27th day of May, 1968, before me, the undersigned a notary public in and for said County and State, personally appeared the within named RUBIE N. MARTIN, surviving spouse of George E. Martin, deceased is known to me to be the identical individual described in and who executed the within instrument and acknowledged to me that she executed the same freely and voluntarily.

IN TESTIMONY WHEREOF, I have hereunto set my hand and official seal the day and year last above written.

SIDNEY J. NICHOLSON NOTARY PUBLIC STATE OF OREGON

Sidney J. Nicholson
Notary Public for Oregon
My Commission Expires: 9-17-70

269...

CORRECTION EASEMENT

Rubie N. Martin, surviving spouse of
George E. Martin, deceased

Florence, Oregon

her

Heceta Water District, an Oregon municipal corporation

Lane

303 449 Lane County Oregon Deed Records

60

30 30

1. A locked gate will be maintained across the south end of this easement, adequately fenced to deny access to the general public, but a key for said lock is to be furnished at all times to Grantor, as well as Grantor's perpetual free use of said easement on any road located thereon by Grantee, conditioned upon grantee's payment of a proportion of upkeep cost only.

2. No vegetation is to be injured or destroyed other than as is actually necessary for the original laying and subsequent maintenance of the main pipeline.

3. There is not to be more than 1,000,000 gallons per day of water transported via any pipeline installed over this easement.

4. Any dock, pump-house and/or other intake facility erected and maintained by Grantee at the Clear Lake end of the pipe line which runs over the herein granted easement shall be securely locked at all times and inaccessible to the general public.

5. No building, structure, or other improvement shall be constructed above

...n Ea... ...

... Water Dist.

State of Oregon,
County of Lane—ss.

I, Ina Randolph, Director of the Department of Records and Elections, in and for the said County, do hereby certify that the within instrument was received for record at

[illegible] MAR 29 [illegible] 11 02 .0

Reel 34 x K

Lane County OFFICIAL Records.

INA RANDOLPH, Director of the Department of Records & Elections.

By [illegible]
Deputy

C29-083-05

[illegible] BUILDING

The center line description to which reference is made herein is as follows:

Beginning at a point on the South boundary of the George Martin property, which point being located South 77° 19' 45" East a distance of 1,520.44 feet from the 1/4 corner on the South boundary of Section 11, Town ship 18 South, Range 12 West of the Willamette Meridian, Lane County, Oregon; thence North 0°00'30" West a distance of 320.0 feet; thence North 31° 49' 30" East a distance of 1,504.70 feet; thence North 3° 03' 30" West a distance of 35 feet, more or less, to a point on the North boundary of the SE 1/4, SE 1/4, Section 11, Township 18 South, Range 12 West of the Willamette Meridian, said point also being the north boundary of the George Martin property.

This Correction Easement supersedes in all particulars that certain easement dated the 12th day of October, 1967, between George E. Martin and Rubie N. Martin, husband and wife, Grantors, and the same Grantee, recorded March 28, 1968, Reel 885R, Lane County Official Records, clerk's filing no. 18925.

Witness my hand and seal, this 27th day of May, 1968.

Rubie N. Martin

STATE OF OREGON)
) ss.
County of Lane)

BE IT REMEMBERED, that on this 27th day of May 1968, before me, the undersigned a notary public in and for said County and State, personally appeared the within named RUBIE N. MARTIN, surviving spouse of George E. Martin, deceased is known to me to be the identical individual described in and who executed the within instrument and acknowledged to me that she executed the same freely and voluntarily.

IN TESTIMONY WHEREOF, I have hereunto set my hand and official seal the day and year last above written.

SIDNEY J. NICHOLSON NOTARY PUBLIC STATE OF OREGON

Sidney J. Nicholson
Notary Public for Oregon
My Commission Expires: 9-17-70

2[illegible]

CORRECTION EASEMENT

Rubie N. Martin, surviving spouse of
George E. Martin, deceased

Florence, Oregon

her

Heceta Water District, an Oregon municipal corporation

Lane

303 449 Lane County Oregon Deed Records

60

30 30

1. A locked gate will be maintained across the south end of this easement, adequately fenced to deny access to the general public, but a key for said lock is to be furnished at all times to Grantor, as well as Grantor's perpetual free use of said easement on any road located thereon by Grantee, conditioned upon grantee's payment of a proportion of upkeep cost only.

2. No vegetation is to be injured or destroyed other than as is actually necessary for the original laying and subsequent maintenance of the main pipelin

3. There is not to be more than 1,000,000 gallons per day of water transported via any pipeline installed over this easement.

4. Any dock, pump-house and/or other intake facility erected and maintained by Grantee at the Clear Lake end of the pipe line which runs over the herein granted easement shall be securely locked at all times and inaccessible to the general public.

5. No building, structure, or other [illegible]

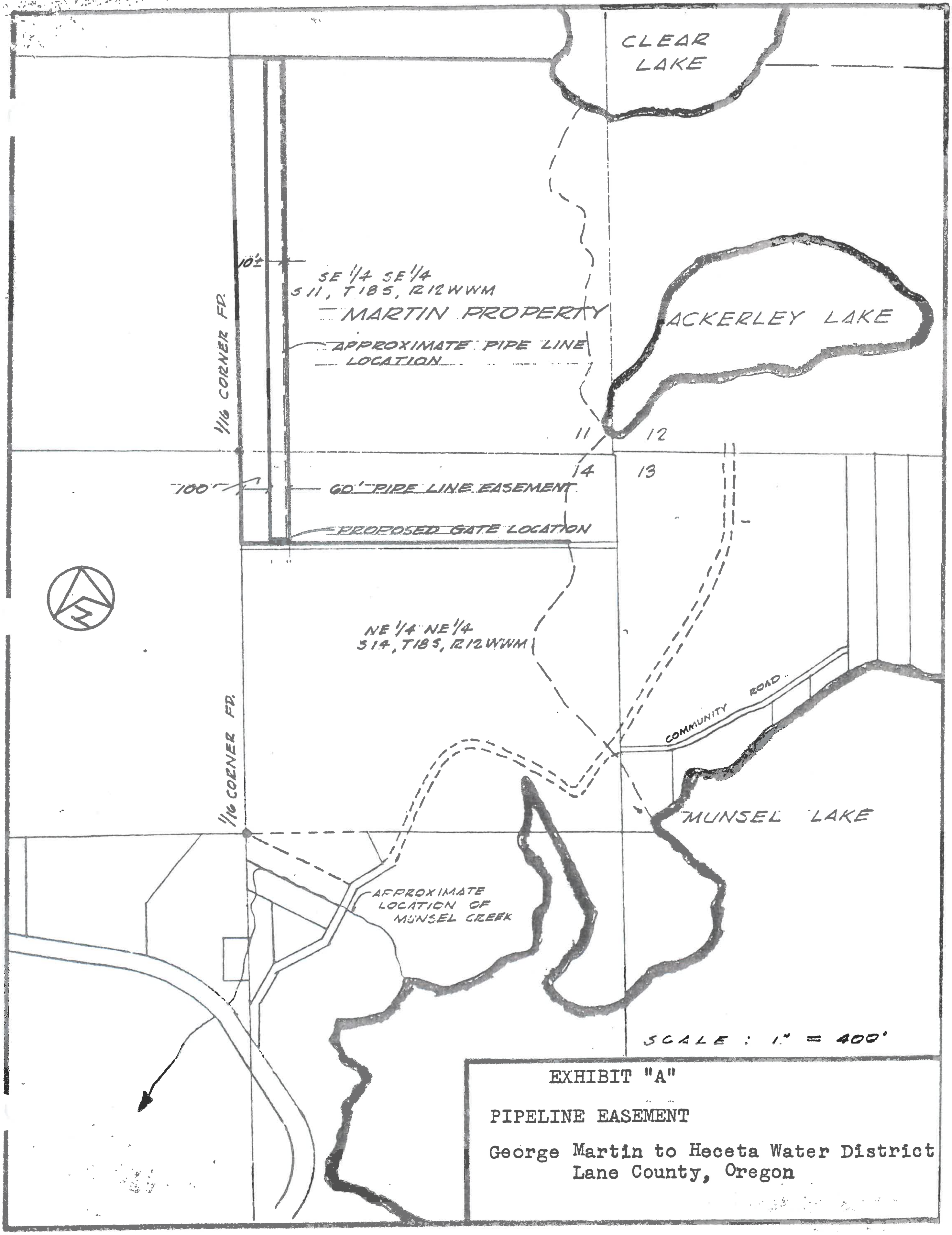
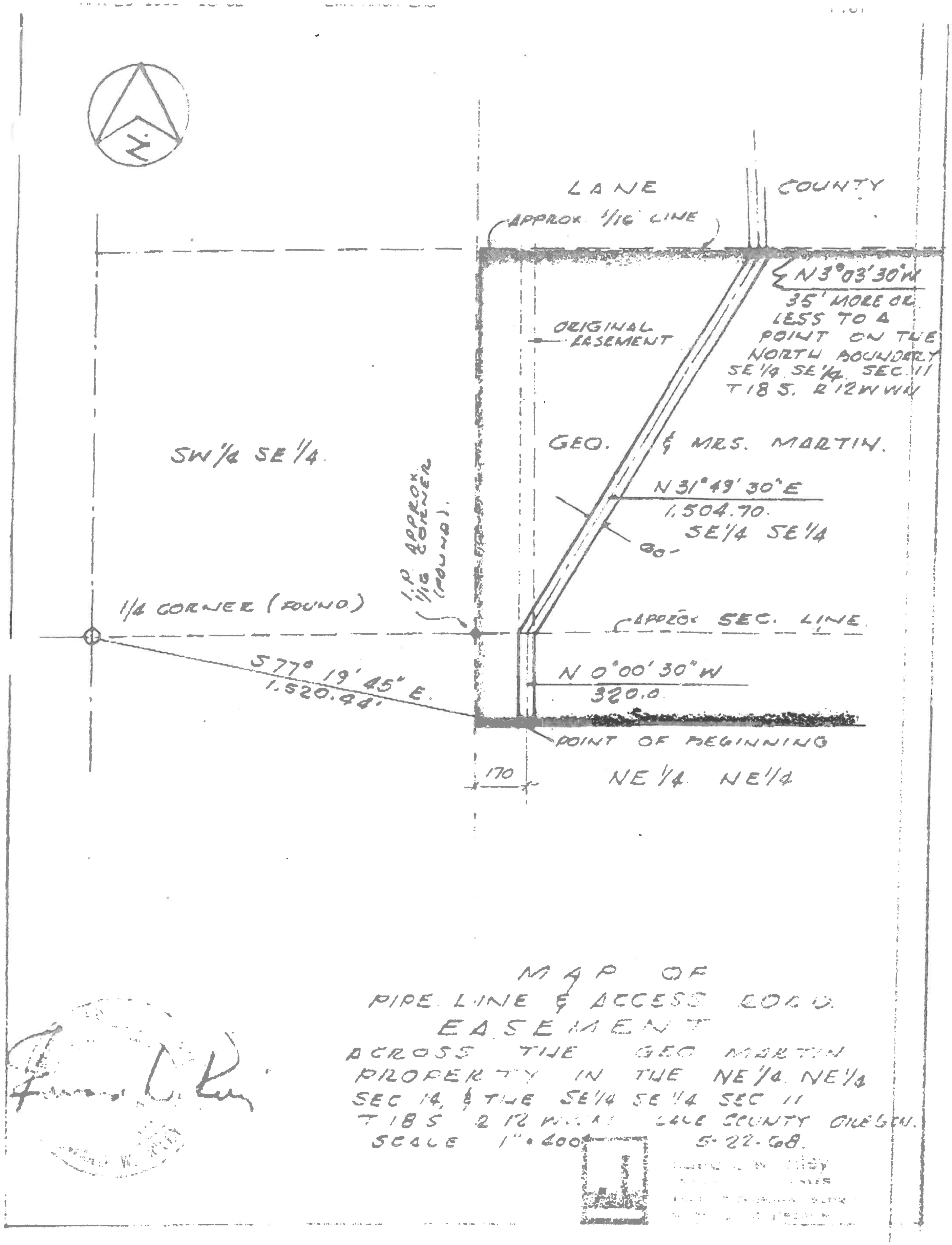


EXHIBIT "A"

PIPELINE EASEMENT

George Martin to Heceta Water District
Lane County, Oregon



LANE COUNTY
APPROX 1/16 LINE
N 3°03'30"W
35' MORE OR LESS TO A POINT ON THE NORTH BOUNDARY SE 1/4 SE 1/4 SEC. 11 T 18 S. R 12 W WM
ORIGINAL EASEMENT
GEO. & MRS. MARTIN.
SW 1/4 SE 1/4
N 31°49'30"E
1,504.70.
SE 1/4 SE 1/4
60'
I.P. APPROX. 1/16 CORNER (FOUND).
1/4 CORNER (FOUND)
APPROX SEC. LINE
S 77° 19' 45" E.
1,520.44'
N 0°00'30"W
320.0
POINT OF BEGINNING
170
NE 1/4 NE 1/4
MAP OF
PIPE LINE & ACCESS ROAD
EASEMENT
ACROSS THE GEO MARTIN PROPERTY IN THE NE 1/4 NE 1/4 SEC 14, & THE SE 1/4 SE 1/4 SEC 11
T 18 S R 12 W.W.M. LANE COUNTY OREGON.
SCALE 1" = 400'
5-22-68.

APPENDIX F: HWPUD BUILDING INSPECTION

NorthWest Inspection Services
PO BOX 628
Florence, Or. 97439
(541) 991-0975

Brian Goss
OREGON CERTIFIED
HOME INSPECTOR #1782
Licensed Bonded & Insured

BUILDING INSPECTION &
WOOD DESTROYING ORGANISM REPORT

Client Name: Heceta Water People's Utility District
Time of Inspection: 02-09-2018 @ 0900

87845 Hwy 101, Florence Oregon 97439

THIS REPORT IS INTENDED ONLY FOR THE USE OF THE PERSON PURCHASING THE BUILDING INSPECTION SERVICES. NO OTHER PERSON, INCLUDING A PURCHASER OF THE INSPECTED PROPERTY WHO DID NOT PURCHASE THE BUIODING INSPECTION SERVICES, MAY RELY UPON ANY REPRESENTATION MADE IN THE REPORT.

Marginal Summary

This summary is not the entire report. The complete report may include additional information of concern to the client. It is recommended that the client read the complete report.

Lots and Grounds

1. Exit: Concrete - The back door is not functional and exits to a set of concrete steps that do not have a sufficient size landing or handrail. Recommend evaluation and repair of door and landing as needed.
2. Vegetation: Shrubs, Trees - Vegetation is up close to and / or against the home, recommend trimming back to provide minimum 10-12" clearance.

Enclosed Parking

3. Shop Garage Garage Doors: Metal - The overhead shop doors have some areas of damage. This damage is mainly cosmetic however the north door will need to be further evaluated and repaired to ensure proper operation.
4. Shop Garage Floor/Foundation: Poured concrete - Minor floor cracks noted that have settled and created a lip that can be tripped over, recommend repair.
5. Shop Garage Hose Bibs: Shop sink - The shop sink has a small 6 gallon water heater that appears to be damaged and not producing sufficient amounts of hot water, recommend evaluation and repair.

Exterior

6. Attached Shop Exterior Surface Type: Wood T-1-11 Shop - Areas of moisture damage / dry rot were located, recommend repair.
7. Office Exterior Surface Type: Composite Lap & Wood T-1-11 Office - The siding is damaged in areas. Due to the age of the building and the siding, as well as its visible appearance, this siding may contain asbestos fibers which can require special repair / removal procedures. It is recommended that a qualified contractor further evaluate, test, and repair as needed.
   Missing or damaged paint / caulking was observed, exposing raw wood in areas around the perimeter of the home, recommend repair to restore moisture resistance.
8. Shop Exterior Surface Type: Fiberglass side light panels - The fiberglass light panels have become cracked and brittle in areas, recommend repair or replacement as needed to help resist moisture from entering the building.
9. Office Crawlspace Skirting Exterior Surface Type: Plywood - The plywood / wood skirting around the office crawlspace is loose and damaged in areas. This skirting is covered in spots with brick-look vinyl, recommend further evaluation of the skirting and repair as needed.
   Under the building I observed moisture and dry rot damage around the skirting as well as open gaps that can allow small animals in the under floor area, recommend evaluation of the skirting and repair. See crawlspace section on venting information.
10. Trim: Wood - Areas of moisture damage / dry rot were located, recommend repair.
11. Fascia: Wood - Missing or damaged paint was observed, exposing raw wood, recommend repair to restore moisture resistance.
    Areas of moisture damage / dry rot were located, recommend repair.
12. Soffits: Wood, Plywood - Areas of moisture damage / dry rot were located, recommend repair.
13. Windows: Aluminum slider - The wood window trim around the aluminum windows on the office are moisture damaged from missing and damaged paint, recommend repair.
14. Window Screens: Vinyl mesh - Missing or damaged, recommend repair and / or replacement.
15. Exterior Lighting: Surface mount - The light was not operational at time of inspection, recommend replacing bulb and repairing fixture if necessary.

Marginal Summary (Continued)

Roof

16. Office & Shop Roof Surface Material: Architectural composition shingle - The roof appears to have been installed around 1995 and is now 23 years old. This type of shingle is designed to last approximately 30-35 years. The roofing is in fair condition, showing areas of wear especially on the south facing side. The protective rock coating has come off in areas which exposes fiberglass threading. Moss growth has also become heavy in areas on the north side of the roof. I observed an area that has been repaired with roofing sealant. This sealant may indicate a past or present leak and is not a proper roof repair. Recommend treating the moss and cleaning the debris from the roof's surface. Evaluate and repair the the damaged and sealed shingles. Monitor the roofing and repair or replace as necessary.
17. Electrical Mast: Mast w/o Tie back - Unused electrical mast and antenna mounts should be removed and the roofing repaired in these areas to lessen the chance of moisture intrusion and roofing damage.
18. Gutters: Galvanized, Plastic - The gutters are blocked by debris, damaged in areas, and / or are not handling the amount of rainwater sufficiently.
    I observed erosion on the ground on the north side of the building. It appears that the gutters are damaged, and overflowing.
    Recommend cleaning to allow proper rainwater drainage and evaluation of the gutters' ability to handle the rainwater.
    I observed loose and / or damaged gutter attachment points, recommend repair.
19. Downspouts: Aluminum - Damaged and or leaking downspout, recommend repair.
20. Leader/Extension: Drain lines, Splash blocks - The downspouts are missing drain lines / splash blocks in areas, recommend adding to direct rainwater away from the perimeter of the building.

Electrical

21. Smoke Detectors: Alarm system - The building appears to have a smoke sensor for a security alarm only. I observed one out of date smoke alarm in the close office space. I did not observe any smoke or carbon monoxide alarms for the building itself, recommend reviewing fire code for this type of office space and adding required units.
22. Office Electric Panel Breakers: AL-CU - I observed a breaker with two wires attached to a single connection point, this is commonly known as a double tapped breaker. Most breakers are only designed to have one wire attached. Recommend further evaluation and repair by a licensed electrician.

Plumbing

23. Water Lines: CPVC - CPVC appears to replace the original galvanized plumbing. No insulation is installed on the plumbing under the building, recommend adding insulation.
    Older buildings may have other types of plumbing that are not visible at the time of inspection. It is always a good idea to consider a water quality test in this age of building.

Attic

24. Office Attic Ventilation: Gable only - The west facing gable vent has holes in the screening and the frame is moisture damaged, recommend repair or replacement.
    The attic area does not have sufficient ventilation installed. Recommend adding lower soffit and upper roof ventilation.
25. Office Attic Insulation: Blown in - The insulation has been pressed down by moisture and or small animals. Odor neutralizer was observed in the attic possibly due to small animal activity, recommend cleaning up the insulation and adding insulation as desired.
26. Office Attic Wiring/Lighting: 110 VAC - There are several exposed and open wire connections at uncovered junction boxes, recommend repair by a licensed electrician.

Marginal Summary (Continued)

Crawl Space

27. North Exterior Crawl Space Access: Wood door - The wood frame for the crawlspace access door is dry rot damaged, recommend repairing the frame and adding barrel latches for easy access.
28. North Exterior Crawl Space Ventilation: None - The crawlspace does not have venting installed in the skirting, recommend adding ventilation when the skirting is repaired.
29. North Exterior Crawl Space Electrical: 110 VAC/220 VAC - The electrical wires run under the building are not supported properly in areas and are lying on the ground or obstructing the crawlspace, recommend having a licensed electrician properly support the wiring where needed.

Structure

30. Foundation: Post & Pier - The office building is built of wood posts that appear to be setting on small concrete piers. Most piers are buried and the bottom of the posts were covered by soil. I dug up two posts and found dry rot damaged wood that is no longer supporting the floor framing. Recommend having a licensed contractor specializing in foundations further evaluate and repair as necessary.
31. Joists/Trusses: 2x8 - I observed an added joist that is shimmed with several pieces of wood, recommend evaluation and repair.

Common Area

32. Open Office Space Living Space Ceiling: Paint, Wood - The paint is peeling and has exposed raw wood on the northwest end of the office, recommend repair.
33. Open Office Space Living Space Electrical: 110 VAC outlets and lighting circuits - The outlets test open or missing ground, recommend having a licensed electrician repair.
34. Office Living Space Electrical: 110 VAC outlets and lighting circuits - The available outlets test open or missing ground, recommend having a licensed electrician repair.

Bathroom

35. Office Bathroom Electrical: 110 VAC outlets and lighting circuits - The GFCI outlet did not trip with the GFCI tester and showed open ground, recommend having a licensed electrician repair or replace the outlet.
36. Office Bathroom Faucets/Traps: Dual handle fixtures with a PVC trap - Hot water was not available for hand washing. This sink may be attached to the faulty shop sink water heater, recommend evaluation and repair.
37. Office Bathroom Ventilation: Electric ventilation fan and window - The ventilation fan was not operating correctly and the heat lamp was missing. This heat lamp is the only source of heat in the bathroom.
38. Office Bathroom Other: Disabled amenities - The bathroom is not sufficiently outfitted for disabled use. Recommend reviewing regulations for this bathroom and outfitting as needed.

Defective Summary

This summary is not the entire report. The complete report may include additional information of concern to the client. It is recommended that the client read the complete report.

Exterior

1. Hose Bibs: Gate - The hose bib on the west side of the building is not functional, recommend evaluation and repair.
   The south exterior hose bib is not secure, allowing movement and possible damage to the plumbing. The handle hits the siding, recommend repair.

Table of Contents

Definitions

NOTE: All definitions listed below refer to the property or item listed as inspected on this report at the time of inspection

Acceptable	Functional with no obvious signs of defect.
Not Present	Item not present or not found.
Not Inspected	Item was unable to be inspected for safety reasons or due to lack of power, inaccessible, or disconnected at time of inspection.
Marginal	Item is not fully functional and requires repair or servicing.
Defective	Item needs immediate repair or replacement. It is unable to perform its intended function.

General Information

Property Information

Property Address 87845 Hwy 101
City Florence State Oregon Zip 97439
Contact Name Carl Neville
Phone 541-999-4125

Client Information

Client Name Heceta Water District
Client Address 8785 Hwy 101
City Florence State Oregon Zip 97439
Phone 541-997-2446
Fax 541-997-1059
E-Mail c.neville@hwpud.com

Inspection Company

Inspector Name Brian Goss
Company Name Northwest Inspection Services
Address PO Box 628
City Florence State Oregon Zip 97439
Phone 541-991-0975
Fax N/A
E-Mail nwis@icloud.com
File Number 0352018

Conditions

Others Present Staff, Property Occupied Yes
Estimated Age 1952 / 1975, Entrance Faces South
Inspection Date 02-09-2018
Start Time 0900 - End Time 1330
Electric On Yes
Gas/Oil On Not Applicable
Water On Yes
Temperature 45*
Weather Partly cloudy, Soil Conditions Wet
Space Below Grade Crawl Space
Building Type Commercial, Garage Shop
Sewage Disposal Septic, How Verified Visual Inspection
Water Source Heceta, How Verified Visual Inspection

Lots and Grounds

Acceptable Parking: Asphalt - 4 Marked Parking and 1 Disabled for a total of 5. Large general parking area in front of shop building. Sealant coat on asphalt is in overall good condition.

Acceptable Walkways: Concrete ramp w/ rail

Acceptable Entry: Covered Entry

Marginal Exit: Concrete - The back door is not functional and exits to a set of concrete steps that do not have a sufficient size landing or handrail. Recommend evaluation and repair of door and landing as needed.

Acceptable Grading: Minor slope

Marginal Vegetation: Shrubs, Trees - Vegetation is up close to and / or against the home, recommend trimming back to provide minimum 10-12" clearance.

Acceptable Fences: Chain link

Enclosed Parking

Shop Garage

Type of Structure: Attached, Car Spaces: Shop area & 3 vehicle bays

Marginal — Garage Doors: Metal - The overhead shop doors have some areas of damage. This damage is mainly cosmetic however the north door will need to be further evaluated and repaired to ensure proper operation.

Acceptable — Door Operation: Manual

Acceptable — Roof Structure: 2x4 Truss

Acceptable — Service Doors: Wood

Acceptable — Ceiling: Exposed framing

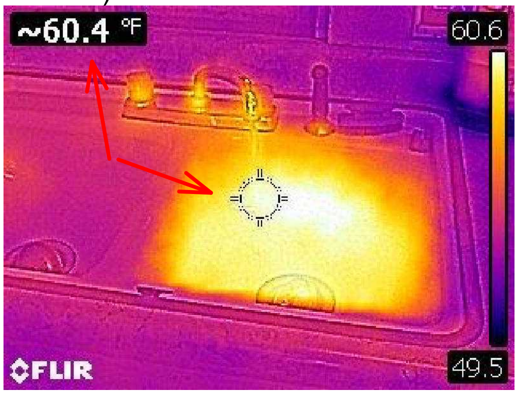
Acceptable — Walls: Exposed framing, Paint

Marginal — Floor/Foundation: Poured concrete - Minor floor cracks noted that have settled and created a lip that can be tripped over, recommend repair.

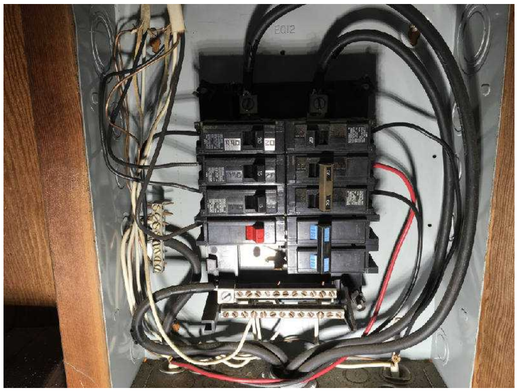
Marginal — Hose Bibs: Shop sink - The shop sink has a small 6 gallon water heater that appears to be damaged and not producing sufficient amounts of hot water, recommend evaluation and repair.

Enclosed Parking (Continued)

Hose Bibs: (continued)



Acceptable Electrical: 110 VAC/220 VAC



Exterior

Attached Shop Exterior Surface

Marginal Type: Wood T-1-11 Shop - Areas of moisture damage / dry rot were located, recommend repair.

Exterior (Continued)

Type: (continued)

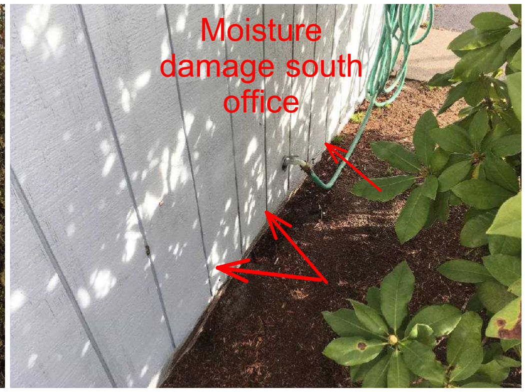
Office Exterior Surface

Marginal Type: Composite Lap & Wood T-1-11 Office - The siding is damaged in areas. Due to the age of the building and the siding, as well as its visible appearance, this siding may contain asbestos fibers which can require special repair / removal procedures. It is recommended that a qualified contractor further evaluate, test, and repair as needed.

Missing or damaged paint / caulking was observed, exposing raw wood in areas around the perimeter of the home, recommend repair to restore moisture resistance.

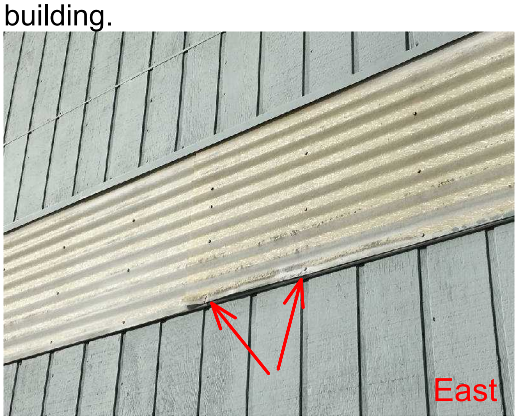
Exterior (Continued)

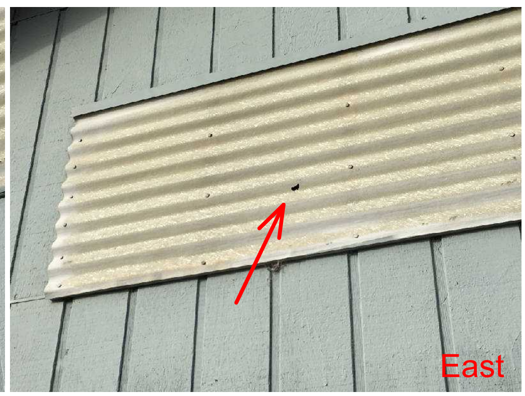
Type: (continued)



Shop Exterior Surface

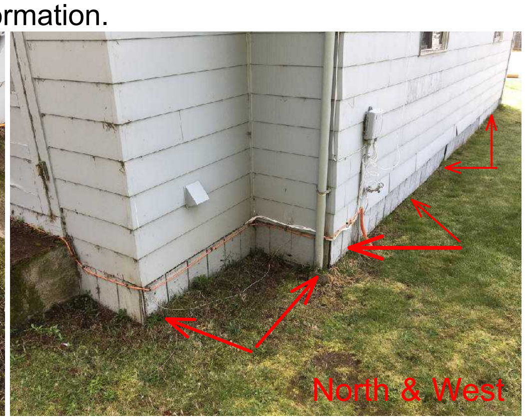
Marginal — Type: Fiberglass side light panels - The fiberglass light panels have become cracked and brittle in areas, recommend repair or replacement as needed to help resist moisture from entering the building.





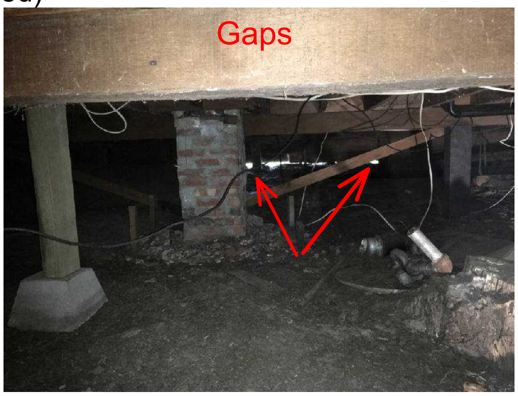
Office Crawlspace Skirting Exterior Surface

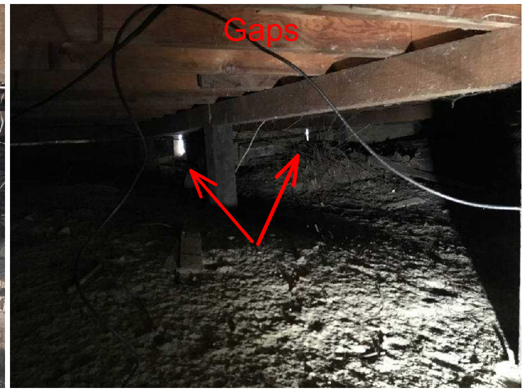
Marginal — Type: Plywood - The plywood / wood skirting around the office crawlspace is loose and damaged in areas. This skirting is covered in spots with brick-look vinyl, recommend further evaluation of the skirting and repair as needed.
Under the building I observed moisture and dry rot damage around the skirting as well as open gaps that can allow small animals in the under floor area, recommend evaluation of the skirting and repair. See crawlspace section on venting information.

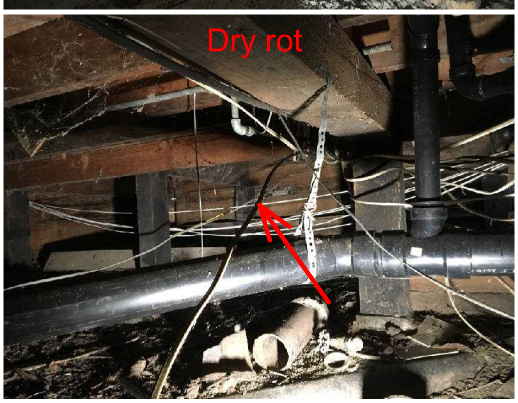


Exterior (Continued)

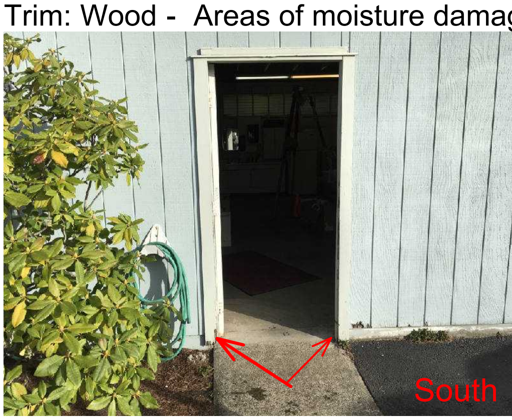
Type: (continued)





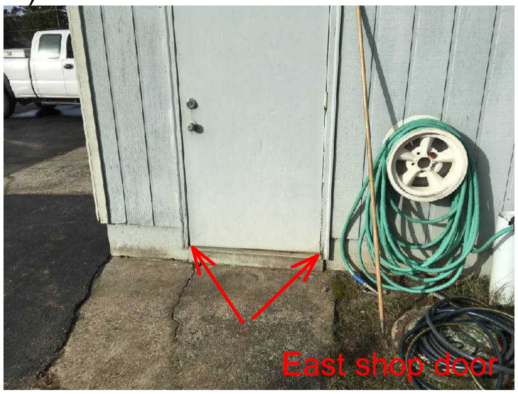


Marginal Trim: Wood - Areas of moisture damage / dry rot were located, recommend repair.



Exterior (Continued)

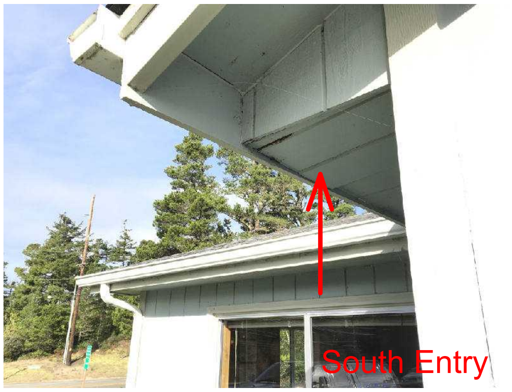
Trim: (continued)



Marginal Fascia: Wood - Missing or damaged paint was observed, exposing raw wood, recommend repair to restore moisture resistance.
Areas of moisture damage / dry rot were located, recommend repair.

Exterior (Continued)

Marginal	Soffits: Wood, Plywood - Areas of moisture damage / dry rot were located, recommend repair.



Acceptable	Entry Doors: Metal

Marginal	Windows: Aluminum slider - The wood window trim around the aluminum windows on the office are moisture damaged from missing and damaged paint, recommend repair.

Exterior (Continued)

Marginal Window Screens: Vinyl mesh - Missing or damaged, recommend repair and / or replacement.

Marginal Exterior Lighting: Surface mount - The light was not operational at time of inspection, recommend replacing bulb and repairing fixture if necessary.

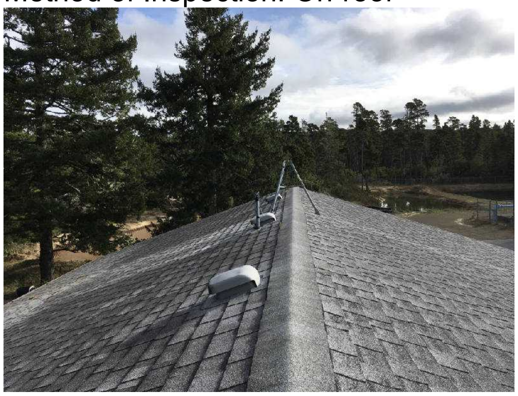
Acceptable Exterior Electric Outlets: 110 VAC

Defective Hose Bibs: Gate - The hose bib on the west side of the building is not functional, recommend evaluation and repair.
The south exterior hose bib is not secure, allowing movement and possible damage to the plumbing. The handle hits the siding, recommend repair.

Roof

Office & Shop Roof Surface

Method of Inspection: On roof




Marginal

Material: Architectural composition shingle - The roof appears to have been installed around 1995 and is now 23 years old. This type of shingle is designed to last approximately 30-35 years. The roofing is in fair condition, showing areas of wear especially on the south facing side. The protective rock coating has come off in areas which exposes fiberglass threading. Moss growth has also become heavy in areas on the north side of the roof. I observed an area that has been repaired with roofing sealant. This sealant may indicate a past or present leak and is not a proper roof repair. Recommend treating the moss and cleaning the debris from the roof's surface. Evaluate and repair the the damaged and sealed shingles. Monitor the roofing and repair or replace as necessary.

Type: Gable

Approximate Age: 23 years

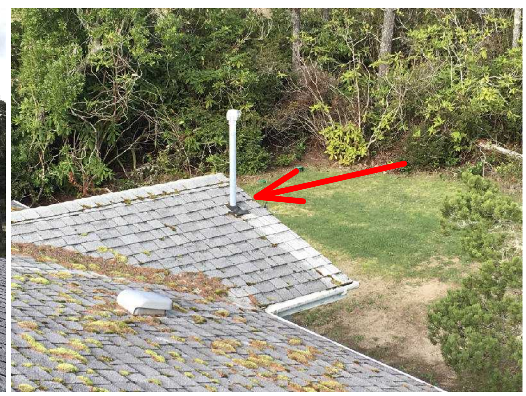
Roof (Continued)

Acceptable Flashing: Metal - Recommend cleaning pine needle debris from flashings as general building maintenance to allow for rainwater drainage.

Acceptable Valleys: Asphalt shingle

Acceptable Plumbing Vents: PVC

Marginal Electrical Mast: Mast w/o Tie back - Unused electrical mast and antenna mounts should be removed and the roofing repaired in these areas to lessen the chance of moisture intrusion and roofing damage.

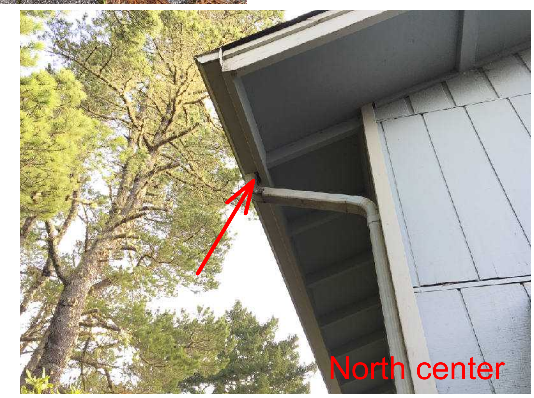


Marginal Gutters: Galvanized, Plastic - The gutters are blocked by debris, damaged in areas, and / or are not handling the amount of rainwater sufficiently.
I observed erosion on the ground on the north side of the building. It appears that the gutters are damaged, and overflowing.
Recommend cleaning to allow proper rainwater drainage and evaluation of the gutters' ability to handle the rainwater.
I observed loose and / or damaged gutter attachment points, recommend repair.

Roof (Continued)

Gutters: (continued)

Marginal Downspouts: Aluminum - Damaged and or leaking downspout, recommend repair.



Marginal Leader/Extension: Drain lines, Splash blocks - The downspouts are missing drain lines / splash blocks in areas, recommend adding to direct rainwater away from the perimeter of the building.

Roof (Continued)

Leader/Extension: (continued)

Electrical

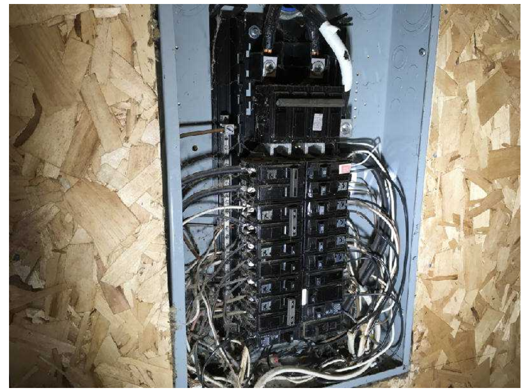
Service Size Amps: 200 Volts: 110-240 VAC

Acceptable	Service: Copper
Acceptable	120 VAC Branch Circuits: Copper
Acceptable	240 VAC Branch Circuits: Copper and aluminum
Acceptable	Conductor Type: Romex
Acceptable	Ground: Present
Marginal	Smoke Detectors: Alarm system - The building appears to have a smoke sensor for a security alarm only. I observed one out of date smoke alarm in the close office space. I did not observe any smoke or carbon monoxide alarms for the building itself, recommend reviewing fire code for this type of office space and adding required units.

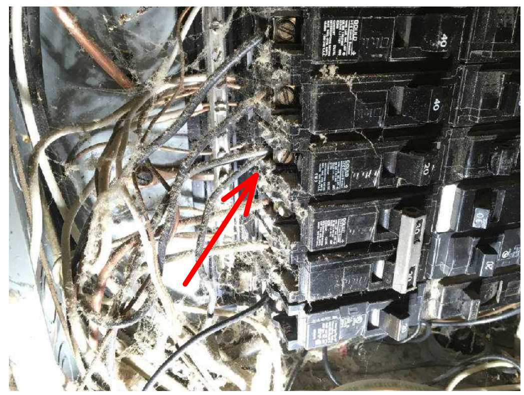
Office Electric Panel

Electrical (Continued)

Acceptable Manufacturer: Gould



Maximum Capacity: 200 Amps
Acceptable Main Breaker Size: 200 Amps
Marginal Breakers: AL-CU - I observed a breaker with two wires attached to a single connection point, this is commonly known as a double tapped breaker. Most breakers are only designed to have one wire attached. Recommend further evaluation and repair by a licensed electrician.



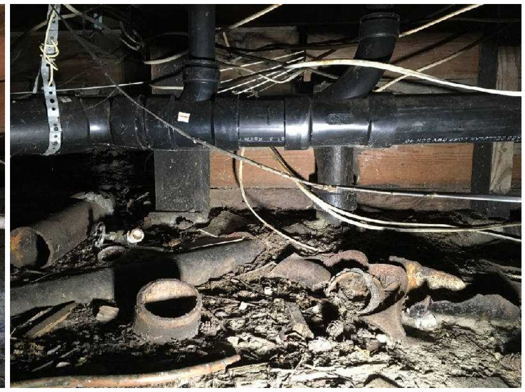
Acceptable GFCI: At GFCI receptacles only
Is the panel bonded? Yes

Plumbing

Acceptable Main Water Shutoff: Water meter - Ensure that the main water shutoff is accessible and functioning.
Marginal Water Lines: CPVC - CPVC appears to replace the original galvanized plumbing. No insulation is installed on the plumbing under the building, recommend adding insulation.
Older buildings may have other types of plumbing that are not visible at the time of inspection. It is always a good idea to consider a water quality test in this age of building.

Plumbing (Continued)

Acceptable Drain Pipes: ABS, PVC - ABS & PVC plastic drain lines appear to have replaced the cast iron drains under the building.



Acceptable Vent Pipes: Galvanized, PVC

Attic

Office Attic

Method of Inspection: In the attic

Acceptable Unable to Inspect: Low clearance and non accessible areas were obstructed from view.

Acceptable Roof Framing: Rafter

Acceptable Sheathing: Dimensional wood

Attic (Continued)

Marginal — Ventilation: Gable only - The west facing gable vent has holes in the screening and the frame is moisture damaged, recommend repair or replacement.
The attic area does not have sufficient ventilation installed. Recommend adding lower soffit and upper roof ventilation.

Marginal — Insulation: Blown in - The insulation has been pressed down by moisture and or small animals. Odor neutralizer was observed in the attic possibly due to small animal activity, recommend cleaning up the insulation and adding insulation as desired.

Acceptable — Insulation Depth: 6"

Marginal — Wiring/Lighting: 110 VAC - There are several exposed and open wire connections at uncovered junction boxes, recommend repair by a licensed electrician.

Attic (Continued)

Wiring/Lighting: (continued)

Acceptable Moisture Penetration: None observed at the time of inspection

Acceptable Bathroom Fan Venting: Electric fan

Crawl Space

North Exterior Crawl Space

Method of Inspection: In the crawl space

Acceptable Unable to Inspect: Low clearance and non accessible areas were obstructed from view.

Marginal Access: Wood door - The wood frame for the crawlspace access door is dry rot damaged, recommend repairing the frame and adding barrel latches for easy access.

Acceptable Moisture Penetration: No moisture present at time of inspection

Crawl Space (Continued)

Marginal — Ventilation: None - The crawlspace does not have venting installed in the skirting, recommend adding ventilation when the skirting is repaired.

Not Present — Insulation: None

Not Present — Vapor Barrier: None

Marginal — Electrical: 110 VAC/220 VAC - The electrical wires run under the building are not supported properly in areas and are lying on the ground or obstructing the crawlspace, recommend having a licensed electrician properly support the wiring where needed.

Crawl Space (Continued)

Electrical: (continued)

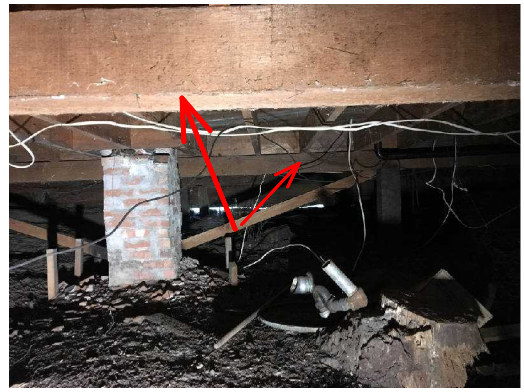
Structure

Acceptable — Structure Type: Wood frame

Marginal — Foundation: Post & Pier - The office building is built of wood posts that appear to be setting on small concrete piers. Most piers are buried and the bottom of the posts were covered by soil. I dug up two posts and found dry rot damaged wood that is no longer supporting the floor framing. Recommend having a licensed contractor specializing in foundations further evaluate and repair as necessary.

Structure (Continued)

Acceptable Beams: Solid wood



Acceptable Bearing Walls: Frame

Marginal Joists/Trusses: 2x8 - I observed an added joist that is shimmed with several pieces of wood, recommend evaluation and repair.

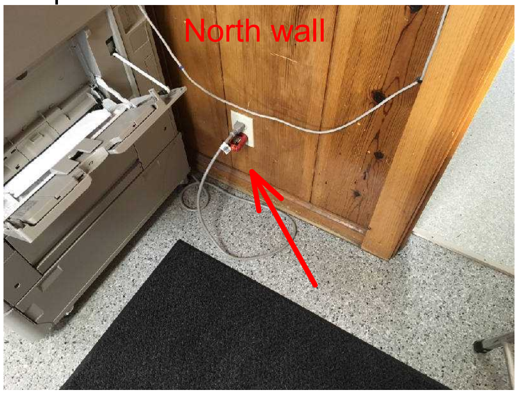
Acceptable Floor/Slab: Dimensional wood

Common Area

Open Office Space Living Space

Marginal — Ceiling: Paint, Wood - The paint is peeling and has exposed raw wood on the northwest end of the office, recommend repair.

Acceptable — Walls: Paint, Wood
Acceptable — Floor: Linoleum, Carpet
Acceptable — Windows: Aluminum slider
Marginal — Electrical: 110 VAC outlets and lighting circuits - The outlets test open or missing ground, recommend having a licensed electrician repair.



Acceptable — HVAC Source: Heating system register - Thermal imaging shows the unit(s) operating.

Acceptable — Smoke Detector: Smoke detector for alarm system only - See electrical section for more information.

Office Living Space

Acceptable — Ceiling: Paint
Acceptable — Walls: Paint
Acceptable — Floor: Linoleum
Acceptable — Doors: Hollow wood

Common Area (Continued)

Acceptable Windows: Aluminum slider

Marginal Electrical: 110 VAC outlets and lighting circuits - The available outlets test open or missing ground, recommend having a licensed electrician repair.

Acceptable HVAC Source: Zonal wall heater - Thermal imaging shows the unit(s) operating.

Acceptable Smoke Detector: Out of date - See electrical section.

Bathroom

Office Bathroom

Acceptable Ceiling: Paint
Acceptable Walls: Paint
Acceptable Floor: Linoleum
Acceptable Doors: Hollow wood
Acceptable Windows: Vinyl slider
Marginal Electrical: 110 VAC outlets and lighting circuits - The GFCI outlet did not trip with the GFCI tester and showed open ground, recommend having a licensed electrician repair or replace the outlet.

Acceptable Counter/Cabinet: Composite and wood
Acceptable Sink/Basin: Molded single bowl

Bathroom (Continued)

Marginal — Faucets/Traps: Dual handle fixtures with a PVC trap - Hot water was not available for hand washing. This sink may be attached to the faulty shop sink water heater, recommend evaluation and repair.

Acceptable — Toilets: Koehler

Marginal — Ventilation: Electric ventilation fan and window - The ventilation fan was not operating correctly and the heat lamp was missing. This heat lamp is the only source of heat in the bathroom.

Marginal — Other: Disabled amenities - The bathroom is not sufficiently outfitted for disabled use. Recommend reviewing regulations for this bathroom and outfitting as needed.

Northwest Inspection Services
PO Box 628
Florence, Oregon 97439

Wood Destroying Organism Report

87845 Hwy 101
Florence, Oregon 97439

Northwest Inspection Services

GENERAL INFORMATION

Inspection Type : Wood Destroying Organism, Date 02-09-2018, Time 1100
File Number 0352018

Company Information

Inspector Name Brian Goss
Company Name Northwest Inspection Services
License Number OCHI #1782
Address PO Box 628
City Florence State Oregon Zip 97439
Phone 541-991-0975 Email nwis@icloud.com
Fax N/A

Property Information

Property Address 87845 Hwy 101
City Florence State Oregon Zip 97439

Client Information

Client Name Heceta Water District
Address 87845 Hwy 101
City Florence State Oregon Zip 97439
Phone 541-997-2446

SCOPE OF INSPECTION

Structure Inspected Main Dwelling
Type of Structure Commercial building
Additional Structures Attached Shop

An inspection of the above listed structure(s) was performed by a qualified inspector to determine the presence or previous presence of an infestation of organisms listed in the findings portion of this report.

This report is limited to the visible and accessible areas of the structure(s) inspected at the time of the report. If visible evidence of active or previous infestation is reported it should be assumed that some degree of damage is present including hidden damage.

It is recommended that if any visible damage or other evidence of damage is observed and noted in this report that the client contact a qualified building trades professional for further evaluation of the structure.

THIS IS NOT A STRUCTURAL DAMAGE REPORT nor should it be construed to constitute a guarantee or warranty as to the absence of wood destroying organisms or damage caused by a previous or active infestation or any latent, concealed or future infestation and resulting damage. NO WARRANTY is expressed or implied by the inspection company or the inspector as to the absence of Wood Destroying Organisms unless indicated in writing in this report.

A Wood Destroying Organisms Inspector is not trained nor required to possess the knowledge to evaluate structural damage and/or comment on it's repair. It is the responsibility of the client to attain an evaluation of structural soundness and estimate of repair by a qualified building trades professional.

Wood Destroying Organism Inspectors are not qualified to report on health hazards or indoor air quality resulting from molds or other fungi. Note: Only wood decaying fungi are included in this report. It is the responsibility of the client to consult with an industrial hygienist or a qualified indoor air contractor to render an opinion on other molds or fungi.

REPORT OF FINDINGS

(1) Visible evidence of wood-destroying organisms observed: NO
(2) Live wood-destroying organisms observed: NO
(3) Visible damage from wood destroying organisms observed: YES If YES, Describe :
Dry rot damage only as listed in the building inspection report.
(4) Visible evidence of conditions conducive to wood-destroying organisms observed: YES If YES, Describe The wood skirting and wood posts underneath the building that are in contact with the ground can be conducive to pest habitat, recommend evaluation and repair to reduce these conditions.

INACCESSIBLE AREAS OR AREAS OF LIMITED VIEW

Attic: Accessible, Obstructed - Low clearance and non accessible areas were obstructed from view.
Crawl Space: Accessible, Obstructed - Low clearance and non accessible areas were obstructed from view.
Exterior: Accessible
Garage: Accessible, Obstructed - Equipment obstructed some areas from view.
Main Living Area: Accessible

TREATMENT

Observed visible evidence of previous treatment: NO
Property currently under contract? NO Company /Treatment Information Unknown
Is/was treatment scheduled to be performed by the inspecting company? NO

APPENDIX G: TRACER STUDY

HBH
Consulting
Engineers

490 N. 2nd Street, Suite B ■ Coos Bay, Oregon 97420
541/266-0355 ■ fax 541/266-7504

April 18, 2003

Heceta Water District
Mr. Mike Kendoll, Superintendent
87845 Highway 101
Florence, Or. 97439

RE: CT Tracer Study Report

Dear Mike:

Thanks to you your operators for your time and your assistance on April 15, 2003. Enclosed please find the CT Tracer Study Report based the on-site test. A contact time of 78 minutes was measured at an average flow of 700 gpm. As stated in the report, this worse case contact time is more than adequate for existing flows and the potential flows if the third and fourth treatment trains are added to the facility.

Per your request, I have asked Tony Greville of Easy Treat to contact you to provide a presentation and, perhaps, a sample run using poly aluminum chlorate (PACl) in place of your current coagulant, aluminum sulphate. I believe you will find PACl to be a high performance coagulant that improves your treatment process and reduces the amount of chemicals used for pH adjustment and polymer addition.

If there are any issues that the Circuit Rider program could assist the District with, please do not hesitate to call. As we discussed, we have a number of operators who can come to your facility and spend some time training and assisting your operators. They can answer questions, provide assistance with chemical feeding and dosing, set up pump performance curves for your chemical metering systems, or many other services. And as I mentioned, there is no charge for these services.

If there are other engineering, planning, mapping, or technical issues, please keep the Circuit Rider program in mind and refer us to other water systems that you come in contact with that could use the assistance.

If you have any questions please call me at (541) 266-0355 in Coos Bay. Good luck with your new plant and thank you again.

Sincerely,
HBH Consulting Engineers, Inc.

J. Garrett Pallo, PE
Engineer

Encl.

Water System Disinfection Contact Time Tracer Study

Heceta Water District

Lane County, Oregon

April 18, 2003

Provided by the Oregon Department of Human Services, Drinking Water Section as part of the Circuit Rider Technical Assistance Program

Prepared By:

HBH Consulting Engineers

11515 SW Durham Road
Suite E9
Tigard, Oregon 97224
503.670.0499
fax 503.670.0540

490 N 2nd Street
Suite B
Coos Bay, Oregon 97420
541.266.0355
fax 541.266.7504

Date of Site Visit:	April 15, 2003	PWS ID:	41-00301
HBH Staff:	Garrett Pallo, PE		
District Staff:	Mike Kendoll, Superintendant		

Description of Facilities

The Heceta Water District owns and operates a water system to treat and distribute surface water for domestic consumption and fire protection to a community located on and to the north of the City of Florence, Oregon. Because of deficiencies in the Florence system, the District also provides a portion of the treated water consumed by the residents of Florence. The estimated service population of the Heceta Water District is 4,500 persons.

The District obtains its raw water from Clear Lake located to the east of the District. The District raw water supply is relatively pristine with very little development or access to the sandy bottom dune lake. Raw water turbidity is relatively low and stable throughout the year. Water is conveyed to the treatment plant through pumping and HDPE transmission piping.

Historically, the District did not have a filter plant and until recently provided only rudimentary treatment to the raw water before delivering it to the distribution system. Within the past few months, construction of a completely new water treatment facility adjacent to the District offices on Highway 101 was completed. The plant consists of two US Filter Trident packaged treatment units, each with a capacity of 350 gpm. The packaged units utilize upflow-absorbtion clarification, and dual media filtration. Backwash of the filters and the upflow clarifiers is accomplished with a combined air/water scour backwash sequence. Backwash and filter-to waste cycles are completely automated. Space is available within the treatment building and piping is in place to allow the addition of two additional treatment trains to increase the total plant capacity to 1,400 gpm. The treatment facility is state-of-the-art with modern controls, telemetry, instrumentation, communications, and other system components. In it's first few months of use, the plant appears to be functioning well and the operators are working hard to learn the nuances of running the new facility.

The District utilizes aluminum sulphate (alum) for primary coagulation. A cationic (573-C) polymer was being used but has been discontinued do to dissatisfaction with performance. A non-ionic polymer (1986-N) is utilized as a filter aid.

Instrumentation includes a full array of turbidimeters, a streaming current monitor, pH and temperature monitoring, chlorine residual monitoring, headloss across the clarifiers and the filters, level sensors, and other process instrumentation. Controls are PLC-based with operator interface through a PC terminal SCADA system and/or a touch screen (PanelView 1000) interface panel.

Filtered water passes out of the treatment plant building and into a 260,000-gallon chlorine contact tank or clearwell. 12.5-percent liquid hypochlorite is injected into the piping connecting the treatment plant to the clearwell where A CL-17 chlorine analyzer monitors the chlorine dosage. The clearwell is an epoxy-coated vertical cylinder tank that is 44-feet in diameter and 23-feet tall. A system of hanging fabric (Hypalon) baffles in the tank provide baffling to increase contact time. The inlet and the outlet ports are on opposite sides of the tank and are separated by the baffling.

Water is pumped from the clearwell and through a header where a second CL-17 chlorine analyzer monitors the chlorine residual of the water just prior to it being pumped into the distribution system. Soda ash is also injected into this header for pH adjustment and corrosion control within the distribution system. The first consumer for finished water is considered to be the plant itself through sinks and other exposed fixtures, followed immediately by the District office.

Testing Procedure

Prior to beginning the test, the level of water in the clearwell was dropped to around 12-feet. The full (overflow) level in the tank is 23-feet. The low level alarm is set at around 16-feet. It was determined that the 12-foot level exceeded the lowest reasonable operating conditions and was a good representation of worse case scenario.

The influent flow rate was increased to the maximum flow rate and capacity of 700 gpm. The treated water pumps were adjusted to maintain an approximate flow into the system of around 700 gpm. The level in the clearwell fell from 12-feet to approximately 11.5-feet over the duration of the test.

The normal injection dosage into the filtrate is approximately 1.2 mg/L. The residual entering the system was 0.97 mg/L consistently for a few hours before the test began. To introduce the tracer "boost", the metering pumps were ramped up to create a tracer slug with a residual of approximately 2.3 mg/L on the inlet to the clearwell.

Once the tracer slug was introduced, the residual on the second CL-17 was observed to monitor the chlorine residual of the water entering the distribution system.

Theoretical Contact Time

The theoretical contact time of the Heceta system is contained entirely in the clearwell. No contact allowances are appropriate for piping or other facilities.

As mentioned previously, the clearwell is comprised of a vertical, above ground, epoxy-coated tank. The inlet and outlet are on opposite sides of the tank. A system of hanging, fabric (Hypalon) baffles provides a serpentine path for the water to travel during its time in the clearwell. For the purposes of a theoretical evaluation, it was assumed that a baffling factor (T_{10}/T) of 0.5 would be appropriate.

During the study, approximately 12-feet of water was consistently in the tank accounting for a contact volume of approximately 136,500 gallons. With an average flow-through rate of 700 gpm, the theoretical contact time is calculated as follows:

(136,500 gal /700 gpm) x 0.5 = 97.5 minutes

The theoretical contact time and assumed baffling factor will be reevaluated below upon review and reduction of the tracer study data.

Measured Contact Time

The accepted EPA method of determining contact time is to use the time at which 10% of the added tracer concentration reaches the sampling point (T_{10}). For this test, the concentration of the tracer was determined and the ten percent level was tracked using the following figures:

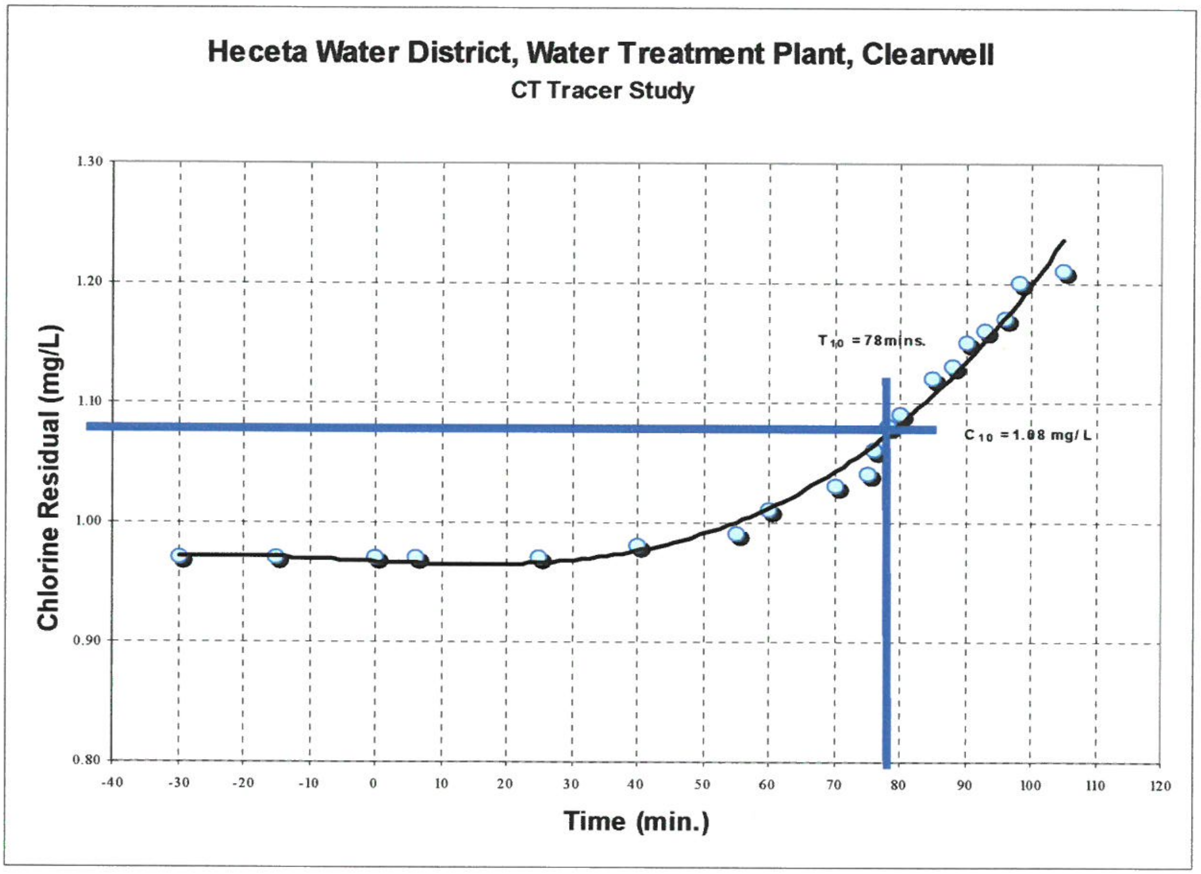
Initial Concentration (in filtrate) = 1.2 mg/L
Boosted Concentration = 2.3 mg/L
Tracer Concentration = 2.3 - 1.2 = 1.1 mg/L
Finished Water Initial Concentration = 0.97 mg/L

C_{10} = initial mg/L + 10%(tracer)
C_{10} = 0.97 mg/L + 0.1(1.1 mg/L)
C_{10} = 1.08 mg/L

Chlorine residual readings were observed at the finished water CL-17 chlorine analyzer until the chlorine concentration rose above 1.08 mg/L. At this point, the contact time requirements, by definition, were met. Once it was apparent that the residual trend was steadily rising above the required C_{10} level, the test was concluded.

The results and data from the tracer study are summarized below in Figure 1.

Figure 1 – Tracer Concentration vs. Time



As can be seen in the above graph, the C_{10} concentration was reached 78 minutes after the tracer boost was introduced to the filtrate stream.

The pH and temperature of the water was approximately 6.50 and 12°C respectively.

Calculated CT

The product of the free chlorine residual concentration (mg/L) and the contact time (min.) is termed "CT". CT tables have been developed to assist operators in determining the CT value required to ensure adequate disinfection. The required CT value depends on the water temperature, pH, chlorine residual, and the log-reduction required. The actual achieved CT must be greater than the required CT.

The water treatment process in Heceta must achieve 3-Log (99.9) inactivation through the combination of the coagulation/filtration process and disinfection. The new Heceta Water District Plant has not yet been evaluated by the Drinking Water Program and has not officially been credited with a removal performance rating. However, based on experience with similar plants and considering the state-of-the-art facility, it is relatively safe to assume that the plant will be credited with a 2.5-Log removal rating. Information on 2.0-Log removal is provided below for information and comparison.

For a flow of approximately 700 gpm, a contact time of 78 minutes was measured during this test. It is assumed that the plant will never operate with a clearwell level lower than that simulated during the tracer study. The actual CT will be the product of the contact time in minutes and the free residual in mg/L. The actual CT based on 78 minutes of contact time is shown below for several residual concentrations:

Free Residual (mg/L)	Contact Time (minutes) at 20 gpm	Actual CT
0.75	78	58.5
1.0	78	78.0
1.25	78	97.5
1.5	78	117.0
1.75	78	136.5
2.0	78	156.0

As mentioned previously, the required CT values vary dependant on temperature, pH, and the chlorine residual in the water. Utilizing the following conservative inputs, the required CT is summarized as follows:

Example 1:
pH = 6.5
T = 10°C
Chlorine = 1.0 mg/L, **0.5-Log** Removal Required
CT = 16 (per CT tables)
Time = 16/1.0 = 16 minutes

Example 2:
pH=6.5
T=10°C
Chlorine =1.0 mg/L, **1.0-Log** Removal Require
CT=31 (per CT tables)
Time = 31/1.0 = 31 minutes

Since the tracer study showed that 78 minutes of contact time is available, the District has more than adequate CT in their system.

If the District is actually credited with a 2.5-Log removal rating, it will have enough CT time for virtually any combination of pH, temperature, and chlorine residual summarized in the CT tables.

It should also be reiterated that the CT values developed within this study are based upon a worse-case scenario. In most cases, the District will operate the clearwell at a higher (fuller) level. This increase in the contact volume will increase the CT time. Decreased flow-through rates, increased temperatures, higher chlorine residuals and other factors will serve to increase the CT time and provide a sense of conservatism to the analysis.

When evaluating the theoretical contact time, a baffling factor of 0.5 was assumed. After reducing the tracer study data, an actual baffling factor of 0.4 is more appropriate for the Heceta clearwell. This may be due to short-circuiting around the fabric curtains or other geometry issues within the clearwell. However, even with a baffling factor of 0.4, the clearwell provides more than adequate contact time for the plant.

If the District does add the third and fourth treatment trains as planned, the capacity of the plant would rise to 1,400 gpm. Using the theorectical approach developed in this study and a baffling factor of 0.4, the calculated, worse case contact time would be as follows:

(136,500 gal/1,400 gpm) x 0.4 = 39 mins

If the plant maintains a 2.5-Log reduction credit and the temperature and pH remain relatively constant, the existing clearwell should provide adequate contact time for the increased flow rates. However, if the plant capacity is expanded, a follow-up tracer study should be performed to confirm the actual CT under the changed conditions.

Conclusions

Based on the results of this tracer test, a 0.5-log inactivation will be provided during the maximum flow rate operation of 700 gpm, water temperature is at or above 5°C, a free residual of at least 1.0 mg/L or above is maintained in the clearwell, and pH is maintained at 7.5 or below. Under the reported, worse case test conditions, the current available chlorine contact time for the Heceta Water District, prior to the first water consumer, is approximately 78 minutes.

APPENDIX H: HWPUD WATER SYSTEM SUMMARY SHEET

HWPUD WATER SYSTEM SUMMARY SHEET

POPULATION DATA

Year	2018	2023	2028	2033	2038
Residential Population	4,921	5,172	5,435	5,713	6,004
Population Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%

WATER RIGHTS

Source	Application	Permit	Certificate	Magnitude (cfs)	Magnitude (MGD)	Priority Date
Clear Lake	44408	33171	56356	1.55	1.00	1/19/1968
Clear Lake	52076	37524	80690	1.50	0.97	4/30/1974
Clear Lake	69079	50036	-	2.25	1.45	5/4/1987
Clear Lake	74717	52090	-	0.95	0.61	10/13/1994
Total				6.25	4.03	

WATER DEMAND VS. CURRENT WATER RIGHTS

Future Raw Water Demand						
Parameter/Year	**Gal. Per Capita**	**2018**	**2023**	**2028**	**2033**	**2038**
Total Population		4,921	5,172	5,435	5,713	6,004
% Nonaccount Water		22%	15%	15%	15%	15%
Water Demand (mgd)						
ADD, gpd	77	0.377	0.368	0.387	0.407	0.427
DDD, gpd	112	0.552	0.539	0.567	0.596	0.626
MMD, gpd	136	0.669	0.654	0.687	0.722	0.759
PWD, gpd	143	0.702	0.686	0.721	0.758	0.796
MDD, gpd	164	0.806	0.788	0.828	0.870	0.915
PHD, gpd	234	1.150	1.124	1.181	1.242	1.305

*Growth rate of 1% applied from year 2023 through 2038 reflecting HWPUD reducing % of nonaccount water to 15% by year 2023.

WATER TREATMENT PLANT CLEARWELL AND SURGE RESERVOIR SUMMARY

Reservoir Name	Material	Year Constructed	Nominal Volume, gal	Base/Overflow Elevation, ft
Raw Water Constant Head Surge	Welded Steel	2002	8,643	120/143
WTP Clearwell	Welded Steel	2002	261,450	120/143

PUMP STATION SUMMARY

Pump Station	No. of Pumps	HP	Flow (gpm)	Reservoir Served	Pressure Zones Served	2037/2038 MDD (gpm)
Mercer Lake	2	30	240	Collard Lake	Collard Lake	72
Enchanted Valley	2	1 at 7.5/1 at 5	50	Enchanted Valley	Enchanted Valley	7
Sutton Lake	2	1 at 25/1 at 30	200	Sutton Lake	Sutton Lake	92

PRESSURE ZONES SUMMARY

Service Area		Service El. Range, ft	Static Pressure Range, psi	Associated Reservoirs	Associated Pump Stations/PRVs
A	Clear Lake	25-130	37-83	Clear Lake	Finished Water PS
B	Upper Collard Lake	235-470	14-116	Collard Lake	Collard Lake PS
C	Enchanted Valley	150-250	62-105	Enchanted Valley	Enchanted Valley PS
D	Upper Sutton Lake	87-310	46-142	Sutton Lake	Sutton Lake PS
E	Sutton Lake-North Mercer Rd.	40-158	70-106	Sutton Lake	Ben/Bunch-North Mercer PRV
F	Sutton Lake- Sutton Lake Rd.	40-227	20-100	Sutton Lake	North Sutton #2 PRV
G	Sutton Lake-Southwest	40-135	31-71	Sutton Lake	North Lane-Shore Crest-Levage PRVs
H	Southern Collard Lake Rd.	126-300	35-111	Collard Lake	Collard Lake PRV
I	Sutton Lake-Rustic Ln.	35-121	35-70	Sutton Lake	Rustic Lane PRV
J	Southern Collard Loop	146-235	40-81	Collard Lake	Collard Loop PRV

STORAGE RESERVOIR SUMMARY

Reservoir Name	Service Area	Material	Year Constructed	Nominal Volume, gal	Base/Overflow Elevation, ft	Service Elevation Range, ft	Estimated Life
Clear Lake	A	Welded Steel	1967	600,000	183/216	25-130	20+
Mercer Lake	B,H,A,J	Welded Steel	1969	500,000	472/503	25-480	20+
Sutton Lake	D,E,F,G,I,A	Concrete	1976	700,000	392/415.5	25-320	38+
Enchanted Valley	C	Stainless Steel	2015	12,600	380/393	85-380	57+

*80 and 60 year life span were used for concrete and steel reservoirs respectively. Clear Lake and Mercer Lake reservoirs were recently rehabilitated, and are in good condition, therefore additional lifespan was added.

RAW WATER INTAKE AND FINISHED WATER PUMP SUMMARY

Pump Station	No. of Pumps	Flow (gpm) Per Pump	HP	TDH (feet)	Reservoir Served	2037/2038 MDD (gpm)
Clear Lake Intake	2	1,000	40	317	Raw Water Constant Head/Surge	914,630
Finished Water Pumps	3	500	25	220	Clear Lake	914,630

DISTRIBUTION PIPING INVENTORY

Pipe Diameter, in.	Total, ft.	% of Total
4	22,027	9
6	110,381	44
8	56,344	22
10	39,552	16
12	22,360	9
Total	250,664	100

Note: Lines smaller than 4" Ø were not tallied however the HWPUD does have lines smaller than 4" Ø.

APPENDIX I: MUTUAL EMERGENCY WATER AGREEMENT

Mutual Emergency Water Agreement

Between
City of Florence
and
Heceta Water People's Utility District

This agreement is made and entered into this 1st day of July, 2014, between City of Florence, Oregon, hereinafter designated "City", and Heceta Water People's Utility District, hereinafter designated "PUD," collectively designated as "Parties."

RECITALS

WHEREAS, City is an Oregon municipal corporation and is the owner and operator of a community water system that supplies safe drinking water to customers in Florence;

WHEREAS, PUD is a domestic water supply district organized and operating under the laws of the State of Oregon. The purpose of the PUD is to supply potable water to the customers of the PUD;

WHEREAS, both City and PUD have community water systems that meet all current requirements of the Oregon Department of Human Services, Public Health Division, Drinking Water Program for safe drinking water supplied to customers:

WHEREAS, both City and PUD have an adequate safe drinking water supply to serve their respective service areas under normal conditions, peak season conditions and most emergency situations;

WHEREAS, both City and PUD have a desire to cooperate with each other to provide to each other in case of an agreed upon emergency situation a temporary safe drinking water supply;

NOW, THEREFORE, in consideration of the covenants and agreements hereinafter set forth to be kept and performed by the parties hereto, it is mutually agreed as follows:

City of Florence Agrees:

1. To sell safe drinking water to PUD on an "as needed" basis during emergency conditions as provided for in Section 3 of this Agreement.

Heceta Water People's Utility District Agrees:

2. To sell safe drinking water to City on an "as needed" basis during emergency conditions as provided for in Section 3 of this Agreement.

Both City and PUD Agree:

3. Emergency Conditions. To provide safe drinking water to one another for temporary emergency conditions. Whether or not temporary emergency conditions exist which require the provision if emergency water supply to the other party will require the consent and agreement of both parties. When emergency safe drinking water may be required by either City or PUD, the requesting party shall contact the other party to determine if there is agreement as to whether an emergency exists and whether safe drinking water is available to provide to the requesting party. Whether an emergency exists and if so, to what extent drinking water is available on a temporary basis will be determined by the City Manager and the PUD General Manager. Once the emergency is declared by agreement of the parties and it is determined that safe drinking water is available to the requesting party to address the emergency condition, representatives of each party shall immediately coordinate the operations of appropriate valves, measuring devices, and auxiliary systems to facilitate prompt delivery of safe drinking water to the requesting party. Emergency safe drinking water provided under this section shall be provided at sixty-five percent (65%) of either the City's highest rate per one thousand gallons or the PUD's highest rate per one thousand gallons, whichever is higher. As used in this section, "highest rate" means the current first tier water rate charge to residential customers residing within the respective service areas of the parties.

4. The provision of supply of emergency safe drinking water to the requesting party may be limited by the providing party solely at its discretion taking into account water supply, demands and needs of its own customers.

5. The parties agree to jointly conserve safe drinking water during a declared regional water shortage, which may be caused by tsunami, drought, flood, or other regional emergency condition.

6. This Mutual Water Agreement can be terminated with or without cause by either party by giving the other party ninety (90) days written notice.

Limitation of Liability and Indemnification. No liability for damage to facilities shall attach to either party on account of any failure to accurately anticipate availability of emergency water or of failure of water supply or water quality.

To the extent permitted by Article XI, Section 7 and Section 10 of the Oregon Constitution and by the Oregon Claims Act, each party shall indemnify, within the limits of the Tort Claims Act, the other party against liability for damage to life or property arising from the indemnifying party's own activities under this agreement, provided that a party will not be required to indemnify the other party for any such liability arising out of the wrongful acts of employees or agents of that other party.

Term. The term shall be ten (10) years from the date of this agreement.

HECETA WATER PEOPLE'S UTILITY DISTRICT

By:___________________________
Robert V. Hursh, President

Date:_________________________

CITY OF FLORENCE

By:___________________________
Nola Xavier, Mayor

Date:_________________________