AGENCY REVIEW DRAFT: OCTOBER 2024

Washington State Department of Social & Health Services

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Department of Social and Health Services

WESTERN STATE HOSPITAL WATER SYSTEM PLAN

PREPARED BY RH2 ENGINEERING, INC.

RH2

Washington State Department of Social & Health Services

Transforming lives

Western State Hospital Water System Plan

AGENCY REVIEW DRAFT
OCTOBER 2024

Department of Social and Health Services
Western State Hospital
9601 Steilacoom Boulevard SW
Lakewood, WA 98498

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CERTIFICATION

This Water System Plan for the Washington State Department of Social and Health Services was prepared under the direction of the following professional engineers registered in the State of Washington.

Michele Campbell, PE

10/02/2024

TABLES

CHARTS

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APPENDICES

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PURPOSE OF THE WATER SYSTEM PLAN

The Washington State Department of Social and Health Services' (DSHS) Western State Hospital (WSH) water system is a major infrastructure, much of which is invisible to the customers that receive its water. The water system requires qualified staff to operate and maintain an ongoing capital improvement program to replace old components to meet the requirements mandated by federal and state laws. The primary purpose of the WSH Water System Plan (WSP) is to identify and schedule water system improvements that correct existing system deficiencies and ensure a safe and reliable supply of water to current and future customers. This WSP complies with Washington State Department of Health (DOH) regulations under Chapter 246-290 Washington Administrative Code (WAC), which requires water purveyors to update their water system plans every 10 years.

DOH Compliance Requirements

DOH issued a Formal Compliance Agreement (FCA) to DSHS on June 1, 2021 due to regulatory violations and treatment technique triggers related to recurring E. coli events. The FCA, provided in **Appendix N**, describes action items and timelines for the WSH system to comply with drinking water regulations. Among other stipulations, these action items require providing and monitoring for a residual disinfectant concentration in the distribution system, developing a phased plan for system repairs and improvements, performing an analysis to evaluate the long-term configuration to enable Lakewood Water District (LWD) to provide a permanent source of supply to WSH, and an assessment for the complete transfer of ownership and operation of the WSH water system to LWD.

Per the Western State Hospital's 2020 Master Plan, the campus is currently undergoing a series of upgrades to the facilities, infrastructure, and circulation of the campus, including a New Forensic Hospital (NFH) project. The NFH, once completed in 2029, will include 350 beds to care for forensic patients and will add additional staffing to the campus. Significant water main improvements are planned to be constructed in the west campus to support the NFH.

DOH issued a letter to DSHS on May 22, 2023 indicating that WSH is not approved to expand the water system and provide water service to the NFH due in part to the regulatory violations referenced in the 2021 DOH FCA. The letter, provided in **Appendix N**, describes alternative action items for the WSH system to comply with in order to expand its public water system and be able to serve the NFH. The expansion alternatives require DSHS to either have a WSP approved by DOH or to enter into an agreement with another utility that has technical and managerial capacity to supply drinking water for the entire hospital campus without reliance on the existing campus water system. Under the WSP alternative, additional stipulations also must be met regarding operations staffing, water quality monitoring and treatment, and annual reporting requirements.

This document serves to meet some of the requirements outlined in the 2021 DOH FCA and the 2023 DOH letter, including the requirement for an approved WSP.

DSHS is pursing agreements for the complete transfer of ownership and operation of the WSH water system to LWD. Analyses performed for this WSP evaluate the improvements necessary for the consolidation of the WSH water system into the LWD water system. Subsequent studies will evaluate the long term cost-benefit of the proposed consolidation and will develop a valuation of the WSH water system assets. An Interlocal Cooperative Agreement (ICA) was executed on August 3, 2023 with LWD, which provides an initial framework for the conversion of the water supply for the campus to LWD.

SUMMARY OF KEY ELEMENTS

This WSP presents a description of the existing water system and service area, a forecast of future water demands, policies and design criteria for water system operation and improvements, the operations and maintenance program, staffing requirements, and a schedule of improvements. The WSP also includes several ancillary elements that include a water use efficiency program, a water quality monitoring plan, a wellhead protection plan, and a cross-connection control program. A summary of the key issues related to these elements is provided in the following sections.

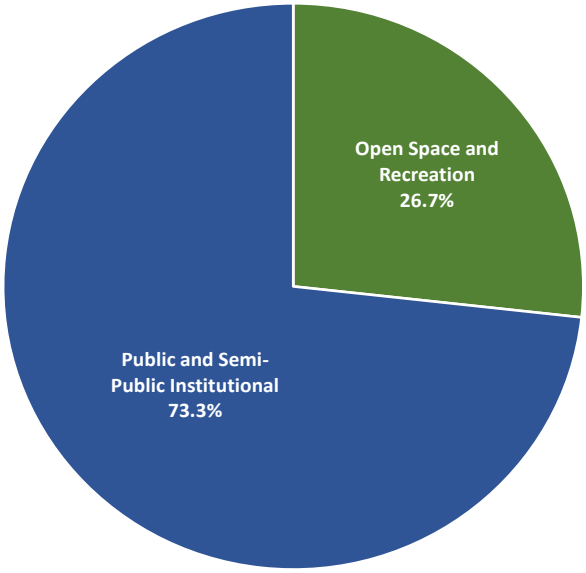
Water Service Area

WSH provides water service to approximately 840 patients and 2,200 employees throughout its retail water service area boundary, which includes the WSH campus and a portion of Fort Steilacoom Park to the south of the campus that is supplied irrigation water by WSH. The retail water service area is located within the Lakewood city limits in Pierce County. WSH is responsible for providing public water service, utility management, and water system development within this area.

In 2023, approximately 73 percent of the service area was designated for public and semi-public institutional use, and approximately 27 percent was designated for open space and recreation, as shown in **Chart ES-1**.

Chart ES-1

Land Use Inside Water Service Area



Existing Water System

WSH opened in 1871 with only 21 patients. The East Campus Well was drilled in 1968, and the Farm Well was drilled in 2003. Due to water quality tests showing positive detections of per- and polyfluoroalkyl substances (PFAS), the East Campus Well has been offline since May 2023.

In addition to WSH's groundwater sources, WSH has an emergency supply intertie with Lakewood Water District (LWD) that can provide up to 2,000 gallons per minute (gpm). A summary of WSH's sources is shown in **Table ES-1**.

Table ES-1

Supply Facilities Summary

Name	Year Constructed	Status	Usage	Existing Capacity (gpm)	Well Depth (feet)	Well Diameter (feet)	Pump Type	Pump Motor Size (hp)
S02 (East Campus Well)	1968	Active[1]	Emergency	500	337	16	Submersible	100
S08 (Farm Well)	2003	Active	Permanent	1,000	560	16	Submersible	125

1 = The East Campus Well is currently offline.

WSH's water system currently has two storage facilities. The Lower Reservoir was constructed in 1903, and the Upper Reservoir was added in 1940. Details of WSH's storage facilities are shown in **Table ES-2**.

Table ES-2

Storage Facilities Summary

Name	Year Constructed	Material	Capacity (gal)	Diameter (feet)	Height (feet)	Base Elevation (feet)	Overflow Elevation (feet)
Lower Reservoir	1903	Steel	317,200	30	60	329	389
Upper Reservoir	1940	Steel	413,600	40	44	345	389

WSH's water system contains approximately 8 miles of water main ranging in size from 1 inch to 12 inches in diameter. As shown in **Table ES-3**, approximately 31 percent of the water main within the system is 8 inches in diameter. Approximately 18 percent of the water main is 10 inches in diameter, and approximately 11 percent of the water main is 12 inches in diameter.

Table ES-3

Water Main Diameter Inventory

Diameter (inches)	Length (feet)	% of Total
4 or smaller	8,743	20.77%
6	8,211	19.51%
8	13,073	31.06%
10	7,567	17.98%
12	4,492	10.67%
Total	**42,086**	**100.00%**

Past Water Usage

In general, the amount of water consumed by WSH's patients and employees varies. **Table ES-4** summarizes the total amount of water supplied to WSH from 2006 to 2023, along with the average day demand (ADD) of the system. It should be noted that 2007, 2008, 2013, 2014, 2018, 2021, and 2023 were the only years where complete data sets of well pump and intertie supply were available.

Table ES-4

Historical Water Supply

Year	Annual Supply (gallons)	ADD (gpm)	ADD (gpd)
2006	48,249,012	92	132,189
2007*	64,446,376	123	176,565
2008*	61,194,600	116	167,198
2009	62,492,436	119	171,212
2010	35,120,668	67	96,221
2011	43,695,100	83	119,713
2012	52,886,831	100	144,500
2013*	53,935,711	103	147,769
2014*	50,562,413	96	138,527
2015	157,719,435	300	432,108
2016	57,583,264	109	157,331
2017	66,966,234	127	183,469
2018*	69,597,742	132	190,679
2019	10,848,496	21	29,722
2020	7,183,381	14	19,627
2021*	57,852,673	110	158,500
2022	48,376,125	92	132,537
2023*	67,032,315	128	183,650

* = Years where complete data sets were available.

gpm = gallons per minute

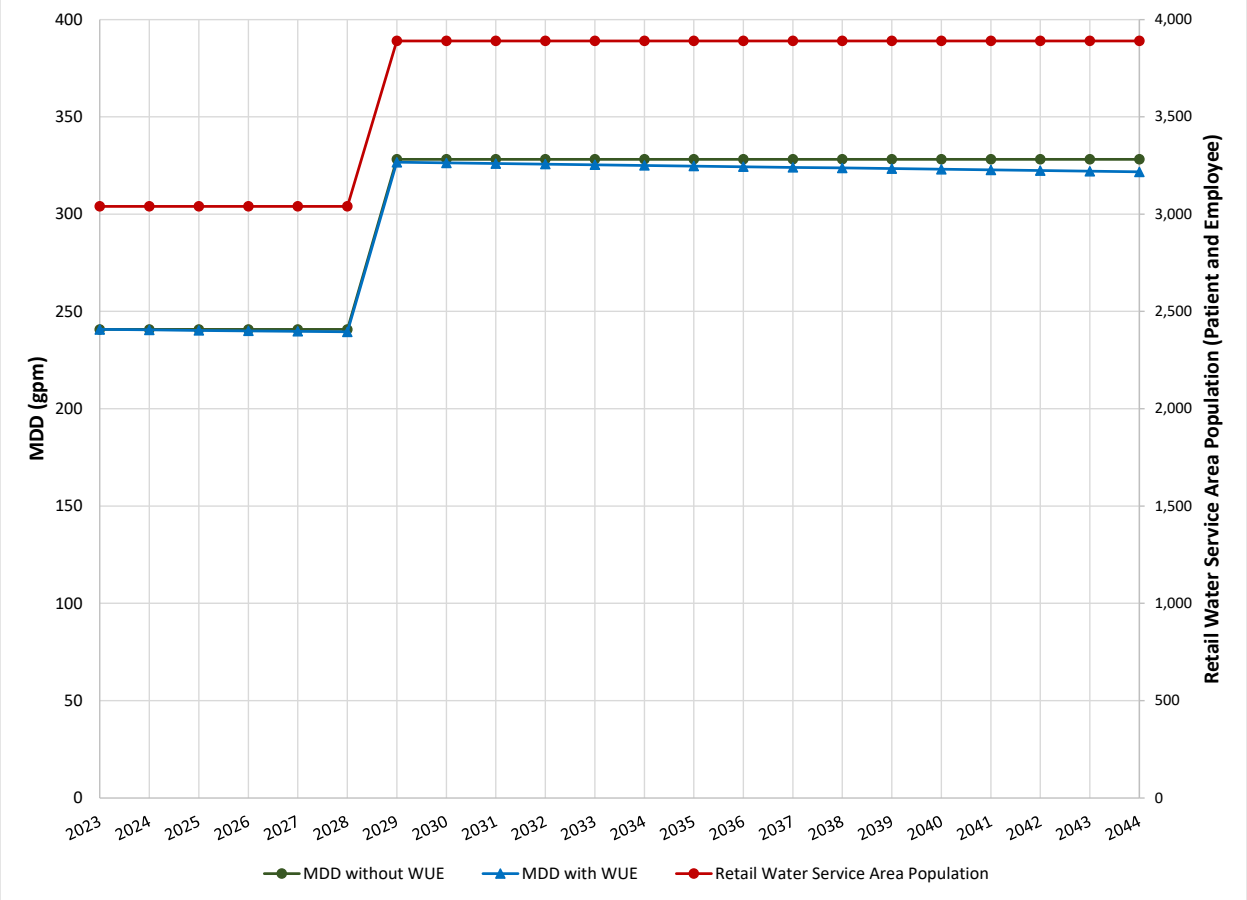
gpd = gallons per day

Future Water Demands and Water Supply

Overall water demand within WSH's system is expected to increase by approximately 36 percent of 2023 demand by the end of the 20-year planning period without savings from water use efficiency measures. **Chart ES-2** presents the projected population forecasts based on projected water demands for the 20-year planning period. The increase in future demand is expected when the New Forensic Hospital project is completed in 2029.

Chart ES-2

Future Water Demands and Population Projections



Water Source and Quality

Historically, WSH's municipal water supply has been provided by two groundwater wells: the East Campus Well (S02) and the Farm Well (S05). Both wells are equipped with temporary chlorination systems that inject a solution of 12.5-percent liquid sodium hypochlorite into the source water. Prior to the installation of the temporary chlorination system, there had been multiple positive total coliform samples reported. However, positive coliform samples have not been detected since the implementation of the chlorination system in 2023.

The East Campus Well has been offline since 2023 when higher than allowable concentrations of PFAS were detected. PFAS compounds have not been detected at the Farm Well.

Other water quality monitoring that has been performed at the sources and in the distribution system has not detected the presence of other regulated contaminants in the system.

WSH also has one intertie with LWD that is located near 81st Street NW and provides emergency supply to WSH.

Operations and Maintenance

WSH's operations and maintenance division is staffed by technically trained personnel. WSH staff regularly participate in safety and training programs. Some water system O&M staff also function as plumbers or provide support for the maintenance of the WSH campus buildings. WSH performed a staffing evaluation as part of this WSP. It is recommended that WSH have approximately four full-time employees to perform preventive maintenance and operations for the water system.

Water System Evaluation

The existing water system was evaluated to determine its ability to meet the policies and design criteria of WSH and those mandated by DOH. The results of the evaluation are summarized as follows:

- WSH needs to drill a replacement well for the East Campus Well to make full use of its water rights. It is assumed the new well will be equipped with a 1,400 gpm pump and may require PFAS treatment. It is recommended that both the Farm Well and the proposed future well be equipped with emergency generators to provide backup power to the sites.
- The Upper and Lower Reservoirs have reached the end of their design life. It is recommended that both reservoirs be demolished and a new reservoir be constructed to provide the required storage to the system.
- Areas of the system require water main replacements to resolve deficiencies related to meeting planning-level fire flows.
- WSH should install a telemetry system to provide remote operation and monitoring capabilities to its water system facilities.

Proposed Water System Improvements and Financing Plan

Improvements to the water system are necessary, primarily to resolve existing system deficiencies, but also to accommodate maintenance and capacity requirements. The Capital Improvement Program (CIP) presented in **Chapter 9** includes two scenarios for the WSH water system:

- **Scenario 1: DSHS maintains ownership of the WSH water system.**

  Improvements identified for the first 11 years of the Scenario 1 CIP (2024 through 2034) are estimated to cost approximately $45.7M. The 21-year period through 2044 includes approximately $52.6M in total project costs.

- **Scenario 2: LWD assumes ownership of the WSH water system and consolidates the system into LWD's water system.**

  Improvements identified for the first 11 years of the Scenario 2 CIP (2024 through 2034) are estimated to cost approximately $34.4M. The 21-year period through 2044 includes approximately $40.6M in total project costs.

1 | INTRODUCTION

WATER SYSTEM OWNERSHIP AND MANAGEMENT

The Washington State Department of Social of Health Services (DSHS) owns and operates the domestic drinking water distribution system that services Western State Hospital (WSH), which includes a majority of the hospital campus and some small adjacent areas. Water system data on file at the Washington State Department of Health (DOH) for WSH's system is shown in **Table 1-1**.

Table 1-1

Water System Ownership Information

Information Type	Description
System Type	Group A - Community - Public Water System
System Name	Western State Hospital
County	Pierce
DOH System ID Number	951501
Address	9601 Steilacoom Boulevard, Tacoma, WA 98498
Contact	Kevin Odegard
Contact Phone Number	(360) 876-0958 ext. 113

OVERVIEW OF EXISTING SYSTEM

In 2023, WSH provided water service to an average of approximately 572 connections within WSH's water service area per DOH's Water Facilities Inventory (WFI) Form. WSH's campus area comprises approximately 0.46 square miles. The 2023 patient population served by the water system was approximately 840, and the full-time employee population was approximately 2,200.

WSH's water supply has historically been provided by two groundwater wells, the East Campus Well and the Farm Well. However, the East Campus Well has been offline since per- and polyfluoroalkyl substances (PFAS) were detected in May and July of 2023. WSH maintains an emergency intertie with Lakewood Water District (LWD). Each of WSH's wells is treated with 12.5-percent sodium hypochlorite. Water storage is provided by two reservoirs that have a total capacity of approximately 0.75 million gallons (MG). WSH's distribution system has one pressure zone and approximately 8.0 miles of water main. A summary of the 2023 water system data is shown in **Table 1-2**.

Table 1-2

2023 Water System Data

Description	Data
Water System Patient Population	840
Water System Employee Population	2,200
Water Service Area	0.46 sq. miles
Total Connections	572 [1]
Estimated Patient Per Capita Demand	157 gpcd
Estimated Employee Per Capita Demand	24 gpcd
Average Day Demand	128 gpm
Maximum Day/Average Day Demand Factor	1.89
Peak Hour/Maximum Day Demand Factor	2.07
Number of Pressure Zones	1
Number of Well Sources[2]	2
Total Capacity of WSH Sources	1,000 gpm
Number of Reservoirs and Total Capacity	2 (0.75 MG)
Total Length of Water Main	42,086 linear feet

1 = Per DOH WFI Form.
2 = The East Campus Well currently is offline. Total capacity does not include East Campus Well.
gpcd = gallons per capita per day
gpm = gallons per minute

AUTHORIZATION AND PURPOSE

WSH authorized RH2 Engineering, Inc., (RH2) to prepare this Water System Plan (WSP) as required by state law under Washington Administrative Code (WAC) 246-290-100. In accordance with WAC 246-290-100, the WSP shall be updated and submitted to DOH every 10 years. This WSP has been written to meet 10-year planning requirements. The purpose of this updated WSP is as follows:

- To evaluate existing water demand data and project future water demands.
- To analyze the existing water system to determine if it meets minimum requirements mandated by DOH and WSH's own policies and design criteria.
- To identify water system improvements that resolve existing system deficiencies and accommodate the system's future needs for at least 20 years.
- To prepare a schedule of improvements that meets the goals of WSH's financial program.
- To document WSH's existing water rights, their current status, and future requirements.
- To evaluate past water quality and identify water quality improvements, as necessary.
- To document WSH's operations and maintenance program.

- To prepare water use efficiency, cross-connection control, wellhead protection, and water quality monitoring plans.
- To comply with all other WSP requirements of DOH.
- To potentially transfer water rights to the LWD.

SUMMARY OF WSP CONTENTS

A brief summary of the content of the chapters in the WSP is as follows:

- The **Executive Summary** provides a brief summary of the key elements of this WSP.
- **Chapter 1** introduces the reader to WSH's water system, the objectives of the WSP, and its organization.
- **Chapter 2** presents the water service area, describes the existing water system, and identifies adjacent water purveyors.
- **Chapter 3** presents related plans, land use, and population characteristics.
- **Chapter 4** identifies existing water demands and projected future demands.
- **Chapter 5** presents WSH's operational policies and design criteria.
- **Chapter 6** discusses WSH's water sources, water rights, and water quality monitoring.
- **Chapter 7** discusses the water system analyses and existing system deficiencies.
- **Chapter 8** discusses WSH's operations and maintenance program.
- **Chapter 9** presents the proposed water system improvements, their estimated costs, and the implementation schedule.
- **Chapter 10** summarizes the financial status of the water system and discusses how project funding is obtained.
- The **Appendices** contain additional information and plans that supplement the main chapters of the WSP.

DEFINITION OF TERMS

The following terms are used throughout this WSP.

Consumption: The true volume of water used by the water system's customers. The volume is measured at each customer's connection to the distribution system.

Cross-Connection: A physical arrangement that connects a public water system, directly or indirectly, with facilities that could present the potential for contaminating the public water system.

Demand: The quantity of water required from a water supply source over a period of time to meet the needs of domestic, commercial, industrial, and public uses, and provide enough water to supply firefighting, system losses, and miscellaneous water uses. Demands are normally discussed in terms of flow rate, such as million gallons per day (MGD) or gallons per minute (gpm), and are described in terms of a volume of water delivered during a certain time period. Flow rates pertinent to the analysis and design of water systems are as follows:

- **Average Day Demand (ADD)**: The total amount of water delivered to the system in a year divided by the number of days in the year.
- **Maximum Day Demand (MDD)**: The maximum amount of water delivered to the system during a 24-hour time period of a given year.
- **Peak Hour Demand (PHD)**: The maximum amount of water delivered to the system, excluding fire flow, during a 1-hour time period of a given year. A system's PHD usually occurs during the same day as the MDD.

Distribution System Leakage (DSL): Water that is measured as going into the distribution system but not metered as going out of the system.

Equivalent Residential Units (ERUs): One ERU represents the amount of water used by one single-family residence for a specific water system. The demand of other customer classes can be expressed in terms of ERUs by dividing the demand of each of the other customer classes by the demand represented by one ERU. Because WSH does not serve any single-family residential customers, ERUs are not calculated for the system.

Existing Service Area: The specific area within the retail service area where WSH already provides direct service, remote service, or where service connections currently are available.

Fire Flow: The rate of flow of water required during firefighting, which is usually expressed in terms of gpm.

Future Service Area: The specific area to which a water system in a Critical Water Supply Service Area is to provide water service as provided in a written agreement between purveyors under Chapter 70.116 Revised Code of Washington (RCW) and Chapter 246-293 WAC.

Head: A measure of pressure or force exerted by water. Head is measured in feet and can be converted to pounds per square inch by dividing feet by 2.31.

Headloss: Pressure reduction resulting from pipeline wall friction, bends, physical restrictions, or obstructions.

Hydraulic Elevation: The height of a free water surface above a defined datum; the height above the ground to which water in a pressure pipeline would rise in a vertical open-end pipe.

Maximum Contaminant Level (MCL): The maximum permissible level of contaminant in the water that the purveyor delivers to any public water system user, measured at the locations identified under WAC 246-290-300, Table 3.

Potable: Water suitable for human consumption.

Pressure Zone: A portion of the water system that operates from sources at a common hydraulic elevation. WSH's only pressure zone has two reservoirs with overflow elevations of 389 feet.

Purveyor: An agency, subdivision of the state, municipal corporation, firm, company, mutual or cooperative association, institution, partnership, or persons or other entity owning or operating a public water system. Purveyor also means the authorized agents of such entities.

Retail Service Area: The specific area where WSH has a duty to serve new service connections when the circumstances meet the following four threshold factors, per DOH Publication No. 331-366:

1. The municipal water supplier has sufficient capacity to serve water in a safe and reliable manner.
2. The service request is consistent with adopted local plans and development regulations.
3. The municipal water supplier has sufficient water rights to provide service.
4. The municipal water supplier can provide service in a timely and reasonable manner.

Service Area: The largest area identified on a map where WSH currently provides direct service and remote service, and the area it plans to serve.

Supply: Water that is delivered to a water system by one or more supply facilities, which may consist of supply stations, booster pump stations, springs, and wells.

Storage: Water that is "stored" in a reservoir to supplement the supply facilities of a system and provide water supply for emergency conditions. Storage is broken down into the following five components, which are defined and discussed in more detail in **Chapter 7**: operational storage; equalizing storage; standby storage; fire flow storage; and dead storage.

LIST OF ABBREVIATIONS

The abbreviations listed in **Table 1-3** are used throughout this WSP.

Table 1-3

Abbreviations

Abbreviation	Description
AC	asbestos cement
ADD	average day demand
AMI	Advanced Metering Infrastructure
AWWA	American Water Works Association
BPS	booster pump station
CCR	Consumer Confidence Report
CIP	Capital Improvement Program
County	Pierce County
CWSSA	Critical Water Supply Service Area
DBP	disinfection byproduct
DOH	Washington State Department of Health
DSHS	Washington State Department of Social and Health Services
DSL	distribution system leakage
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERU	equivalent residential unit
fps	feet per second
FTE	full-time employee equivalent
GMA	Growth Management Act
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
HGL	hydraulic grade line
LWD	Lakewood Water District
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDD	maximum day demand
MG	million gallons
MGD	million gallons per day
mg/L	milligrams per liter
OFM	Office of Financial Management
OSHA	Occupational Safety & Health Administration
PHD	peak hour demand
PFAS	per- and polyfluoroalkyl substances
PRV	pressure reducing valve
psi	pounds per square inch
PSV	pressure sustaining valve
PVC	polyvinyl chloride
RCW	Revised Code of Washington
RTU	remote telemetry unit
SCADA	supervisory control and data acquisition
SDWA	Safe Drinking Water Act
SEPA	State Environmental Policy Act
SOC	synthetic organic chemical
SWTR	Surface Water Treatment Rule
TDH	total dynamic head
THM	trihalomethane
UGA	Urban Growth Area
USGS	United States Geological Survey
VOC	volatile organic chemical
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety & Health Act
WSH	Western State Hospital
WSP	Water System Plan
WUCC	Water Utility Coordinating Committee
WUE	Water Use Efficiency

2 | WATER SYSTEM DESCRIPTION

INTRODUCTION

This chapter describes Western State Hospital's (WSH) retail water service area (RWSA) and water service agreements and provides a thorough description of the water system and its individual components. The results of the evaluation and analyses of the existing water system are presented in **Chapter 7**.

WATER SERVICE AREA

History

With only 21 patients at the time, WSH opened in 1871 on the site of historic Fort Steilacoom as a state-owned psychiatric hospital for adults within Washington State. The Washington State Department of Social and Health Services (DSHS) owns and operates the domestic drinking water distribution system serving WSH. WSH patient population grew significantly throughout the 1880s and 1890s, accompanied by significant growth in hospital facilities. Today, WSH provides services to 20 counties in Western Washington. The approximately 216-acre campus is one of the largest inpatient psychiatric hospitals west of the Mississippi, with over 800 beds and 2,500 employees. WSH was listed on the National Register of Historic Places and the Washington Heritage Register as the Fort Steilacoom Historic District on November 25, 1977.

In 1903, the Lower Reservoir was constructed south of the hospital, east of what is now Pierce College, and north of Waughop Lake. In 1940, an additional reservoir was constructed, the Upper Reservoir, approximately 500 feet east of the Lower Reservoir.

Historically, WSH has relied exclusively on groundwater for its source of water. The East Campus Well was drilled in 1968, and the Farm Well was drilled in 2003. Two other original groundwater sources, one well and one spring source, are no longer in use. Due to water quality tests showing positive detections of per- and polyfluoroalkyl substances (PFAS), the East Campus Well has been offline since May 2023. WSH does not intend to further expand its groundwater sources. WSH also maintains an emergency intertie with the Lakewood Water District (LWD), located on the northern edge of the hospital campus near 81st Street SW.

The hospital is still growing as WSH is in the process of constructing improvements for a new therapeutically designed hospital on campus to include 350 beds to care for forensic patients. While some existing buildings will be demolished for these improvements, the majority of the new hospital will augment, not replace, the existing structures. As part of the new Forensic Hospital project, significant water main improvements are planned to be constructed in the west campus. The project is currently underway.

The inventory of WSH facilities will be discussed in more detail in the remainder of this chapter.

Existing Retail Water Service Area

WSH is located in western Pierce County in the City of Lakewood (Lakewood). WSH's campus limits encompass an area of approximately 0.45 square miles, as shown on **Figure 2-1**.

WSH's existing water rights can be used throughout the defined water service area per the 2003 Municipal Water Law. WSH's existing retail water service area (RWSA), which covers an area of approximately 0.46 square miles, is shown on **Figure 2-1**. The existing RWSA includes the WSH campus, the Oakridge Community Facility east of the campus, and an irrigation area in the Fort Steilacoom Park south of the campus. WSH does not anticipate any extension of its service area and as such, the future service area is the same as the RWSA, as shown on **Figure 2-1**.

Geography, Geology, and Topography

WSH is located primarily on glacial and interglacial deposits, which extend from the land surface to depths of up to 2,000 feet below ground surface. These sediments are underlain by bedrock of Tertiary age. The effects of the advance and retreat of the Vashon ice sheet from 18,000 to 14,000 years before present dominate the surficial geology. The geology of the RWSA is typical of continental glacial drift in the southern Puget Lowland. At this location, there are a couple different deposits of loose Vashon recessional glacial outwash referred to as the Steilacoom Gravel, and ice-contact recessional outwash. Both units consist primarily of sand and gravel. Beneath these layers, and where the Vashon recessional outwash deposits are not present, Vashon glacial till (a dense mixture of silt, sand, gravel, cobbles, and boulders can be found). Beneath the Vashon glacial till occurs the Vashon advance outwash that primarily consists of sand and often forms a regional aquifer. The glacial till in this region is dense, as are the underlying deposits, which were compacted by the weight of more than 3,000 feet of ice when the Vashon continental ice sheet overrode the area. Beneath the Vashon sediments, older non-glacial and glacial deposits can be found. The older coarse-grained deposits form aquifers and the fine-grained deposits form aquitards.

Tectonically, the WSH area lies between an oblique convergent plate boundary and the rising and volcanically active Cascade Mountain Range. An active subduction zone lies deep below WSH and the continental crust is being compressed and pushed northward. This tectonic setting results in significant seismic activity. The soils in the WSH are identified as being at very low risk for liquefaction by the Washington State Department of Natural Resources and no seismic activity has been known to affect water quality or infrastructure since its initial construction and implementation.

The topography of WSH's RWSA varies in elevation from approximately 215 feet to 246 feet above mean sea level (AMSL). The lowest areas within the RWSA are in the northern portion near Building 28. Elevations as high as 246 feet AMSL occur in the northeastern portion of the RWSA near Building 56. Generally, the WSH RWSA is relatively flat.

INVENTORY OF EXISTING WATER FACILITIES

This section provides a detailed description of the existing water system and the current operation of the facilities. The analysis of the existing water facilities is presented in **Chapter 7**. Additional information on WSH's existing water system facilities is included on the Washington State Department of Health (DOH) Water Facilities Inventory form and the Asset Inventory in **Appendix A** and **Appendix B**, respectively.

Pressure Zones

The WSH water system serves customers within an elevation range of approximately 215 feet AMSL, near Building 28 at the intersection of Circle Drive and Totem Street, to approximately 246 feet in the northeastern part of campus near Building 56. As the areas served is relatively flat, only one pressure zone is required. The pressure is regulated by reservoir levels with overflow elevations of 389 feet, as illustrated in the hydraulic profile (**Figure 2-2**).

Supply Facilities

The existing water system is supplied by two groundwater wells, S02 and S05, referred to as the East Campus Well and Farm Well, respectively. An emergency intertie with the LWD also is available located on the northern edge of the hospital campus near 81st Street SW. **Table 2-1** summarizes WSH's existing supply sources and their capacities in gallons per minute (gpm). Additional detail on existing sources is provided in **Chapter 6**. Water sources are equipped with flow meter totalizers that are used to measure production rate. Totalizer readings are then recorded by operations staff.

Table 2-1

Supply Facilities Summary

Name	Year Constructed	Status	Usage	Existing Capacity (gpm)	Well Depth (feet)	Well Diameter (feet)	Pump Type	Pump Motor Size (hp)
S02 (East Campus Well)	1968	Active[1]	Emergency	500	337	16	Submersible	100
S08 (Farm Well)	2003	Active	Permanent	1,000	560	16	Submersible	125

[1] = The East Campus Well is currently offline.
gpm = gallons per minute
hp = horsepower

Wells

S02 (East Campus Well)

East Campus Well House

The S02 well was installed in 1968. The 16-inch-diameter, 337-foot-deep well is located onsite near WSH's East Campus Wards, Building 29, and the adjacent parking lot. This well has a capacity of 500 gpm. Access to the well is secured with a fence surrounding the well house. The S02 well pumps directly into the distribution system.

A temporary chlorination system was installed in 2023. Per a letter to DSHS dated April 19, 2023, DOH requires contact time facilities at the East Campus Well to provide CT6 disinfection as mitigation for the lack of sanitary control around this well. Regardless, this source has been offline since PFAS compounds were detected in May and July of 2023.

S05 (Farm Well)

Farm Well House

The S05 well was installed in 2003. The 16-inch-diameter, 560-foot-deep well is located off campus approximately ¼ mile south of WSH. The well has a capacity of 1,000 gpm and is located on property owned by Lakewood. Access to the well house is limited along a walking trail that is contained within Fort Steilacoom Park and is secured with a fence surrounding the well house. Well S05 pumps water directly to WSH's two reservoirs that then supply the distribution system. The building surrounding the Farm Well is a reinforced concrete masonry unit building with concrete wall footings, a concrete slab on grade floor, and a wood truss roof with metal roofing. The building was designed in 2004.

A temporary chlorination system was installed in 2023 to provide a disinfecting chlorine residual at the distribution entry point.

Interties

Water system interties are physical connections between two adjacent water systems. Interties normally are separated by a closed isolation valve or control valve. Emergency supply interties provide water from one system to another during emergency situations only. An emergency situation may occur when a water system loses its main source of supply or a major transmission main, or during firefighting situations, and is unable to provide a sufficient quantity of water to its customers. Normal supply interties provide water from one system to another during non-emergency situations and typically are supplying water at all times.

The LWD emergency intertie is located within the northwest corner of the WSH RWSA. This intertie is configured such that water may be gravity fed from LWD's 404 Pressure Zone into the WSH water system when the manually operated valve is opened. The valve is located in the parking lot north of the East Campus Well. LWD's supply has been utilized at times in the past to supply the WSH system when the East Campus and Farm wells could not be operated.

Storage Facilities

WSH's water system has two storage facilities that provide storage for the distribution system. A summary of the storage facilities is shown in **Table 2-2**, and a detailed description of each facility follows.

Table 2-2

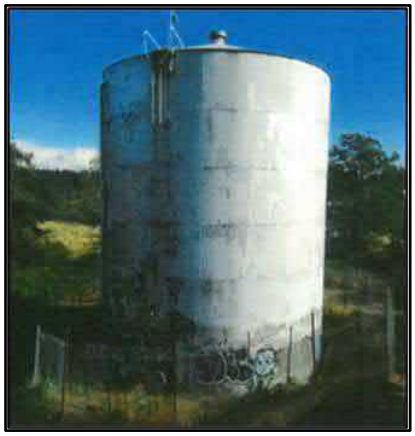
Storage Facilities Summary

Name	Year Constructed	Material	Capacity (gal)	Diameter (feet)	Height (feet)	Base Elevation (feet)	Overflow Elevation (feet)
Lower Reservoir	1903	Steel	317,200	30	60	329	389
Upper Reservoir	1940	Steel	413,600	40	44	345	389

gal = gallon

Upper Reservoir

The 413,600-gallon Upper Reservoir is located across Steilacoom Boulevard, approximately 0.2 miles south of the hospital campus. The 40-foot-diameter, 44-foot-tall steel tank was constructed in 1940. The reservoir provides approximately 9,400 gallons of storage per foot height. The reservoir's inlet and outlet pipes are 10-inch-diameter and 8-inch-diameter water main, respectively.



Upper Reservoir

Lower Reservoir

The 317,200-gallon Lower Reservoir is adjacent to the Upper Reservoir, approximately 0.2 miles south of the WSH campus. The 30-foot-diameter, 60-foot-tall steel tank was constructed in 1903 and provides approximately 5,300 gallons of storage per foot height. Two 8-inch-diameter water mains serve as the reservoir's inlet and outlet pipes.

Lower Reservoir

Distribution and Transmission System

WSH's water system contains approximately 8.0 miles of water main ranging from 1 inch to 12 inches in diameter. As shown in **Table 2-3**, most of the water main (approximately 31-percent) within the system is 8 inches in diameter.

Table 2-3

Water Main Diameter Inventory

Diameter (inches)	Length (feet)	% of Total
4 or smaller	8,743	20.77%
6	8,211	19.51%
8	13,073	31.06%
10	7,567	17.98%
12	4,492	10.67%
Total	**42,086**	**100.00%**

The water main in the system consists of asbestos cement, cast iron, ductile iron, galvanized steel, and polyvinyl chloride (PVC) as shown in **Table 2-4.**

Table 2-4

Water Main Material Inventory

Material	Length (feet)	% of Total
Cast Iron	29,050	69.03%
PVC	2,479	5.89%
Ductile Iron	2,893	6.87%
Galvanized Steel	3,449	8.20%
Asbestos Cement	4,214	10.01%
Total	**42,086**	**100.00%**

The life expectancy of water main generally is 75 to 100 years, depending on the water main material and soil conditions in which it was installed. As shown in **Table 2-5**, approximately 93 percent of water main within the WSH system is known to be older than 50 years.

Table 2-5

Water Main Installation Year Inventory

Age (years)	Length (feet)	% of Total
< 20	252	0.60%
20-30	2,499	5.94%
30-40	0	0.00%
40-50	0	0.00%
> 50	39,335	93.46%
Total	**42,086**	**100.00%**

Water System Operation and Control

Successful operation of any municipal water system requires gathering and using accurate water system information. The distribution system is primarily supplied with water from the Farm Well. The Farm Well supplies water to the Upper and Lower Reservoirs. The operation of the Farm Well is manually controlled by the water levels in the reservoirs.

SATELLITE SYSTEM MANAGEMENT

A Satellite System Management Agency (SSMA) is defined as a person or entity that is certified by DOH to own or operate more than one public water system without the necessity for a physical connection between such systems. SSMAs were created to stop the proliferation of small water systems, many of which could not meet federal and state water quality and water system planning regulations. The goal of SSMAs is to ensure that the people of Washington State will receive safe and reliable water supplies in the future from professionally managed or properly operated water systems. SSMAs can provide three different levels of service:

1. Ownership of the satellite system;
2. Operations and management of the satellite system; or
3. Contract services only.

The service can be provided to new systems, existing systems that are no longer viable, or existing systems placed into receivership status by DOH.

WSH currently is not a certified SSMA and currently is not considering assuming such responsibility in the future. Operations of the WSH water system are facilitated through a SSMA with Northwest Water Systems, Inc.

ADJACENT WATER SYSTEMS

The area outside of and immediately adjacent to the WSH campus is LWD and the Town of Steilacoom RWSA, as well as some smaller systems such as the Chambers Creek Water System and Sunrise Terrace Community LLC. Water systems located adjacent to or close to LWD's future service area boundary are shown in **Figure 2-3**. A brief description of each major water system follows.

Lakewood Water District

As illustrated in **Figure 2-3**, LWD's water system is located directly outside WSH's campus, serving the Town of Steilacoom, Lakewood, and beyond. The LWD water system provides service to approximately 17,716 connections with 29 active wells. LWD also has generated a network of emergency interties with surrounding water companies such as Tacoma Water and Parkland Light and Water. DSHS and DOH have expressed their desire for LWD to become the permanent source of water supply and ownership for the WSH water system. The existing District intertie currently provides water for WSH for emergency use only. When the manually operated intertie valve is

opened, water may be gravity fed from LWD's 404 Pressure Zone directly into the WSH water system.

Town of Steilacoom

The Town of Steilacoom's (Steilacoom) water system, located west of the WSH campus, serves approximately 6,721 customers. Currently, Steilacoom purchases all water from LWD but maintains ownership of one well. Water is supplied to Steilacoom through two existing metered interties that connect LWD and Steilacoom. No additional future interties currently are planned.

City of Tacoma

The City of Tacoma's (Tacoma) water system, located north of WSH, is a regional water supplier that serves more than 300,000 customers in Pierce and King Counties. Tacoma's raw water supply originates in the Green River Watershed, which covers approximately 148,884 acres on the west flank of the Cascade Mountains between Chinook Pass and Snoqualmie Pass and supplies up to 167 million gallons per day (MGD). Tacoma can supplement its Green River supply with water from seven wells located along the north fork of the Green River. This well field can produce 84 MGD in the winter and spring months and is only utilized when the water in the Green River is too turbid to be used as a supply. This typically occurs in the fall and winter when rain and snow melt washes soil sediment into the river. In addition to the North Fork Wells, Tacoma has several wells in its service area that can be used to meet peak summer water demands. The South Tacoma Wells have a maximum capacity of approximately 59 MGD.

The raw water supply for this system is stored in the Howard Hanson Reservoir, which was created after the U.S. Army Corps of Engineers installed the Howard Hanson Dam in 1961. The water from the reservoir is then diverted into Tacoma's pipeline for treatment and distribution. In 2005, Tacoma finished installing 34 miles of transmission main, increasing the water supply to Tacoma and south King County. Due to this increase in supply, an expansion of the Howard Hanson Dam was required to increase storage capacity. This 2007 expansion added 6.5 billion gallons of storage capacity to Tacoma's water system. New water treatment facilities also were constructed in 2005 and 2007 that include ozone disinfection.

Legend

- Western State Hospital Campus Area
- Western State Hospital Water Service Area (Retail and Future)

Water System Facilities

- Reservoir
- Well
- Intertie

Water Main by Diameter

- < 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- Lakewood Water District Water Main

Lakewood Water District
Oakbrook Tank
0.50 MG
Ground Elev: 225'
Base Elev: 370'
Overflow Elev: 404'

Oakbrook Wells
O-2 (1,000 gpm) & O-3 (1,000 gpm)

Lakewood Water District Emergency Intertie (81st St SW)

East Campus Well (500 gpm) (Offline)

Lower Reservoir
0.32 MG
Overflow Elev: 389'
Height: 60'

Upper Reservoir
0.41 MG
Overflow Elev: 389'
Height: 44'

Oakridge Group Home

Farm Well (1,000 gpm)

Waughop Lake

79TH ST SW
81ST ST SW
ONYX DR SW
GOLF COURSE RD SW
KIDS FIRST PL
CIRCLE DR
GARRISON SPRINGS RD
PICKETT ST
SENTINEL DR
WEST ST
CHAPEL GATE CT
FORT ST
STEILACOOM BLVD SW
BYRD DR
STEILACOOM BLVD
GARDEN CT
RIGNEY RD
MARIETTA ST
95TH AVCT SW
91ST STCT SW
92ND STCT SW
93RD ST SW
93RD STCT SW
FARWEST DR SW
DAWSON LN SW
CARVER RD SW
95TH ST SW
MT TAKOMA DR SW
WAUGHOP LAKE RD SW
ANGLE LN SW
82ND ST SW
83RD ST SW
84TH ST SW
TERRACE RD SW
DALTON DR SW
HAVILAND AV SW
NIXON AV SW
92ND ST SW
NORTH WY SW
94TH ST SW
FIR GLEN RD SW
RUSTIC LN SW
95TH ST SW
LENOX AV SW
HOPKINS RD SW
WEDGEWOOD CT SW
ELWOOD DR SW

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Vicinity Map

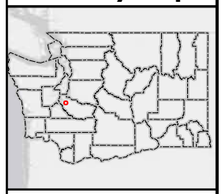

Figure 2-1
Existing Water System
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 300 Feet

0 150 300 600 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

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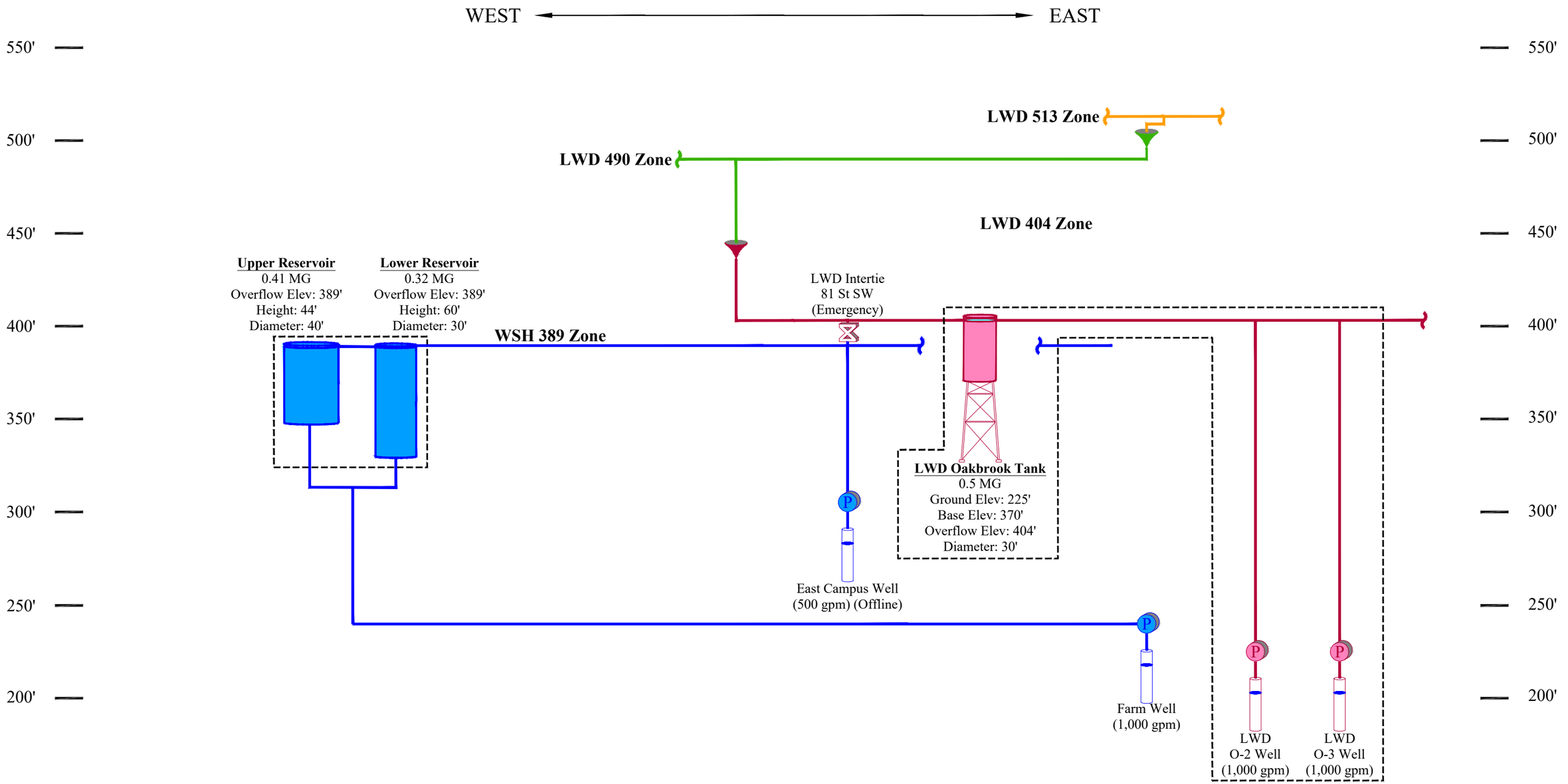

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Washington State Department of Social & Health Services
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Legend

- Lakewood Water District (LWD) 513 Zone
- LWD 490 Zone
- LWD 404 Zone
- Western State Hospital (WSH) Distribution
- Intertie
- Pressure Reducing Valve
- Well Source
- Facilities at Same Site

Figure 2-2
Existing Hydraulic Profile
Dept. of Social and Health Services
Western State Hospital Water System Plan

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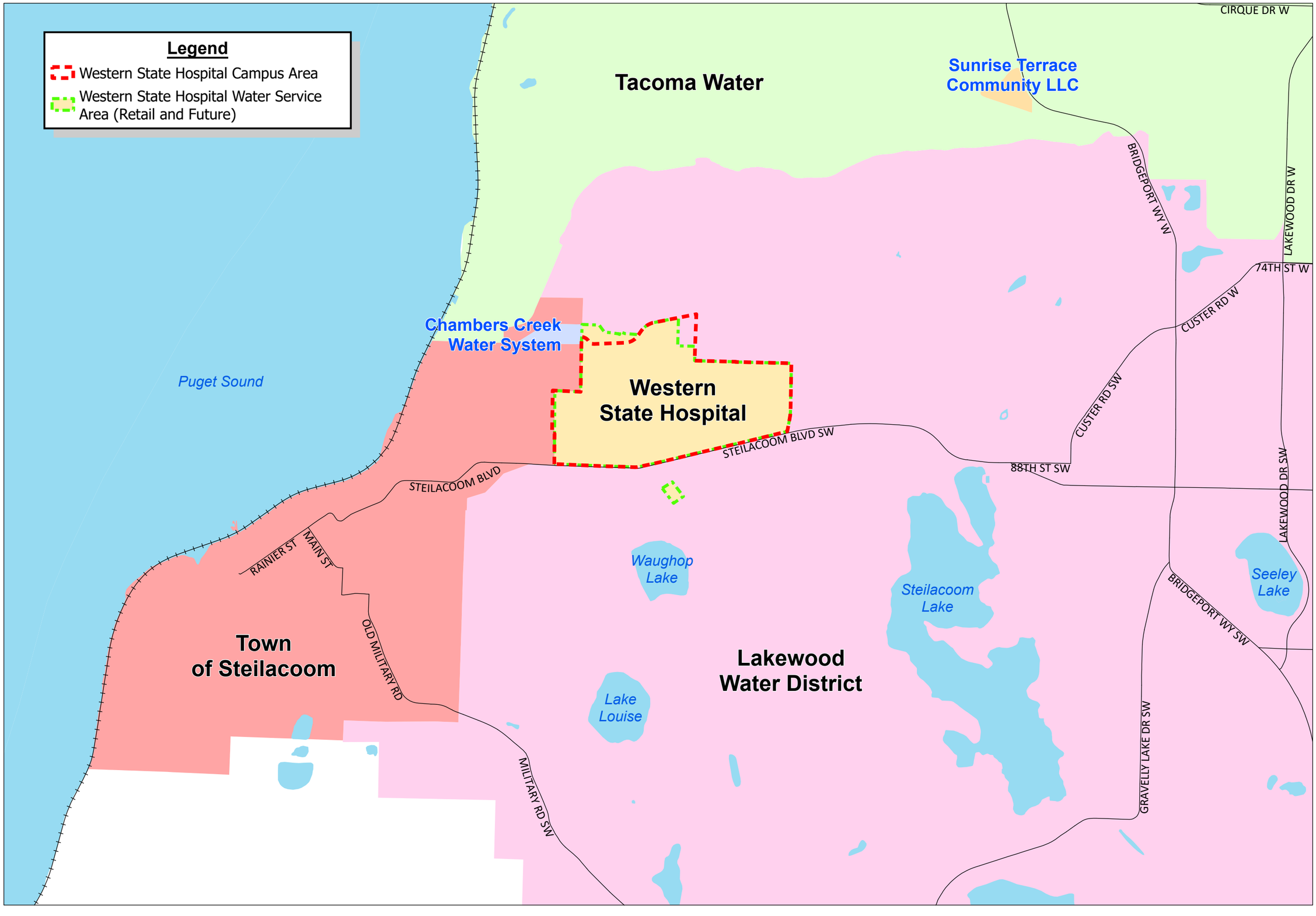

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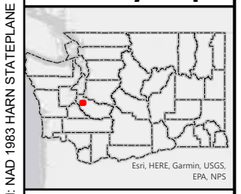

Figure 2-3
Adjacent Water Systems
Dept. of Social and Health Services Western State Hospital Water System Plan

Washington State Department of Social & Health Services
Transforming lives

1 inch : 1,000 Feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

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3 | LAND USE AND POPULATION

INTRODUCTION

The State of Washington Growth Management Act (GMA) requires, among other things, consistency between land use and utility plans and their implementation. This chapter demonstrates the compatibility of the Western State Hospital (WSH) Water System Plan (WSP) with other plans, identifies the designated land uses within the existing and future service area, and presents patient population and employment projections within WSH's planning area.

COMPATIBILITY WITH OTHER PLANS AND POLICIES

To ensure that the WSP is consistent with the land use policies that guide it and other related plans, the following planning documents were examined.

- State of Washington Growth Management Act
- *Pierce County Comprehensive Plan*
- *Pierce County Coordinated Water System Plan and Regional Supplement, 2021 Update*
- *City of Lakewood Comprehensive Plan*
- *Lakewood Water District 2020 Comprehensive Water Plan*
- *Western State Hospital Master Plan 2020*

Growth Management Act

The State of Washington GMA of 1990 (and its multiple amendments) defined four goals relevant to this WSP:

1. Growth should be in urban areas;
2. There should be consistency between land use and utility plans and their implementation;
3. There should be concurrency of growth with public facilities and services; and
4. Critical areas should be designated and protected.

Urban Growth Area

The GMA requires that Pierce County (County) designate an Urban Growth Area (UGA) where most future urban growth and development will be directed. The countywide UGA is defined in the County's *Comprehensive Plan* and encompasses the area where this urban growth and development is projected to occur over the 20-year planning period. The current County UGA boundaries in the vicinity of WSH are shown on **Figure 3-1**.

Consistency

The GMA requires planning consistency from two perspectives. First, it requires consistency of plans between jurisdictions. This means that plans and policies of WSH, the City of Lakewood (Lakewood), and the County must be consistent per Revised Code of Washington (RCW)

36.70A.100. Second, the GMA requires that the implementation of the WSP be consistent with comprehensive plans (RCW 36.70A.120).

The Washington State Department of Health (DOH) Municipal Water Law also requires that water system plans are consistent with local plans and regulations. The signed Consistency Statement Checklists included in **Appendix C** from WSH and Lakewood's planning department document the determination that this WSP is consistent with their plans and regulations.

Concurrency

Concurrency means that adequate public facilities and services be provided at the time that growth occurs. For example, growth should not occur where schools, roads, and other public facilities are overloaded. To achieve this objective, the GMA directs growth to areas already served or readily served by public facilities and services (RCW 36.70A.110). It also requires that when public facilities and services cannot be maintained at an acceptable level of service, the new development should be prohibited (RCW 36.70A.110).

Critical Areas

The GMA requires that critical areas be designated and protected. Critical areas include aquifer recharge areas, wetlands, frequently flooded areas, streams, wildlife habitat, landslide hazard areas, seismic hazard areas, and steep slopes. WSH has adopted development regulations identifying and protecting critical areas as required. The State Environmental Policy Act Checklist in **Appendix D** addresses other environmental concerns.

Pierce County Comprehensive Plan

The current version of the *Pierce County Comprehensive Plan* was adopted in 2015 and last amended in 2023. The plan includes the following components.

- Chapter 1: Introduction
- Chapter 2: Land Use Element
- Chapter 3: Capital Facilities Element
- Chapter 4: Cultural Resources Element
- Chapter 5: Design and Character Element
- Chapter 6: Economic Development Element
- Chapter 7: Environment Element
- Chapter 8: Essential Public Facilities Element
- Chapter 9: Housing Element
- Chapter 10: Open Space Element
- Chapter 11: Parks and Recreation Element
- Chapter 12: Transportation Element
- Chapter 13: Utilities Element
- Chapter 14: Community Plans

The County's *Comprehensive Plan* guides development and designates land use in unincorporated Pierce County.

Pierce County Coordinated Water System Plan and Regional Supplement

The *Pierce County Coordinated Water System Plan and Regional Supplement* (CWSP) was updated in July 2021. It was developed under the provisions of the Water Supply Coordination Act (Chapter 70.116 RCW). The County's CWSP provides maximum integration and coordination of public water system facilities. The CWSP provides policy recommendations, helps coordinate the delivery of water to Group A water systems, sets the framework and process of water system review plans, identifies future demand to determine the sufficiency of water rights, and sets minimum standards for fire flow.

City of Lakewood Comprehensive Plan

Lakewood's current *Comprehensive Plan*, updated in August 2023, is undergoing a new update. The Land Use Element of Lakewood's *Comprehensive Plan* is Lakewood's vision of how growth and development should occur over a 20-year horizon. It accommodates growth while preserving the character of established neighborhoods and protecting them from intrusion of incompatible uses. The goals and policies outlined in the Land Use Element of the *Comprehensive Plan* will be realized through Lakewood's implementation strategies, including future sub-area planning, technical area planning, design and development regulations, the process of development review, and other such methods.

The utilities, transportation, capital facilities, and improvements elements ensure that new development will be serviced adequately without compromising adopted levels of service, similar to the principle of concurrency as defined in the GMA. The *Comprehensive Plan* can be referenced for land use outside WSH's future retail water service area (RWSA).

Lakewood Water District Water System Plan

Like WSH, Lakewood Water District (LWD) is required to develop a WSP and update it every 10 years to comply with DOH regulations under Chapter 246-290 Washington Administrative Code (WAC). LWD's plan was last updated and adopted in February 2020. WSH and LWD have had preliminary discussions regarding the potential to incorporate WSH into LWD's service area, either partially or entirely. LWD has "connection-ready" services extended to each of the campus supply lines in the event that WSH's well supply is either unavailable or unsafe. These connection points would be utilized as a permanent supply source if a decision is made to fully connect the campus to LWD's system.

Western State Hospital Master Plan

WSH's *Master Plan 2020* was adopted in December 2021. The plan was developed to guide facility investments and provides a land use plan for coordination with local and regional jurisdictions. The primary intent of this document is to accommodate a set of facility improvements to the existing WSH campus.

LAND USE

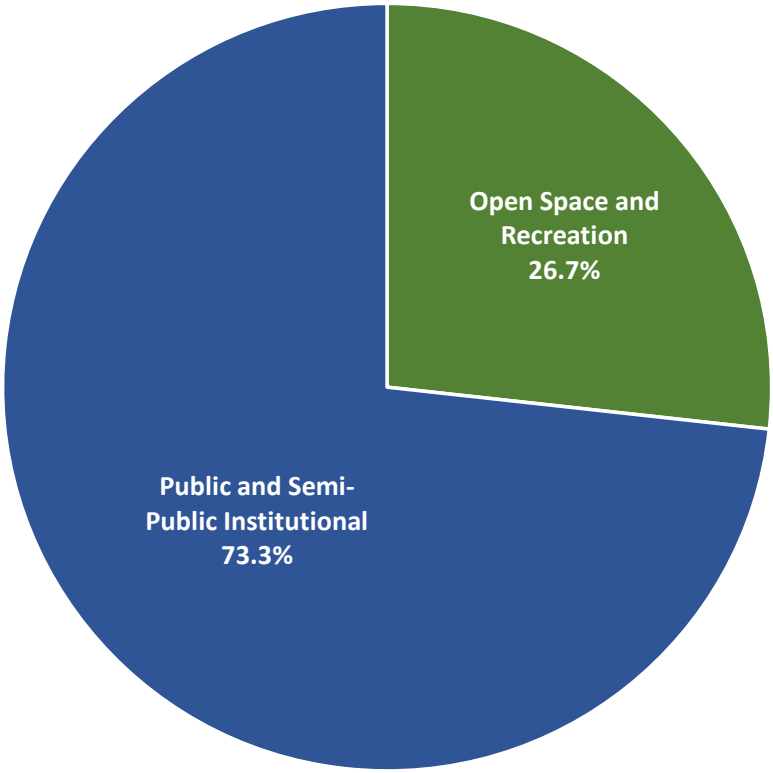
The WSH campus, approximately 0.45 square miles, lies entirely within the City of Lakewood. The existing RWSA, approximately 0.46 square miles, is slightly larger than the WSH campus because it includes areas of Steilacoom Park to the south of the campus that are irrigated by the WSH water system. WSH does not anticipate any extension of its RWSA, and as such, the future RWSA will remain the same as the existing RWSA. Future land use for WSH is defined in the Lakewood *Comprehensive Plan*. The Land Use Map, **Figure 3-1**, guides development and can be used to forecast future demands. Land use outside the WSH campus as designated by Lakewood is shown on **Figure 3-1**.

Approximately 73.3 percent of the WSH area within the future RWSA is designated by Lakewood for public and semi-public institutional use as indicated in **Table 3-1**. Approximately 26.7 percent of the future RWSA is designated for open space and recreation.

Table 3-1

Land Use Inside Future RWSA

Land Use Type	Square Miles	% of Total
Open Space and Recreation	0.12	26.7%
Public and Semi-Public Institutional	0.34	73.3%
Total	**0.46**	**100.0%**



POPULATION

Patient Population

The WSH water system is unique in that the water system population is limited to patients, employees, and visitors. Patient count historically has been limited by the number of beds available at WSH.

Per correspondence dated March 22, 2024, from the WSH Senior Capital Projects Manager, WSH's existing patient population is approximately 840 people. The WSH *Master Plan 2020* projects that WSH's patient population will reach 1,190 people at build-out. Build-out is associated with the completion of the new Forensic Hospital, slated for completion in the next 5 years. Assuming a build-out year of 2029, this growth corresponds to a compound annual growth rate of approximately 7.2 percent. It is assumed that this build-out patient population will not increase beyond 2029 for the duration of the 20-year planning period.

Full-Time Employee Population

Per the correspondence dated March 22, 2024, WSH's existing full-time employee population is approximately 2,200 people. However, this is not to say 2,200 employees are served at one time.

As shown in **Table 3-2**, of these 2,200 employees, 1,364 (62 percent) are day shift employees, 418 (19 percent) are swing shift employees, 330 (15 percent) are night shift employees, and 88 (4 percent) are on-call. The maximum number of employees on the campus at once is 1,782, representing the overlap between the day shift and swing shift employees.

Table 3-2

2024 Full-Time Employee Staffing

Shift Type	Employees	% of Total
Day	1,364	62%
Swing	418	19%
Night	330	15%
On-Call	88	4%
Total	**2,200**	**100%**

The WSH *Master Plan 2020* projects that WSH's employee population will reach 2,700 people at build-out. Assuming a build-out year of 2029, this growth corresponds to a compound annual growth rate of approximately 4.2 percent. It is assumed that this build-out employee population will not increase beyond 2029 for the duration of the 20-year planning period, as reflected in **Table 3-3**.

Table 3-3

Existing and Projected Patient Population and Employee Population

Year	Patient	Employment
2024	840	2,200
2029 (Forensic Hospital Completion)	1,190	2,700
2034 (+10 Years)	1,190	2,700
2044 (+20 Years)	1,190	2,700

Legend

- Western State Hospital Campus Area
- Western State Hospital Water Service Area (Retail and Future)
- UGA Boundary

Future Land Use - Western State Hospital

- Open Space & Recreation (OSR)
- Public & Semi-Public Institutional (PI)
- Incorporated City
- Unincorporated Pierce County

City of University Place

City of Lakewood

Town of Steilacoom

OSR

PI

OSR

Puget Sound

Waughop Lake

Steilacoom Lake

Lake Louise

CHAMBERS CREEK RD W

STEILACOOM BLVD

STEILACOOM BLVD SW

88TH ST SW

104TH ST SW

MOUNT TAHOMA DR SW

INTERLAAKEN DR SW

ARDMORE DR SW

PHILLIPS RD SW

83RD AVE SW

HIPKINS RD SW

BUTTE DR SW

FARWEST DR SW

MILITARY RD SW

CUSTER RD SW

RISLEY RD

LAFAYETTE ST

MAIN ST

RAINIER ST

LEXINGTON ST

SEHQUALISH ST

STEVENS ST

ROE ST

MILITARY RD

UNION AVE

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Vicinity Map

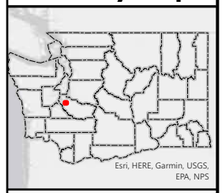


Figure 3-1
Future Land Use
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 700 Feet

0 350 700 1,400 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00688\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: LMOJARAB PLOT DATE: AUG 22, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

4 | WATER DEMANDS

INTRODUCTION

A detailed analysis of system demands is crucial to the planning efforts of a water supplier. A demand analysis first identifies current demands to determine if the existing system can effectively provide an adequate quantity of water to its customers under the most crucial conditions, in accordance with federal and state laws. A future demand analysis identifies projected demands to determine how much water will be needed to satisfy the water system's future growth and continue to meet federal and state laws.

The magnitude of water demands is typically based on three main factors: 1) population; 2) weather; and 3) water use classification. Population and weather have the two largest impacts on water system demands. Patient and employee population growth at Western State Hospital (WSH) tends to increase the annual demand, whereas high temperatures tend to increase the demand over a short period of time. Population does not solely determine demand because different user types use varying amounts of water. Typically, the use varies based on the number of users in each customer class, land use density, and irrigation practices. Water use efficiency efforts also impact demands and can be used to accommodate a portion of the system's growth without increasing a system's supply capacity.

Demands on the water system determine the size of storage reservoirs, supply facilities, water mains, and treatment facilities. Several different types of demands were analyzed and are addressed in this chapter, including average day demand (ADD), maximum day demand (MDD), peak hour demand (PHD), fire flow demand, future demands, and a demand reduction forecast based on the Water Use Efficiency (WUE) Program.

Certificate of Water Availability

In accordance with the requirements of the Growth Management Act (GMA), WSH must identify that water is available prior to issuing a building permit. The requirement for providing evidence of an adequate water supply was codified in 1990 under Revised Code of Washington (RCW) 19.27.097 in the Building Code section.

CURRENT POPULATION AND SERVICE CONNECTIONS

Patient and Employee Population Served

The existing patient population is limited to the number of available beds at WSH. The existing patient population is approximately 840 people. The existing employee population is approximately 2,200 people, though on campus at one time, there may be a maximum of 1,782 employees as described in **Chapter 3**.

EXISTING WATER DEMANDS

Water Use Classifications

The WSH water system supplies the patient population, employee population, and irrigation services. However, the consumption for each of these classifications currently is not metered.

Water Supply

Water supply, or production, is the total amount of water supplied to the system, as measured by the meters at source of supply facilities. Water supply is different than water consumption in that water supply is the recorded amount of water put into the system and water consumption is the recorded amount of water taken out of the system. The measured amount of water supply of any system is typically larger than the measured amount of water consumption, due to non-metered water use and water loss (i.e., distribution system leakage), which will be described more in the **Water Consumption and Distribution System Leakage** section of this chapter.

Table 4-1 summarizes the total amount of water supplied to WSH from 2006 to 2023. It should be noted that data for 2007, 2008, 2013, 2014, 2018, 2021, and 2023 were the only years for which complete data sets of well pump and intertie supply were available.

Table 4-1

Historical Water Supply

Year	Annual Supply (gallons)	ADD (gpm)	ADD (gpd)
2006	48,249,012	92	132,189
2007*	64,446,376	123	176,565
2008*	61,194,600	116	167,198
2009	62,492,436	119	171,212
2010	35,120,668	67	96,221
2011	43,695,100	83	119,713
2012	52,886,831	100	144,500
2013*	53,935,711	103	147,769
2014*	50,562,413	96	138,527
2015	157,719,435	300	432,108
2016	57,583,264	109	157,331
2017	66,966,234	127	183,469
2018*	69,597,742	132	190,679
2019	10,848,496	21	29,722
2020	7,183,381	14	19,627
2021*	57,852,673	110	158,500
2022	48,376,125	92	132,537
2023*	67,032,315	128	183,650

* = Years where complete data sets were available.

gpm = gallons per minute

gpd = gallons per day

WSH is required to prepare and submit a Water Use Efficiency (WUE) Report to DOH annually. The water supply totals provided in the historical reports are shown in **Table 4-2**. These values are generally higher than the data from the well logs in the earlier years shown in **Table 4-1**. Effort was made to confirm the source of the data in the WUE Reports and to evaluate the inconsistencies between the supply data in the two tables. Because this effort was inconclusive and the data compiled to develop **Table 4-1** was generally more detailed, the WUE Report data in **Table 4-2** was not utilized for any analyses in this Water System Plan. It is recommended that DSHS confirm the source and accuracy of both sets of data to ensure appropriate future water system planning.

Table 4-2

Historical Water Supply – WUE Reports

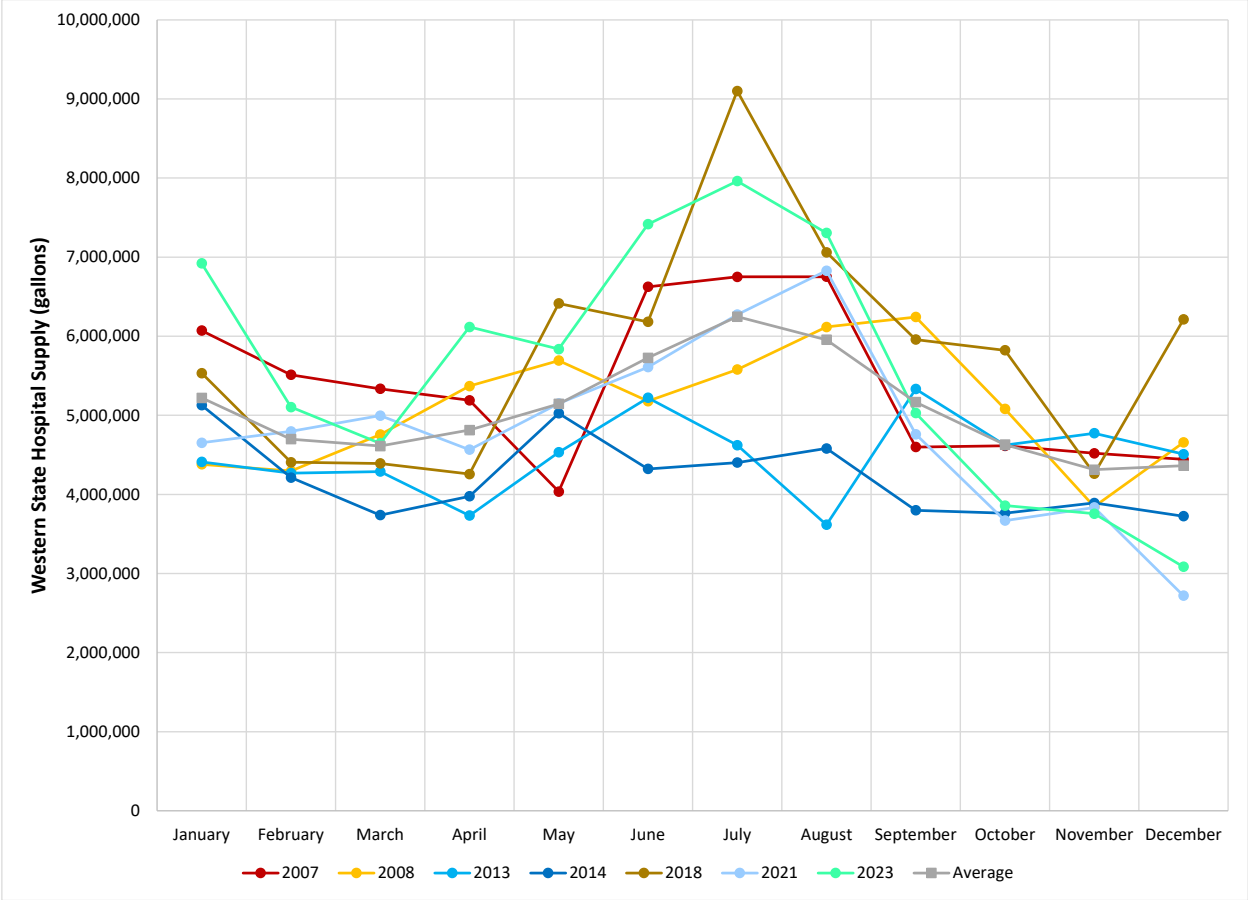
Year	Total Supply (gallons)	ADD (gpm)	ADD (gpd)
2012	70,000,000	133	191,257
2013	73,000,000	139	200,000
2014	54,750,000	104	150,000
2015	73,000,000	139	200,000
2016	73,000,000	139	199,454
2017	73,000,000	139	200,000
2018	69,589,742	132	190,657
2019	69,589,742	132	190,657
2020*	--	--	--
2021	53,101,269	101	145,483
2022	46,076,481	88	126,237
2023	50,864,816	97	139,356

* = Water supply was not provided on the 2020 WUE Report.

Like most other water systems, WSH's water use varies seasonally. **Chart 4-1** shows the historical amount of water supplied to WSH's system for each month of the years where complete data sets were available.

Chart 4-1

Historical Monthly Water Supply for Select Years



As shown in **Chart 4-1**, water supply increases significantly during summer months, primarily due to irrigation. WSH's highest water use typically occurs in July and August.

Chart 4-2 shows the average monthly water supply by source for the base year 2023. **Chart 4-3** shows the annual water supply by source for select years where complete data sets were available. As shown in **Chart 4-2** and **Chart 4-3**, WSH's groundwater sources currently can provide the required supply, except during emergency situations where the Lakewood Water District (LWD) intertie is utilized to provide supply when WSH's groundwater sources are unavailable. In August of 2023 the water main from the Farm Well had a leak and the LWD Intertie was briefly utilized as repairs were performed.

Chart 4-2 also illustrates the East Campus Well being taken offline in July 2023 due to per- and polyfluoroalkyl substances (PFAS) detection in this water source. **Chart 4-3** additionally shows the use of the LWD intertie as a major source of water supply in 2021 when both wells were taken offline due to *E. coli* detections in the water supply. These wells have since been equipped with a temporary chlorination system.

Chart 4-2

2023 Average Monthly Water Supply

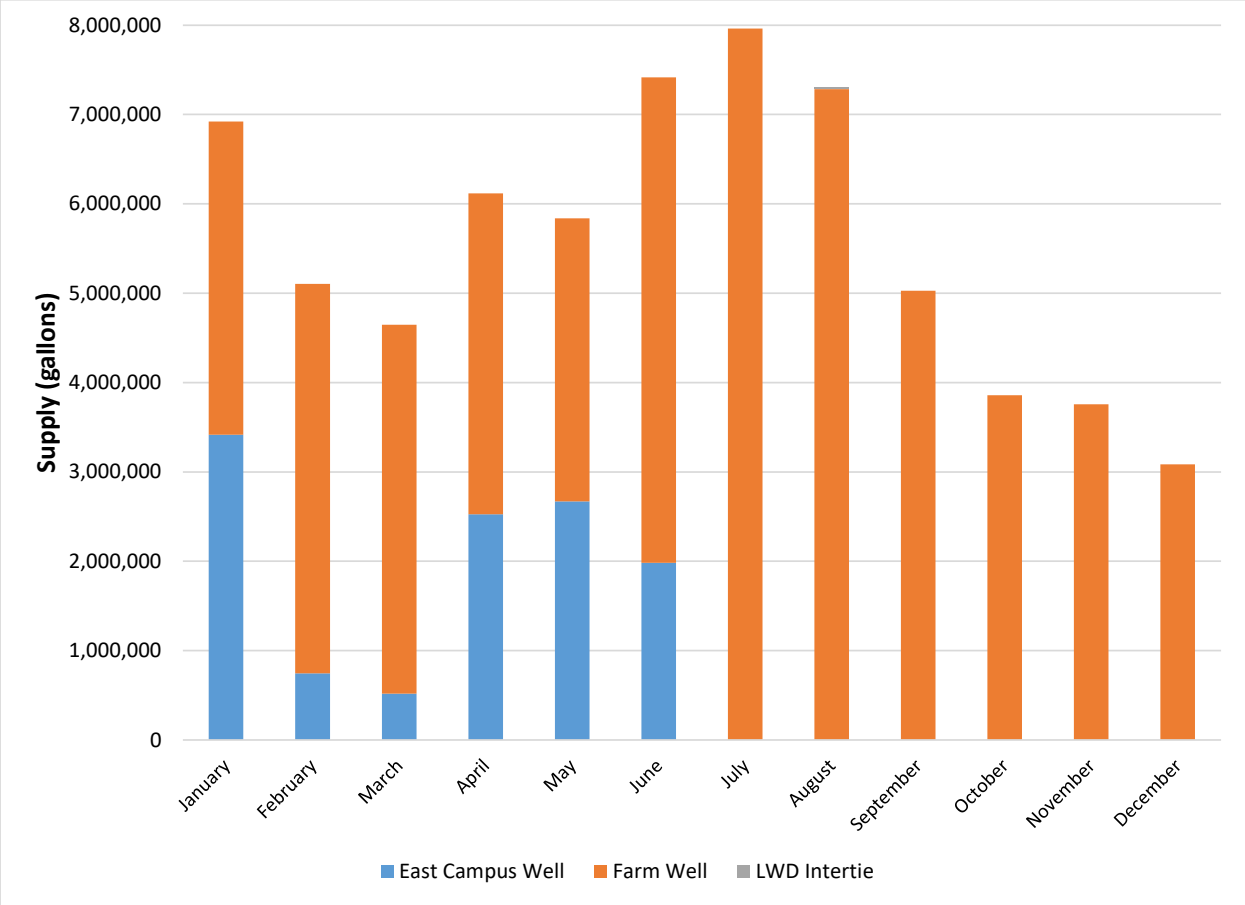
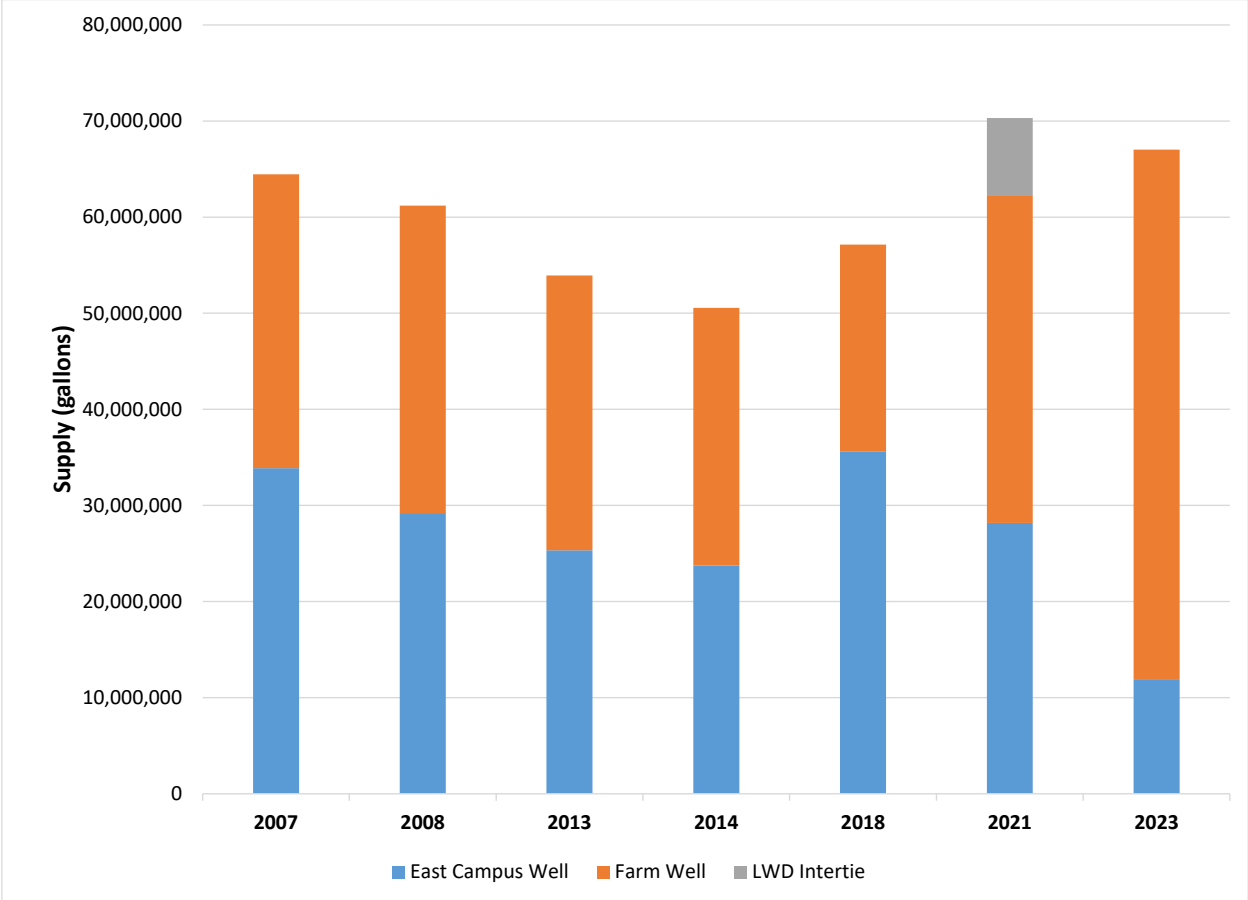


Chart 4-3

Annual Water Supply by Source for Select Years



Water Consumption and Distribution System Leakage

Water consumption is the amount of water used by all customers of the system as measured by the customer's meters (if meter readings are available). Though a number of buildings on WSH's campus are equipped with water meters, not every building or irrigation connection is metered and WSH does not track or maintain the meters that are installed, meaning any data collected is unreliable. As such, consumption data is not available. For the purpose of this Water System Plan (WSP), consumption is equal to supply.

For systems that are fully metered, the difference between the amount of water supply and water consumption is the amount of distribution system leakage (DSL). There are many sources of DSL in a typical water system, including water system leaks, inaccurate supply metering, inaccurate customer metering, illegal water system connections or water use, fire hydrant usage, water main flushing, and malfunctioning telemetry and control equipment resulting in reservoir overflows. Several of these types of usages, such as water main flushing and fire hydrant usage, may be considered authorized uses if they are tracked and estimated. Although real losses from the distribution system, such as reservoir overflows and leaking water mains,

should be tracked for accounting purposes, these losses must be considered leakage. The WUE Rule establishes a DSL standard of 10 percent or less based on a rolling 3-year average.

Because WSH does not have service meters on all connections, it is not possible to directly calculate DSL. As described in **Chapter 9**, DSHS must install service meters on all connections to the distribution system to become compliant with WAC 246-290-496 and enable the system to calculate DSL.

Per Capita Demand

Although usage between the three water use classifications is effectively not metered, the proportion of the water use for each classification may be approximated using the Washington State Department of Health's (DOH) *Water System Design Manual*. Per the *Water System Design Manual* (WSDM), planning-level water demands can be approximated for hospitals by assuming 400 gpd per bed. For employees, 15 gpd per person per shift, and for irrigation, 180 gpd per 1,000 square feet of irrigated land. **Table 4-3** presents the DOH guide for nonresidential water demand and how it applies to WSH. Per this methodology, it is estimated that patients require 14.3 percent of the total water demands, employees require 5.6 percent, and irrigation requires 80.0 percent. These proportions of usage were applied to the WSH average annual demand to estimate the per capita usage between patients and employees.

Table 4-3

Estimated Proportion of Water Usage per DOH Water System Design Manual

Description	Quantity	DOH WSDM[1] Unit Demand	Estimated Calc'd Usage (gallons)	Estimated % Usage
2023 Patient Population	840	400 gpd/bed	122,640,000	14.3%
2023 Employee Population	2,200	15 gpd/person/shift	48,180,000	5.6%
2023 Irrigated Area (sq ft)[2]	10,409,928	180 gpd per 1,000 sq ft	683,932,277	80.0%
Total Usage per WSDM			**854,752,277**	**100.0%**

[1] = Water System Design Manual

[2] = Total irrigated area is estimated by subtracting the total impervious area per the *2020 Master Plan* from the total area of the RWSA.

Table 4-4 presents the computation of the existing system per capita demand based on 2023 population data, 2023 annual consumption, and the proportional usage as determined in **Table 4-3**. For this computation, irrigation was allocated proportionally to the patient and employee consumption based on their proportion of domestic (non-irrigation) demand, 71.8 percent and 28.2 percent, respectively.

As shown in the upper portion of **Table 4-4**, the patient population served by WSH's water system in 2023 was approximately 840. This total population and 71.8 percent (the proportion of consumption and irrigation allocated to patients) of the 2023 annual consumption were used to arrive at the existing per capita demand of 157 gpd. The total employee population in 2023 was 2,200. This total population and 28.2 percent (the proportion of consumption and

irrigation allocated to employees) of the 2023 annual consumption were used to arrive at the existing per capita demand of 24 gpd.

Table 4-4

Existing Per Capita Demand

2023 Patient Population	840
Average Annual Patient Consumption (gal)	48,125,764
Existing Patient Per Capita Demand (gpcd)	**157**
2023 Employee Population	2,200
Average Annual Employee Consumption (gal)	18,906,550
Existing Employee Per Capita Demand (gpcd)	**24**

gpcd = gallons per capita per day

Because the type of existing water users is consistent with expectations for the future development of the water system and WSH does not anticipate future growth beyond the construction of the new forensic hospital, no adjustments are necessary to the per capita demand estimates for future customers. Often, future per capita demands are adjusted to account for large industrial or other types of customers that are not considered representative of future users. However, for WSH, the existing 157 gpd per patient and 24 gpd per employee were assumed to be representative of the future per capita demand. This number is used later in this chapter to forecast water demands in future years based on future population estimates.

Pressure Zone Demand

WSH has only one pressure zone as described in **Chapter 2** of this WSP. As such, the pressure zone demand is equal to the system demand described in this chapter.

Peak Demands

Average Day Demand

ADD is the total amount of water delivered to the system in a year divided by the number of days in the year. The ADD is determined from the historical water use patterns of the system and can be used to project future demands within the system. Water production records from WSH's well sources and LWD sources were reviewed to determine the system's ADD. The system's ADD from 2016 through 2023 is shown in **Table 4-1**.

Maximum Day Demand

MDD is the maximum amount of water used throughout the system during a 24-hour time period of a given year. MDD typically occurs on a hot summer day when irrigation is occurring throughout much of the system. In accordance with Washington Administrative Code (WAC) 246-290-230, the distribution system shall provide fire flow at a minimum pressure of 20 pounds per square inch (psi) during MDD conditions. Supply facilities (wells, springs, pump

stations, interties, etc.) typically are designed to supply water at a rate that is equal to or greater than the system's MDD.

MDD typically is determined from the combined flow of water into the system from all supply sources and reservoirs on the maximum day. Daily supply rates from WSH's sources were not available for this water system planning effort. Therefore, the system's MDD could not be computed based on actual system data. Instead, Appendix D.3 of the DOH *Water System Design Manual* was used to compute the system's MDD. This appendix of the *Water System Design Manual* correlates MDD to the maximum month ADD by a factor of 1.35 for systems serving greater than 1,000 people. The maximum month ADD of 178 gpm, calculated with the maximum month total supply for 2023, occurred in July. Multiplied by 1.35, this resulted in an estimated MDD of 241 gpm, as shown in **Table 4-5**.

Table 4-5

Peak Demands and Peaking Factors

Demand Type	Demand (gpm)	Demand (gpd)
ADD	128	183,650
MDD[1]	241	346,671
PHD	498	716,960
Peaking Factors		
MDD/ADD	1.89	
PHD/MDD	2.07	
PHD/ADD	3.90	

[1] = MDD is approximated with 1.35 times the maximum month ADD. The 2023 maximum month ADD was found to equal 178 gpm during the month of July.

Peak Hour Demand

PHD is the maximum amount of water used throughout the system, excluding fire flow, during a 1-hour time period of a given year. In accordance with WAC 246-290-230, new public water systems or additions to existing systems shall be designed to provide domestic water at a minimum pressure of 30 psi during PHD conditions. Equalizing storage requirements typically are based on PHD data.

The PHD, like the MDD, typically is determined from the combined flow of water into the system from all supply sources and reservoirs. Hourly water production records and chart recordings of reservoir levels are not available for WSH's storage facilities, or WSH's supply sources. Therefore, the system's PHD could not be computed based on actual system data. Instead, a modified version of Equation 3-1 in the DOH *Water System Design Manual* was used to compute the system's PHD. Though Equation 3-1 is written in terms of equivalent residence units (ERUs), due to the unique nature of this water system, DOH has recommended utilizing connections in lieu of ERUs. Per DOH Water Facility Inventory calculations, WSH currently utilizes 572 connections out of the total 610 approved connections. Using Equation 3-1 with the

assumption that one connection was equivalent to one ERU, this resulted in an estimated PHD of 498 gpm, as shown in **Table 4-5**.

DOH Equation 3-1

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

Where:

PHD = Peak hourly demand in gpm;

C = Coefficient associated with ranges of equivalent residential units (ERUs);

N = Number of ERUs based on MDD;

F = Factor associated with ranges of ERUs; and

ERU_{MDD} = MDD per ERU (gpd).

Fire Flow Demand

Fire flow demand is the amount of water required during firefighting as defined by applicable codes. Fire flow requirements are established for individual buildings and expressed in terms of flow rate (gpm) and flow duration (hours). Fighting fires imposes the greatest demand on the water system because a large volume of water must be supplied over a short period of time, requiring each component of the system to be properly sized and configured to operate at its optimal condition. Adequate storage and supply cannot effectively support the water system if the transmission or distribution system cannot deliver water at the required rate and pressure necessary to extinguish a fire.

For the purposes of the construction of the new forensic hospital and administration building, KPFF Inc., calculated fire flow requirements for individual buildings on the west side of the WSH campus based on the building size, construction type, and fire suppression system provided, all in accordance with International Fire Code standards. These fire flow requirements were subsequently reviewed by West Pierce Fire and Rescue. The calculated fire flow requirements will be used to provide a target level of service for planning and sizing future water facilities on the WSH campus in the vicinity of the respective buildings. These calculations may be seen in **Appendix E.**

For other buildings where KPFF did not calculate the required fire flow, actual fire flow requirements were not available. Therefore, a general planning-level fire flow requirement was established based on similar requirements stated in the LWD *2020 Comprehensive Water Plan.* For Public and Semi-Public Institutional facilities, the LWD *2020 Comprehensive Water Plan* states a planning-level fire flow requirement of 3,500 gpm for 3 hours. This planning-level fire flow requirement will be used to provide a target level of service for planning and sizing future water facilities on the WSH campus. The calculated and planning-level fire flow requirements throughout the distribution system are summarized in **Table 4-6**.

Table 4-6

Calculated and Planning-Level Fire Flow Requirements

Building Number	Fire Flow (gpm)
1	2,500
2	2,000
3	2,250
4	2,000
5	2,500
6	2,500
8	3,500
9	2,000
10	1,000
16	4,000
17	2,000
18	2,000
19	2,000
20	2,000
27	1,625
32	2,000
33	1,750
34	1,750
35	2,750
36	1,500
New Forensic Hospital	1,500
New Administration Building	1,188
Other	3,500

The water system analyses presented in **Chapter 7** are based on an evaluation of the water system to provide sufficient fire flow in accordance with these calculated and general planning-level fire flow requirements.

FUTURE WATER DEMANDS

Basis for Projecting Demands

Future demands were calculated using the results of the existing per capita demand computations shown in **Table 4-4**, and the projected patient and employment population data from **Chapter 3**. Future demand projections were computed with and without water savings expected from implementing WUE measures contained in WSH's WUE Program in **Appendix D**.

Demand Forecasts and Water Use Efficiency

Table 4-7 presents the existing and projected water demand forecast for WSH's water system. The actual demand data from 2023 also is shown for comparison purposes. Future ADDs were projected based on patient and employee population estimates for the given years and the estimated demand per capita. The future MDDs and PHDs shown were computed from the projected ADDs and the existing system peaking factors shown in **Table 4-5**. The future demand projections also are shown with and without estimated reductions in water use from achieving WUE goals. WSH's current WUE goal is to reduce DSL by 1 percent each year. As discussed earlier in this chapter, DSL is not able to be calculated. For the purposes of this WSP, the DSL standard of 10 percent was assumed for WSH. Therefore, the estimated reductions are based upon reducing 10 percent of the ADD by 1 percent each year.

Table 4-7

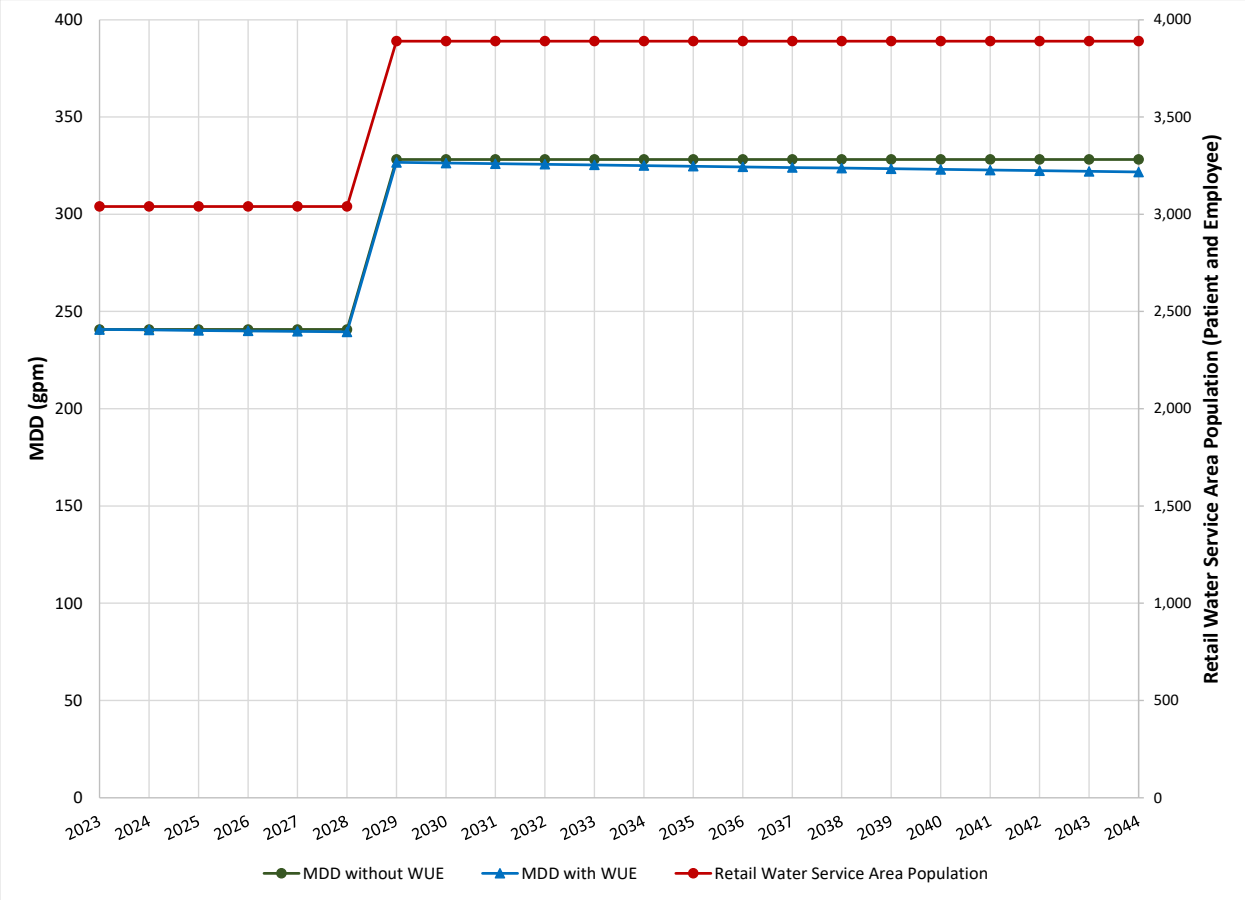
Future Water Demand Projections

Description	Existing	Projected											
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034 (+10 Years)	2044 (+20 Years)
Retail Water Service Area Patient Population	840	840	840	840	840	840	1,190	1,190	1,190	1,190	1,190	1,190	1,190
Patient Increase from Base Year	--	0	0	0	0	0	350	350	350	350	350	350	350
Retail Water Service Area Employee Population	2,200	2,200	2,200	2,200	2,200	2,200	2,700	2,700	2,700	2,700	2,700	2,700	2,700
Employee Increase from Base Year	--	0	0	0	0	0	500	500	500	500	500	500	500
Demand Basis Data (gpcd)													
Patient Population ADD	157	157	157	157	157	157	157	157	157	157	157	157	157
Employee Population ADD	24	24	24	24	24	24	24	24	24	24	24	24	24
ADD (gpm)													
Demand without WUE	128	128	128	128	128	128	174	174	174	174	174	174	174
Demand with WUE	--	127	127	127	127	127	173	173	173	173	173	172	170
MDD (gpm)													
Demand without WUE	241	241	241	241	241	241	328	328	328	328	328	328	328
Demand with WUE	--	241	240	240	240	240	327	326	326	326	326	325	322
PHD (gpm)													
Demand without WUE	498	498	498	498	498	498	679	679	679	679	679	679	679
Demand with WUE	--	497	497	496	496	495	676	675	674	674	674	672	665

The analysis and evaluation of the existing water system with proposed improvements, as presented in **Chapters 7** and **9**, is based on the 2044 projected demand data without WUE reductions. This ensures that the future system will be sized properly to meet requirements, whether or not additional water use reductions are achieved. However, WSH will continue to pursue reductions in water use by implementing the WUE Program contained in **Appendix D**. The projected MDD from **Table 4-7** is shown graphically in **Chart 4-4**. **Chart 4-4** will be used in **Chapter 7** to compare demand projections with source of supply availability.

Chart 4-4

Future Water Demand and Population Projections



5 | POLICIES AND DESIGN CRITERIA

INTRODUCTION

Under the Washington State Department of Social and Health Services (DSHS), Western State Hospital (WSH) operates and plans water service for its consumers according to the design criteria, laws, and policies that originate from the seven agencies shown in **Table 5-1**. The agencies are listed from those with the broadest to narrowest authority.

Table 5-1

Regulatory Agencies

Agency	Design Criteria/Laws/Policies
U.S. Department of Health and Human Services	Federal Regulations
U.S. Environmental Protection Agency	Federal Regulations
Washington State Department of Ecology	State Regulations
Washington State Department of Health	State Regulations
Washington State Department of Social and Health Services	State Regulations
Pierce County	County Regulations
American Water Works Association	Design Criteria

These laws, design criteria, and policies guide WSH's operation and maintenance of the water system and its planning for growth and improvements. The agencies' overall objective is to ensure that WSH provides high-quality water service to its customers. The seven agencies also set the standards WSH must meet to ensure the water supply is adequate to meet existing and future water demands. The water system's ability to meet these demands is detailed in **Chapter 7**, and the recommended system improvements are identified in **Chapter 9**.

The highest governmental entities establishing policies and laws – the U.S. Government, Washington State, and Pierce County Council – establish requirements in statutes, regulations, or ordinances. DSHS adopts regulations and policies that cannot be less stringent or in conflict with those established by governments above them. The policies take the form of bylaws, policies, standards, memoranda, and operational procedures, many of which are summarized in this chapter.

The policies associated with the following categories are presented in this chapter.

- Supply
- Customer Service
- Facilities
- Organizational

SUPPLY POLICIES

Quality Protection

- WSH will pursue steps to meet or exceed water quality laws and standards.
- WSH will take reasonable measures to protect its system and customers.

Cross-Connection Control

- WSH has a responsibility to protect the water system from contamination due to cross-connections. Cross-connections that can be eliminated will be eliminated. Cross-connections that cannot be eliminated must be controlled by an approved air gap or backflow preventer that is commensurate with the assessed degree of hazard.
- WSH currently contracts the management of its water system to Northwest Water Systems, Inc., which includes cross-connection control services and water quality sample collections.
- WSH has a cross-connection control program for eliminating cross connections. A copy of WSH's Cross-Connection Control Program is contained in **Appendix F**.
- Certified backflow prevention and inspection is completed annually.
- WSH will comply with the backflow prevention assembly installation and testing requirements as indicated in Washington Administrative Code (WAC) 246-290-490, and as published in the Pacific Northwest Section of the American Water Works Association (AWWA) *Cross-Connection Control Manual Accepted Procedure and Practice*.

Quantity

- WSH will plan for at least a 20-year projected use of its supply sources so that potential future water resource limitations can be handled effectively.
- WSH will ensure the capacity of the system, including its supply facilities, storage, and transmission mains, is sufficient to meet the peak day demands of the system.

Fire Flow

- Required fire flow for individual western campus buildings was previously calculated based on the 2018 International Fire Code by KPFF, Inc., as part of the future system hospital design. The calculated fire flow can be found in **Appendix G**.
- For all other buildings where individual fire flow requirements were not calculated by KPFF, Inc., WSH will plan to provide a minimum fire flow of 3,500 gallons per minute (gpm) for a 3-hour duration while maintaining a minimum residual pressure of 20 pounds per square inch (psi) at all points throughout the distribution system and a maximum allowable water main velocity of 8 feet per second (fps). This planning-level fire flow requirement will be used to provide a target level of service for planning and sizing future water facilities on the WSH campus.

Water Use Efficiency

- WSH has and will continue to promote the efficient and responsible use of water and will conserve water.
- Water use efficiency goals will be evaluated and reported annually and updated at least every 10 years as part of the Water System Plan (WSP) update.
- WSH's Water Use Efficiency (WUE) Program (**Appendix E)** describes its current program.
- WSH's WUE goals will be consistent with those identified in the Pierce County *Coordinated Water System Plan* (CWSP).

Regional Participation

- WSH will begin to participate in the efforts of the Pierce County Water Utility Coordinating Committee to engage in regional supply management and planning activities to protect the environment, increase reliability, improve water quality, and secure needed water quantities.

CUSTOMER SERVICE POLICIES

Water Service and Connection

- WSH will strive to provide potable water service to the people served within WSH's retail water service area (RWSA), provided policies related to service can be met.
- Proposed developments within WSH's RWSA shall connect directly to WSH's water system, unless deemed unfeasible by WSH at the time of the request.
- Water system extensions required to provide water service to proposed developments shall be approved by WSH and must conform to WSH's adopted design criteria, construction standards, and specifications.
- Water service can be extended within the RWSA if the project is in compliance with WSH's utility standards and policies, WSP, water rights, Pierce County's adopted land use plan, and zoning and development regulations.
- WSH has the duty to serve all customers within the RWSA if all of the following conditions can be met:
    - WSH has sufficient capacity to serve water in a safe and reliable manner.
    - The applicant is in compliance with all applicable local plans, development regulations, and utility standards and policies.
    - Sufficient water rights and supply are available.
    - WSH can provide such service in a timely and reasonable manner.
- For water service applications, WSH will review the availability for water service during land use permitting, site civil review, and building permit review. During the land use permitting process, WSH will determine if water is available for the project in accordance with the adopted protocols in the WSP. During the site civil review, WSH will

address the sizing, looping of the water main, cross-connection control, and metering needs. The formal water service application begins at the time of building permit application when fire flow and service sizing is evaluated. The complete process takes several months to complete.

- Water system capacity, pressure, and fire flow will be evaluated at the time of the water service application. WSH will use the capacity analysis contained in **Chapter 7** to evaluate sources of supply, treatment, storage, distribution system, and water rights capacity available to the applicant.
- The Certificate of Water Service Availability shall expire at the time that the associated permit expires (i.e., land use, site civil, or building permit).
- Time extensions in regard to the Certificate of Water Service Availability shall be granted in accordance with the associated permit requirements. When extensions are denied, the disputes are handled through the rules guiding the associated permit process. Disputes can be brought to WSH for discussion and resolution.
- Individual wells may be installed on existing lots of record within WSH's RWSA if WSH determines it is unfeasible to provide direct connection to the water system at the time of the request. This option is strictly limited to individual cases where timely and reasonable service is not possible. Owners of individual wells will be required to connect to WSH's water system at the time WSH water becomes available.

Temporary Services

- No temporary service is allowed, unless there are plans for timely permanent water service that meet WSH standards. All temporary services will be evaluated by WSH.

Emergency Service

- Compliance with standards may be temporarily deferred for emergency water service.
- Policy criteria may be temporarily waived for emergency service.

Planning Boundaries

- WSH's RWSA and existing and future water service areas will be designated in the current WSP and will be consistent with the CWSP.
- WSH will follow State of Washington guidelines in assuming portions of adjacent water systems as a result of annexation.

FACILITY POLICIES

This section describes the planning criteria and policies used to establish an acceptable hydraulic behavior level and a standard of quality for the water system. Additional criteria are contained in WSH's Design and Construction Standards and Specifications, a copy of which is included in **Appendix H**.

Minimum Standards

- Proposed development within WSH's existing and future RWSA shall conform to WSH's adopted design criteria, construction standards, and specifications, in addition to the requirements of governmental agencies.

Pressure

- WSH will endeavor to maintain a maximum pressure of 120 psi in the water mains during normal demand conditions. Individual building connections are responsible for reducing water pressures over 80 psi.
- WSH will endeavor to maintain a minimum pressure of 40 psi at customer meters during normal demand conditions, excluding a fire or emergency.
- WSH will endeavor to maintain a minimum pressure of 30 psi at customer meters during peak and all other demand conditions, excluding a fire or emergency.
- During fire conditions, WSH will endeavor to maintain a minimum pressure of 20 psi at customer meters and throughout the remainder of the system.
- During a failure of any part of the system, the maximum pressure will not exceed 150 psi.

Velocities

- During normal demand conditions, WSH will ensure the velocity of water in a water main is less than 5 fps.
- During emergency conditions such as a fire, and for design purposes, WSH will endeavor to ensure the velocity of water in a water main does not exceed 8 fps.

Storage

- Storage within the distribution system must be of sufficient capacity to supplement supply when system demands are greater than the supply capacity (equalizing storage) and still maintain sufficient storage for proper pump operation (operational storage), fire suppression (fire flow storage), and other emergency conditions (standby storage).
- Gravity standby storage must be located above an elevation that yields a 20 psi service pressure to the highest service in the pressure zone under peak hour demand conditions.
- Gravity fire flow storage must be located above an elevation that yields a 20 psi service pressure to all services in the pressure zone under maximum day demand conditions.
- WSH will provide sufficient standby storage for an emergency condition in which a major supply source is out of service. The volume of storage will be sufficient to maintain uninterrupted supply to the system during an emergency condition.
- WSH will provide sufficient storage for a fire condition equal to the system's maximum fire protection water demand and the required duration.

- WSH will have high water level and low water level alarms for storage facilities.
- Storage facilities will be located in areas where they will satisfy the following requirements:
    - Minimize fluctuations in system pressure during normal demands.
    - Maximize the use of storage facilities during peak demands.
    - Improve the reliability of supply to WSH.

Transmission and Distribution

- Unless deemed impractical by WSH, transmission and distribution mains will be looped to increase reliability and fire flow capacity and to decrease headlosses.
- Mains will comply with the generally recognized design criteria from the AWWA and the Washington State Department of Health.
- New construction will be in accordance with WSH's Design and Construction Standards and Specifications (**Appendix H**).
- Distribution system designs will be engineered such that adequately sized service lines will be used. Residential service lines will be 1 inch or larger. Service lines will be the same size as the meter or larger.
- The minimum diameter of distribution mains providing fire flow will be 12 inches. New water mains will be ductile iron pipe. WSH may consider other piping materials for specialized applications on a case-by-case basis.
- New distribution main design will utilize a hydraulic analysis to assist in determining water main size.
- New mains providing fire flow will be sized to provide the required fire flow at a minimum residual pressure of 20 psi during maximum day demand conditions, while maintaining a maximum pipeline velocity of less than 8 fps.
- Valve installations will satisfy the following criteria:
    - WSH has one pressure zone. In the event a pressure zone reconfiguration occurs, zone valves will be located at all pressure zone boundaries to allow future pressure zone realignment without the need for additional pipe construction.
    - Isolation valves typically will be installed in the lines to allow individual pipelines to be shut down for repair or installation services. Unless it is impractical to do so, the distance between in-line isolation valves shall not exceed 600 feet. A minimum of two valves shall be provided per cross and one valve per tee.
    - Air/vacuum release valves will be placed at all high points, or "crowns," in all pipelines and must have WSH approval prior to installation.
    - Blow-off assemblies shall be located at main dead ends where there is no fire hydrant. Blow-off assemblies shall have valves the same size as the main with concrete thrust blocking.
    - Individual pressure reducing or check valves will be installed on new customer service lines in WSH. Pressure reducing valves protect customers from high

pressures in case a mainline pressure reducing station or pump station operational control fails. Check valves prevent hot water tanks from emptying into WSH's distribution system when a nearby water main is empty or when the pressure in the main is less than the pressure in the tank, and prevent contamination of the system mains by possible cross connections in the building's pipes or fixtures.

- The local fire authority will review proposed fire hydrant installations to ensure the correct number and spacing of fire hydrants for each project per standards.

Supply and Booster Pump Stations

- Existing and future booster pump stations will be modified and constructed to comply with the following minimum standards:
  - Structures will be designed to minimize combustibility, where practical.
  - Buildings will have adequate heating, cooling, ventilation, insulation, lighting, and work spaces necessary for on-site operation and repair.
  - Sites will be fenced to improve security, reduce vandalism, and reduce the potential for WSH liability.
  - Each station will be equipped with a flow meter and all necessary instrumentation to assist personnel in operating and troubleshooting the facility.
  - Emergency power capability will be provided at all supply and booster pump stations.
  - Pumps will be operated automatically, with flexibility in pump start/stop settings.
  - Booster pump stations will be operated with the provision for at least two methods of control to minimize system vulnerability.
  - Manual override of stations will be provided locally at stations.
- Booster pump stations will be monitored with alarms for the following conditions:
  - Pump started automatically or manually.
  - Power phase failure.
  - Communication failure.
  - Low suction pressure.
  - High and low discharge pressure.
- Stations will have local flow indication and totalizing indicators.
- Booster pump stations will be placed wherever necessary to fulfill the following criteria:
  - Provide supply redundancy to a pressure zone.
  - Improve the hydraulic characteristics of a pressure zone.
  - Maximize storage availability and transmission capacity.
  - Improve water quality (i.e., increase circulation) and quantity.

Pressure Reducing Stations

- Pressure reducing valves will be placed in vaults that are large enough to provide ample workspace for field inspection and valve repair.
- Vaults will be provided with adequate drainage to prevent water accumulation and equipped with sump pumps to prevent vault flooding or pumped of excess water annually.
- Pressure relief valves may be provided on the low pressure side of the pressure reducing valves to prevent the system from over pressurizing in case of a pressure reducing valve failure.

Control

- WSH's monitoring system must be capable of efficiently operating the water system's components in accordance with this WSP and in response to reservoir levels, system pressures, and abnormal system conditions.

Maintenance

- Facility and equipment breakdowns are given the highest maintenance priority. Emergency repairs are to be made even if overtime labor is involved.
- Equipment will be scheduled for replacement when it becomes obsolete and as funding is available.
- Worn parts will be repaired, replaced, or rebuilt before they represent a high failure probability.
- Spare parts will be stocked for all equipment items whose failure will impact the ability to meet other policy standards.
- Equipment that is out of service will be returned to service as soon as possible.
- A preventive maintenance schedule will be established for all facilities, equipment, and processes.
- Tools will be obtained and maintained to repair all items whose failure will impact the ability to meet other policy standards.
- Dry, heated shop space will be available for maintenance personnel to maintain facilities.
- Maintenance personnel will be trained to efficiently perform their job descriptions.
- Maintenance will be performed by the water maintenance staff or other approved staff and supervised by the Facility Manager.
- Written records and reports showing the operation and maintenance history will be maintained on each facility and item of equipment.

ORGANIZATIONAL POLICIES

Staffing

- Personnel certifications will meet or exceed Washington State standards.
- WSH will promote staff training.

6 | WATER SOURCE AND QUALITY

INTRODUCTION

The two basic objectives of a water system are to provide a sufficient quantity of water to meet customer usage demands and to provide high-quality water. **Chapter 7** discusses the Washington State Department of Social and Health Services, (DSHS) Western State Hospital (WSH) water system's ability to supply a sufficient quantity of water and identifies future source requirements. This chapter discusses WSH's existing water sources, water rights, water quality regulations, and water quality monitoring results.

EXISTING WATER SOURCES AND TREATMENT

Water Sources

WSH's municipal water supply currently is provided by two groundwater wells: the East Campus Well (S02), and the Farm Well (S05). There also is an emergency intertie that connects to Lakewood Water District (LWD).

East Campus Well

The East Campus Well is WSH's oldest active source. Due to the well's proximity to the WSH parking lot, the Washington State Department of Health (DOH) has identified this source as high susceptibility, requiring a chlorine contact time (CT) of 6 milligram-minutes per liter (mg-min/L). A down hole inspection report for the well was completed in 2022 and is included in **Appendix I**. The inspection was not able to confirm if the well meets the current sanitary seal requirements. DSHS implemented temporary chlorination at this site in 2023 but does not currently have the ability to maintain a CT of 6 mg-min/L. This source has been offline since higher than allowable concentrations of per- and polyfluoroalkyl substances (PFAS) were detected in 2023.

Farm Well

The Farm Well is located off campus approximately ¾ mile southeast of WSH and was originally untreated. This well supplies water directly to WSH's two reservoirs serving the distribution system. In 2023, DSHS implemented temporary chlorination at this site.

Lakewood Water District Intertie

There currently is one emergency intertie with LWD near 81st Street SW. This intertie is a source of emergency supply for WSH.

Water Treatment

Both well sites are equipped with temporary chlorination systems that inject a solution of 12.5-percent sodium hypochlorite into the source water. This provides an initial dose of 2.0 milligrams per liter (mg/L), resulting in at least a 0.5 mg/L free-chlorine residual throughout distribution to provide a disinfection barrier and mitigate against pathogens such as legionella and viruses. Both the East Campus Well and Farm Well sites have well houses that store the sodium hypochlorite solution in 30-gallon chemical drums where it is fed into the system. The chlorination systems were installed and are operational as of 2023.

WATER RIGHTS

Overview

A water right is a legal authorization to use a specified amount of public water for specific beneficial purposes. The water right amount is expressed in terms of instantaneous withdrawal rate and annual withdrawal volume. Washington State law requires users of public water to receive approval from the Washington State Department of Ecology (Ecology) prior to actual use of the water. This approval is granted in the form of a water right permit, which is developed into a certificate. However, a water right is not required for certain purposes (typically individual residences) that use 5,000 gallons per day or less of groundwater from a well.

The process of obtaining a water right involves submitting a water right application that is reviewed by Ecology. If the request is approved, a water right is issued to allow for water use to commence. A water right permit provides permission to construct the necessary wells or diversions, pumps, and pipes to start using water. The water right permit remains in effect until the permit holder determines that its project is complete, and they have used as much water as they will under the water right. At that time, the permit holder files a proof of appropriation form, which attests to the rate and volume of water used under the water right. A water right certificate is issued by Ecology following a proof of examination and determination that the amount of water put to beneficial use is consistent with the amount and conditions indicated on the water right permit.

A water right permit can only be issued by Ecology if the proposed use meets the following requirements:

- Water will be put to beneficial use.
- There will be no impairment to existing or senior rights.
- Water is physically and legally available for appropriation.
- Issuance of the requested water right will not be detrimental to the public interest.

During preparation of the report of examination (ROE), Ecology considers existing basin management plans, stream closures, minimum instream flows, hydraulic continuity (surface water interconnected to groundwater), utilization of existing water sources, water conservation, and availability of alternative water supplies, among other things. The water right

decision process is increasingly becoming more complex and time consuming due to the many competing interests for water, environmental issues, and regulatory requirements.

Existing Water Rights

DSHS currently utilizes 4 ground water rights for municipal supply of WSH: 2 certificates (Ground Water Certificate (GWC) 7602-A and GWC 7025-A) and 2 water right claims (G2-014863CL and G2-014864CL) that authorize the combined withdrawal of a maximum total of 2,650 gallons per minute (gpm) and 1,156 acre-feet per year (afy) (**Table 6-1**). The certificates authorize withdrawal of 1,400 gpm and 1,156 afy (24.3 afy additive and 1,131.7 afy non-additive) from Well No. 3 (East Campus Well). The claims authorize withdrawal of 1,250 gpm and 1,131.7 afy from the Farm Well.

Table 6-1

Water Right Summary

Water Right Number	Source	Instantaneous Rate (gpm)		Annual Volume (afy)	
		Additive	Non-Additive	Additive	Non-Additive
G2-014863CL	Farm Well	750	0	726.0	0
G2-014864CL	Farm Well	500	0	405.7	0
Subtotal Farm Well		*1,250*	-	*1,131.7*	-
GWC 7025-A	East Campus Well	900	0	24.3	701.7
GWC 7602-A	East Campus Well	500	0	0	430.0
Subtotal East Campus Well		*1,400*	-	*24.3*	*1,131.7*
Grand Total		**2,650**	**-**	**1,156.0**	**-**

All water rights are for municipal water supply purposes and can be used year-round.

Once this Water System Plan (WSP) is approved by DOH, the place of use of all four water rights will automatically be updated to be the service area as identified in this WSP.

Other water right claims associated with the WSH property, including G2-014865CL and G2-014866CL, are not discussed in this WSP since they currently are not being used by DSHS for municipal supply.

The water right history of each water right included in **Table 6-1** is described in the following sections, and the water right self-assessment and important water right documents are contained in **Appendix I**.

G2-014863CL

On June 26, 1972, Ecology received a water right claim filed by WSH. The claim identified the date of first use as approximately 1938, with the water used for year-round community domestic supply from Well No. 1 at an instantaneous rate of 900 gpm and an annual volume of 726 afy.

On February 27, 2024, Ecology received a water right change application from DSHS to change the point of withdrawal from Well No. 1 to the Farm Well. The water right change application was assigned tracking number CG2-014863CL. DSHS drilled and started to use the Farm Well as a replacement for Well No. 1 in 2003. This was a *de facto* change because a water right change application had not been processed to provide authorization.

On August 20, 2024, Ecology approved the water right change application through issuance of a final ROE. In the ROE, Ecology indicated that a certificate of change would be issued with the attributes identified in **Table 6-2**. Important water right documents are contained in **Appendix I**.

Table 6-2

Water Right Claim G2-014863CL Attributes

Attributes	Existing Information
Name	Washington State Department of Social and Health Services
Date of First Use	1938
Instantaneous Rate	750 gpm
Annual Volume	726 afy
Purpose of Use	Municipal
Period of Use	Continuous (Year Round)
Place of Use	Western State Hospital, Comprising the former U.S. Military Reserve in Sections 32 and 33, Township 20 North, Range 2 East W.M.; and Government Lots 2, 3, and 4 and the North 450 feet of Government Lots 5 (East) and 5 (West) in Section 4, Township 19 North, Range 2 East W.M. Less Roads
Source	Farm Well NW ¼ NE ¼ Section 4, Township 19 North, Range 2 East, W.M.

G2-014864CL

On June 26, 1972, Ecology received a water right claim filed by WSH. The claim identified the date of first use as approximately 1938, with the water used for year-round community domestic supply from Well No. 2 at an instantaneous rate of 500 gpm and an annual volume of 430 afy.

On February 27, 2004, Ecology received a water right change application from DSHS to change the point of withdrawal from Well No. 2 to the Farm Well. The water right change application was assigned tracking number CG2-014864CL. DSHS drilled and started to use the Farm Well as a replacement for Well No. 2 in 2003. This was a *de facto* change because a water right change application had not been processed to provide authorization.

On August 20, 2024, Ecology approved the water right change application through issuance of a final ROE. In the ROE, Ecology indicated that a certificate of change would be issued with the attributes identified in **Table 6-3**. Important water right documents are contained in **Appendix I**.

Table 6-3

Water Right Claim G2-014864CL Attributes

Attributes	Existing Information
Name	Washington State Department of Social and Health Services
Date of First Use	1938
Instantaneous Rate	500 gpm
Annual Volume	405.7 afy
Purpose of Use	Municipal
Period of Use	Continuous (Year Round)
Place of Use	Western State Hospital, Comprising the former U.S. Military Reserve in Sections 32 and 33, Township 20 North, Range 2 East W.M.; and Government Lots 2, 3, and 4 and the North 450 feet of Government Lots 5 (East) and 5 (West) in Section 4, Township 19 North, Range 2 East W.M. Less Roads
Source	Farm Well NW ¼ NE ¼ Section 4, Township 19 North, Range 2 East, W.M.

GWC 7025-A

On October 21, 1968, Washington State Department of Institutions applied for a water right for continuous domestic supply from a well (the same well that was already authorized under Ground Water Permit No. 8531) at a rate of 900 gpm. Ecology assigned the request Ground Water Application No. 9847.

The public notice for this application identified the well as being located within the Thomas M. Chambers D.L.C. No. 43, within former U.S. Military Reserve of Section 33, Township 20 North, Range 2 East W.M.

On April 2, 1969, Ecology issued a ROE approving an additional 900 gpm and 726 afy from Well No. 3 (now referred to as the East Campus Well) for year-round community domestic supply for WSH.

On May 14, 1969, Ecology issued Ground Water Permit No. 9115 authorizing the water right as identified in the ROE. The well was identified as being approximately 1,100 feet south and 1,140 feet west from the north quarter corner of Section 33, being within Thomas M. Chambers D.L.C. No. 43, within former U.S. Military Reserve of Section 33, Township 20 North, Range 2 East W.M.

On August 20, 1970, W.V. Connell, a representative from the Washington State Department of Institutions, filed a Proof of Appropriation of Water indicating that the well was capable of pumping 900 gpm under this water right.

On October 8, 1970, Ecology issued GWC 7025-A to the Washington State Department of Institutions.

On March 29, 2002, Ecology issued metering order DE 02WRSR-3828 to WSH. This metering order required that an approved measuring device (source meter) be installed and maintained for the well to record water use on a weekly basis. Water use data, including the total annual volume withdrawn and peak pumping rate for the year, in addition to monthly meter readings

and peak pumping rate during each month, was required to be submitted to Ecology annually by January 31st of the following year.

Mapping of the East Campus Well location in 2022 suggested that the East Campus Well was outside of the area identified as the point of withdrawal legal description in the public notice, ROE, permit, and certificate. This was likely due to an error in identifying the well's location. The well's true location was determined to be within Government Lot 8 (approximately NE ¼ NW ¼), Section 33, Township 20 North, Range 2 East, W.M.

On May 25, 2022, DSHS filed a letter with Ecology with the subject: Request for a Conforming Document on GWC 7602-A and GWC 7025-A and Ministerial Correction to Point of Withdrawal Location. The purpose of use was requested to be recognized as being for municipal water supply purposes and while issuing the superseding certificate, a request was made to correct the location of the East Campus Well at the same time.

On August 3, 2022, Ecology issued Superseding GWC 7025-A. This certificate was issued in response to the request to confirm the purpose of use to municipal and to correct the legal description for the East Campus Well. After issuance, it was discovered that there were some ministerial errors on the document.

On August 20, 2024, the relationship between the ground water certificates and older ground water claims, with respect to the annual volume authorized, was clarified in the final ROEs for change issued on the ground water claims. **Table 6-4** contains the attributes identified for this certificate based on the clarification in the recently issued ROEs for change. Important water right documents are contained in **Appendix I**.

Table 6-4

GWC 7025-A Attributes

Attributes	Existing Information
Name	Washington State Department of Institutions
Priority Date	October 21, 1968
Instantaneous Rate	900 gpm
Annual Volume	726 afy (24.3 afy additive; 701.7 afy non-additive)
Purpose of Use	Municipal
Period of Use	Continuous (Year Round)
Place of Use	The place of use of this water right is the service area described in the most recent Water System Plan for the Western State Hospital Water System approved by the Washington State Department of Health. RCW 90.03.386 may have the effect of revising the place of use of this water right if the criteria in section RCW 90.03.386(2) are met.
Source	East Campus Well NE 1/4 NW 1/4 Section 33, Township 20 North, Range 2 East, W.M.

RCW = Revised Code of Washington

GWC 7602-A (Superseded GWC 6928-A)

On March 7, 1968, State of Washington, Western State Hospital, Department of Institutions applied for a water right for continuous domestic supply from a well at a rate of 500 gpm and 400 afy. Ecology assigned the request Ground Water Application No. 9303.

The public notice for this application identified the well as being located within the Thomas M. Chambers D.L.C. No. 43, within former U.S. Military Reserve of Section 33, Township 20 North, Range 2 East W.M.

On May 15, 1968, Ecology issued a ROE approving 500 gpm and 430 afy for continuous community domestic supply for Western State Hospital.

On June 10, 1968, Ecology issued Ground Water Permit No. 8531 authorizing the water right as identified in the ROE. The well was identified as being 1,100 feet south and 1,140 feet west from the north quarter corner of Section 33, being within Thomas M. Chambers D.L.C. No. 43, within former U.S. Military Reserve of Section 33, Township 20 North, Range 2 East W.M.

On July 16, 1970, W.V. Connell filed a Proof of Appropriation of Water indicating that the well was capable of pumping 780 gpm.

On August 12, 1970, Ecology issued GWC 6928-A to State of Washington, Western State Hospital, Department of Institutions.

On February 29, 1972, Ecology issued Superseding GWC 7602-A. On the face of that document, it stated, “This Certificate Supersedes Ground Water Certificate No. 6928-A, Issued on August 12, 1970.”

On March 29, 2002, Ecology issued metering order DE 02WRSR-3828 to WSH. This metering order required that an approved measuring device (source meter) be installed and maintained for the well to record water use on a weekly basis. Water use data, including the total annual

volume withdrawn and peak pumping rate for the year, in addition to monthly meter readings and peak pumping rate during each month, must be submitted to Ecology annually by January 31st of the following year.

Mapping of the East Campus Well location in 2022 suggested that the East Campus Well was outside of the area identified as the point of withdrawal legal description in the public notice, ROE permit, and certificate. This was likely due to an error in identifying the well's location. The well's true location was determined to be within Government Lot 8 (approximately NE ¼ NW ¼), Section 33, Township 20 North, Range 2 East, W.M.

On May 25, 2022, DSHS filed a letter with Ecology with the subject: Request for a Conforming Document on GWC 7602-A and GWC 7025-A and Ministerial Correction to Point of Withdrawal Location. The purpose of use was requested to be recognized as being for municipal water supply purposes and while issuing the superseding certificate, a request was made to correct the location of the East Campus Well at the same time.

On August 3, 2022, Ecology issued Second Superseding GWC 7602-A. This certificate was issued in response to the request to conform the purpose of use to municipal and to correct the legal description for the East Campus Well. After issuance, it was discovered that there were some ministerial errors on the document.

On September 7, 2022, Ecology issued Third Superseding GWC 7602-A to correct the ministerial errors.

On August 20, 2024, the relationship between the ground water certificates and older ground water claims, with respect to the annual volume authorized, was clarified in the final ROEs for change issued on the ground water claims. **Table 6-5** contains the attributes identified for this certificate based on the clarification in the recently issued ROEs for change. Important water right documents are contained in **Appendix H**.

Table 6-5

GWC 7602-A Attributes

Attributes	Existing Information
Name	Washington State Department of Social and Health Services
Priority Date	March 7, 1968
Instantaneous Rate	500 gpm
Annual Volume	430 afy (non-additive)
Purpose of Use	Municipal
Period of Use	Continuous (Year Round)
Place of Use	The place of use of this water right is the service area described in the most recent Water System Planfor the Western State Hospital Water System approved by the Washington State Department of Health. RCW 90.03.386 may have the effect of revising the place of use of this water right if the criteria in section RCW 90.03.386(2) are met.
Source	East Campus Well NE 1/4 NW 1/4 Section 33, Township 20 North, Range 2 East, W.M.

Pending Water Right Applications

DSHS currently has no pending water right applications for WSH.

Water Right Action Items

The following data must be collected and submitted to Ecology.

Source Metering Data Collection and Submittal

Consistent with the metering order issued by Ecology and recent water right change ROEs, source meters must be installed and maintained for both the East Campus Well and Farm Well. Water use must be recorded weekly. Water use data, including the total annual volume withdrawn and peak pumping rate for the year, in addition to monthly meter readings and peak pumping rate during each month, must be submitted to Ecology annually by January 31st of the following year. WSH will evaluate the existing source meters and make improvements as necessary, as described in CIP F9 in **Chapter 9**.

Water Supply Evaluation

An evaluation of DSHS existing water rights was performed to determine the sufficiency of the water rights to meet both existing and future water demands. **Table 6-6** compares the combined maximum instantaneous water right amounts of the sources with the peak day demand of the system, and the combined maximum annual water right amounts of the sources with the average day demand of the system. As shown in the table, DSHS has sufficient water rights (both instantaneous rate and annual volume) to meet the existing demands.

Table 6-6

Existing Water Rights Evaluation

	Instantaneous Rights/ Maximum Day Demand	Annual Rights/ Average Day Demand	
Description	**(gpm)**	**(afy)**	**(gpm)**
Total Water Rights	2,650	1,156	717
Existing (2023) Water Demand	241	206	128
Surplus (or Deficient) Rights	2,409	950	589

Table 6-7 summarizes the results of the future water rights evaluation, which compares the water rights of the existing sources with the system's future 10-year and 20-year demand projections. The analyses considered future demand projections with and without water use reductions from the DSHS's planned water use efficiency efforts, as shown in the table. The results of the future water rights evaluation indicate DSHS has sufficient water rights to meet the projected demands through the year 2044.

Table 6-7

Future Water Rights Evaluation

	Instantaneous Rights/ Maximum Day Demand	Annual Rights/ Average Day Demand	
Description	**(gpm)**	**(afy)**	**(gpm)**
Year 2034 (+ 10 years) Without Water Use Efficiency			
Total Water Rights	2,650	1,156	717
Projected (2034) Water Demand	328	280	174
Surplus (or Deficient) Rights	2,322	876	543
Year 2044 (+ 20 years) Without Water Use Efficiency			
Total Water Rights	2,650	1,156	717
Projected (2044) Water Demand	328	280	174
Surplus (or Deficient) Rights	2,322	876	543
Year 2034 (+ 10 years) With Water Use Efficiency			
Total Water Rights	2,650	1,156	717
Projected (2034) Water Demand	325	278	172
Surplus (or Deficient) Rights	2,325	878	544
Year 2044 (+ 20 years) With Water Use Efficiency			
Total Water Rights	2,650	1,156	717
Projected (2044) Water Demand	322	275	170
Surplus (or Deficient) Rights	2,328	881	546

RECLAIMED WATER

Existing Reclaimed Water Use

WSH does not currently produce or use reclaimed water.

DRINKING WATER REGULATIONS

Overview

The quality of drinking water in the United States is regulated by the Environmental Protection Agency (EPA). Under provisions of the Safe Drinking Water Act (SDWA), the EPA is allowed to delegate primary enforcement responsibility for water quality control to each state. In the State of Washington, DOH is the agency responsible for implementing and enforcing drinking water regulations. For the State of Washington to maintain primacy (delegated authority to implement requirements) under the SDWA, the state must adopt drinking water regulations that are at least as stringent as the federal regulations. In meeting these requirements, the state, in cooperation with the EPA, has published drinking water regulations that are contained in Chapter 246-290 Washington Administrative Code (WAC).

Existing Regulations

The federal SDWA was enacted in 1974 as a result of public concern about water quality. The SDWA sets standards for the quality of drinking water and requires water treatment if these standards are not met. The SDWA also sets water testing schedules and methods that water systems must follow. In 1986, the SDWA was amended as a result of additional public concern and frequent contamination of groundwater from industrial solvents and pesticides. The 1986 Amendments require water systems to monitor and treat for a continuously increasing number of water contaminants identified in the new federal regulations. The SDWA was amended again and re-authorized in August of 1996.

In response to the 1986 Amendments, the EPA established six rules, known as the Phase I Rule, Phase II and IIb Rules, Phase V Rule, Surface Water Treatment Rule, Total Coliform Rule, and Lead and Copper Rule. The EPA regulates most chemical contaminants through the Phase I, II, IIb, and V Rules. WSH's active sources are affected by many of these rules.

The EPA set two limits for each contaminant that is regulated under the rules. The first limit is a health goal, referred to as the Maximum Contaminant Level Goal (MCLG). The MCLG is zero for many contaminants, especially known cancer-causing agents (carcinogens). The second limit is a legal limit, referred to as the Maximum Contaminant Level (MCL). MCLs are equal to or higher than the MCLGs; however, most MCLs and MCLGs are the same, except for contaminants that are regulated as carcinogens. The health goals (MCLGs) for carcinogens are typically zero, because they cause cancer, and it is assumed that any amount of exposure may pose some risk of cancer. A summary of each rule follows.

To fully understand the discussion, a brief definition of several key terms is provided in the following section.

- Organic Chemicals – Animal or plant produced substances containing carbon and other elements such as hydrogen and oxygen.
- Synthetic Organic Chemicals (SOCs) – Human-made organic substances, including herbicides, pesticides, and various industrial chemicals and solvents.

- Volatile Organic Chemicals (VOCs) – Chemicals, as liquids, that evaporate easily into the air.
- Inorganic Chemicals (IOCs) – Chemicals of mineral origin that are naturally occurring elements. These include metals such as lead and cadmium.

Phase I Rule

The Phase I Rule, which was the EPA's first response to the 1986 Amendments, provides limits for eight VOCs that may be present in drinking water. VOCs are used by industries in the manufacturing of rubber, pesticides, deodorants, solvents, plastics, and other chemicals. VOCs are found in everyday items such as gasoline, paints, thinners, lighter fluid, mothballs, and glue, and typically are encountered at dry cleaners, automotive service stations, and elsewhere in industrial processes. WSH currently complies with all contaminant monitoring requirements under this rule.

Phase II and IIb Rules

The Phase II and IIb Rules update and create limits for 38 contaminants (organics and inorganics). Some of the contaminants are frequently applied agricultural chemicals (nitrate), while others are more obscure industrial chemicals. WSH currently complies with all contaminant monitoring requirements under these rules.

Phase V Rule

The Phase V Rule sets standards for 23 additional contaminants, of which 18 are organic chemicals (mostly pesticides and herbicides) and 5 are IOCs (such as cyanide). WSH currently complies with all contaminant monitoring requirements under this rule.

Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) governs surface water sources, such as rivers, lakes, and reservoirs (which are open to the atmosphere and subject to surface runoff), and ground water sources under the influence of surface water (GWI). The SWTR seeks to prevent waterborne diseases caused by the microbes *Cryptosporidium, Legionella,* and *Giardia lamblia*, which are present in most surface waters. The rule requires disinfection of all surface water and GWI sources. All surface water and GWI sources also must be filtered, unless a filtration waiver is granted. A filtration waiver may be granted to systems with pristine sources that continuously meet stringent source water quality and protection requirements. The East Campus Well and Farm Well are deeper than 50 feet and not within 200 feet of surface water. According to the sanitary survey conducted in 2021, these wells do not appear to have the characteristics of GWI sources; therefore, this rule is not applicable.

Interim Enhanced Surface Water Treatment Rule

The Interim Enhanced Surface Water Treatment Rule (IESWTR) became effective concurrent with the Stage 1 Disinfectants/Disinfection Byproducts Rule. The rule primarily applies to public water systems that serve 10,000 or more people and use surface water or GWI sources. The

rule also requires primacy agencies (i.e., DOH in Washington State) to conduct sanitary surveys of all surface water and GWI systems, regardless of size. The rule is the first to directly regulate the protozoan *Cryptosporidium* and has set the MCLG for *Cryptosporidium* at zero. The wells are not classified as GWI; therefore, the first portion of this rule is not applicable. WSH currently complies with the remaining requirements of this regulation.

Long Term 1 Enhanced Surface Water Treatment Rule

This Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) addresses water systems using surface water or GWI sources serving fewer than 10,000 people. The rule extends protections against *Cryptosporidium* for smaller water systems. WSH's groundwater sources are not GWI; therefore, this rule is not applicable.

Revised Total Coliform Rule

The Revised Total Coliform Rule (RTCR) sets an MCL for *Escherichia coli* (*E. coli*) and specifies the frequency and timing of coliform testing based on population served, public water system type, and source water type. When total coliform is detected, a treatment technique is triggered. The water system must assess its water system facilities and operations and fix any sanitary defects. For confirmed *E. coli* incidents, known as an *E. coli* MCL violation, the water system must perform a Level 2 assessment and provide public notice within 24 hours. If a positive sample is collected on a consecutive sample, WSH also will need to collect source samples.

Coliform is a group of bacteria, some of which live in the digestive tract of humans and many animals and are excreted in large numbers with feces. Coliform can be found in sewage, soils, surface waters, and vegetation. The presence of any coliform in drinking water indicates a potential health risk and potential waterborne disease outbreak, which may include gastroenteric infections, dysentery, hepatitis, typhoid fever, cholera, and other infectious diseases. *E. coli* is a member of the coliform group that is almost exclusively of fecal origin, and their presence can lead to increased health risks.

WSH's current water quality monitoring schedule dictates that three routine samples be collected each month. To comply with the legal limit, systems must not find coliform in more than 5 percent of the samples taken each month. For smaller systems like WSH's that take fewer than 20 samples per month, 1 sample that contains coliform would exceed the legal limit and trigger the follow-up sampling requirements. The last known positive routine and repeat samples were in July 2021, when WSH detected the presence of coliform in its distribution system. *E. coli* also was detected in July 2020, along with routine and repeat coliform samples detected in November 2020. WSH has since implemented temporary chlorination of its well sources to minimize future pathogen risk in the distribution system.

Lead and Copper Rule, Revisions, and Improvements

The Lead and Copper Rule identifies action levels for both lead and copper. An action level is different than an MCL. An MCL is a legal limit for a contaminant, and an action level is a trigger for additional prevention or removal steps. The action level for lead is 15 micrograms per liter (µg/L) and the action level for copper is 1.3 mg/L. If the 90th percentile concentration of either

lead or copper from the group of samples exceeds these action levels, a corrosion control study must be undertaken to evaluate strategies and make recommendations for reducing the lead or copper concentration below the action levels. The rule requires systems that exceed the lead level to educate the affected public about reducing its lead intake. Systems that continue to exceed the lead action level after implementing corrosion control and source water treatment may be required to replace piping in the system that contains lead sources. Corrosion control is typically accomplished by increasing the pH of the water to make it less corrosive, which reduces its ability to break down water pipes and absorb lead or copper.

In January 2021, the EPA issued Lead and Copper Rule Revisions (LCRR) as an addendum to the Lead and Copper Rule. The compliance date for water systems is October 16, 2024. Under the LCRR, a lead trigger level of 10 µg/L is defined which requires additional monitoring and treatment requirements. In addition, community and NTNC water systems must submit a lead service line inventory (LSLI) to state programs by October 16, 2024. The LSLI must include the location and material of the public and private sides of every service line and make the inventory publicly available. WSH is not aware of any lead service lines in the distribution system and a LSLI has been submitted to DOH.

In November 2023, the EPA released proposed Lead and Copper Rule Improvements (LCRI) to strengthen the LCRR. The LCRI requires water systems that classified service lines as Lead or Galvanized Needing Replacement in the LSLI to replace these lines within 10 years, with few exceptions. The LCRI would also lower the 90th percentile lead action level from 15 µg/L to 10 µg/L and remove the 10 µg/L lead trigger level. No distribution sample in the last 10 years has exceeded a lead level of 10 µg/L.

Lead is a common metal found throughout the environment in lead-based paint, air, soil, household dust, food, certain types of pottery, porcelain, pewter, brass, and water. Lead can pose a significant health risk if too much of it enters the body. Lead builds up in the body over many years and can cause damage to the brain, red blood cells, and kidneys. The greatest risk is to young children and pregnant women. Lead can slow normal mental and physical development of growing bodies.

Copper is a common, natural, and useful metal found in our environment. It is also a trace element needed in most human diets. The primary impact of elevated copper levels in water systems is stained plumbing fixtures. At certain levels (well above the action levels), copper may cause nausea, vomiting, and diarrhea. It also can lead to serious health problems in people with Wilson's disease. Long-term exposure to elevated levels of copper in drinking water also could increase the risk of liver and kidney damage. WSH currently complies with all contaminant monitoring and treatment requirements under this rule.

Radionuclides Rule

The Radionuclides Rule establishes MCLs for alpha, beta, and photon emitters, uranium, and radium 226/228. Radionuclides are elements that undergo a process of natural decay and emit radiation in the form of alpha or beta particles and gamma photons. The radiation can cause various kinds of cancers, depending on the type of radionuclide exposure from drinking water.

The regulations address both human-made and naturally occurring radionuclides in drinking water.

The Radionuclides Rule establishes an MCLG of zero for the four regulated contaminates and MCLs of 5 picocuries per liter (pCi/L) for combined radium-226 and radium-228, 15 pCi/L for gross alpha (excluding radon and uranium), 4 millirems per year (mrem/year) for beta particle and photon radioactivity, and 30 µg/L for uranium. WSH currently complies with all contaminant monitoring requirements under this rule.

Watershed Control Program

The Washington State mandate for watershed protection and the required elements of a watershed control program are contained in WAC 246-290-135, Source Protection. A watershed control program is a proactive and ongoing effort of a water purveyor to exercise surveillance over the conditions and activities within the watershed affecting source water quality to protect the health of its customers, as outlined in WAC 246-290-668, Watershed Control. Group A public water systems that use surface water or groundwater under the influence of surface water as their source are required to develop and implement a watershed control program. All required elements of a watershed control program must be documented and included in the purveyor's WSP or Small Water System Management Program. WSH's water sources are groundwater, with none classified as being under the influence of surface water; therefore, this requirement is not applicable.

Wellhead Protection Program

The Washington State mandate for wellhead protection, and the required elements of a wellhead protection program, is contained in WAC 246-290-135, Source Protection. A wellhead protection program is a proactive and ongoing effort of a water purveyor to protect the health of its customers by preventing contamination of the groundwater that it supplies for drinking water. Group A public water systems that use groundwater as their source are required to develop and implement a wellhead protection program. All required elements of a local wellhead protection program must be documented and included in either the WSP or a Small Water System Management Program document. A preliminary copy of WSH's Wellhead Protection Program is contained in **Appendix J**. WSH will develop and adopt an improved Wellhead Protection Plan, as described in CIP M3 in **Chapter 9**.

Consumer Confidence Report

The Consumer Confidence Report (CCR) is the centerpiece of the right-to-know provisions of the 1996 Amendments to the SDWA. The annual report must be updated and re-issued to all customers by July 1st of each year thereafter. This rule currently is being revised to possibly require delivery to customers every 6 months for water systems over 10,000 people. EPA also will require additional language to be included, but these final revisions are yet to be determined.

The CCR is a report on the quality of water that was delivered to the water users during the previous calendar year. The reports must contain certain specific elements, but also may

contain other information that the purveyor deems appropriate for public education. Some, but not all, of the information that is required in the reports includes the source and type of the drinking water, type of treatment, contaminants that have been detected in the water, potential health effects of the contaminants, identification of the likely source of contamination, violations of monitoring and reporting, and variances or exemptions to the drinking water regulations. A copy of WSH's most recent CCR is contained in **Appendix J**.

Stage 1 Disinfectants/Disinfection Byproducts Rule

Disinfection byproducts (DBPs) are formed when free chlorine reacts with organic substances, most of which occur naturally. These organic substances (called precursors) are a complex and variable mixture of compounds. The DBPs themselves may pose health risks.

The rule applies to WSH and most other water systems, including systems serving fewer than 10,000 people that add a chemical disinfectant to the drinking water during any part of the treatment process. The rule reduced the MCL for total trihalomethanes (TTHMs), which are a composite measure of 4 individual THM, from the previous interim level of 0.10 mg/L to 0.08 mg/L. The rule establishes MCLs and requires monitoring of 3 additional categories of DBPs (0.06 mg/L for five haloacetic acids (HAA5), 0.01 mg/L for bromate, and 1.0 mg/L for chlorite). The rule establishes maximum residual disinfectant levels for chlorine (4.0 mg/L), chloramines (4.0 mg/L), and chlorine dioxide (0.8 mg/L). The rule also requires systems using surface water or groundwater directly influenced by surface water to implement enhanced coagulation or softening to remove DBP precursors, unless alternative criteria are met. WSH has begun monitoring DBP concentrations in the distribution system and currently complies with all contaminant monitoring requirements under this rule.

Unregulated Contaminant Monitoring Rule

The EPA established the Unregulated Contaminant Monitoring Rule (UCMR) to generate data on contaminants that are being considered for inclusion in new drinking water standards. The information collected by select public water systems will ensure that future regulations established by the EPA are based on sound science.

Three separate lists of unregulated contaminants are maintained under the UCMR: List 1; List 2; and List 3. Contaminants are organized on the tiered lists based on the availability of standard testing procedures and the known occurrence of each contaminant, with List 1 containing contaminants that have established standard testing procedures and some, but insufficient, information on their occurrence in drinking water. Monitoring for contaminants on the lists is limited to a maximum of 30 contaminants within a 5-year monitoring cycle, and the EPA is required to publish new contaminant monitoring lists every 5 years. As new lists are published, contaminants will be moved up in the lists if adequate information is found to support additional monitoring. All public water systems serving more than 10,000 people and a randomly selected group of smaller water systems are required to monitor for contaminants. WSH currently monitors for some unregulated contaminants.

Arsenic Rule

Arsenic is highly toxic, affects the skin and nervous system, and may cause cancer. The Arsenic Rule sets the MCLG of arsenic at zero and reduces the MCL from the previous standard of 0.05 mg/L to 0.01 mg/L. Arsenic's monitoring requirements are consistent with the existing requirements for other inorganic contaminants. Arsenic is present in both wells, but the levels are below the MCL. WSH has not recorded exceedances of arsenic concentrations in its history of sampling.

Filter Backwash Recycling Rule

Public water systems using surface water or groundwater under the direct influence of surface water that utilize filtration processes and recycling must comply with the Filter Backwash Recycling Rule. The rule aims to reduce risks associated with recycling contaminants removed during filtration.

The rule requires filter backwash water to be returned to a location that allows complete treatment. In addition, filtration systems must provide detailed information regarding the treatment and recycling process to the state. WSH's groundwater sources are not filtered for contaminant removal; therefore, this rule does not apply.

Stage 2 Disinfectants/Disinfection Byproducts Rule

The EPA implemented the Stage 2 Disinfectants/Disinfection Byproducts Rule (Stage 2 D/DBPR) simultaneously with the Long Term 2 Enhanced Surface Water Treatment Rule.

Similar to the Stage 1 D/DBPR, this rule applies to most water systems that add a disinfectant to the drinking water other than ultraviolet light or those systems that deliver such water. The Stage 2 D/DBPR changes the calculation procedure requirement of the MCLs for two groups of disinfection byproducts, total TTHM and HAA5. The rule requires each sampling location to determine compliance with MCLs based on their individual annual average DBP levels (termed the Locational Running Annual Average), rather than utilizing a system-wide annual average. The rule also proposes new MCLGs for chloroform (0.07 mg/L), trichloroacetic acid (0.02 mg/L), and monochloroacetic acid (0.03 mg/L).

Additionally, the rule requires systems to document peak DBP levels and prepare an Initial Distribution System Evaluation (IDSE) to identify Stage 2 D/DBPR compliance monitoring sites. IDSEs require each water system to prepare a separate IDSE plan and report, with the exception of those systems who obtain a 40/30 Certification or a Very Small System Waiver. In order to qualify for the 40/30 Certification, all samples collected during Stage 1 monitoring must have TTHM and HAA5 levels less than or equal to 0.040 mg/L and 0.030 mg/L, respectively. WSH has begun monitoring DBP concentrations in the distribution system. The current water quality monitoring schedule dictates that WSH collect one TTHM and one HAA5 sample on an annual basis. WSH currently complies with all contaminant monitoring requirements under this rule.

Long Term 2 Enhanced Surface Water Treatment Rule

Following the publishing of the IESWTR, the EPA introduced the LT1ESWTR to supplement the preceding regulations. The second part of the regulations of the LT1ESWTR are mandated in the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The final rule was implemented simultaneously with the Stage 2 D/DBPR described in the previous section. This rule applies to all systems that use surface water or GWI sources.

This rule establishes treatment technique requirements for filtered systems based on their risk level for contamination, calculated from the system's average *Cryptosporidium* concentration. Requirements include up to 2.5-log *Cryptosporidium* treatment, in addition to existing requirements under the IESWTR and LT1ESWTR. Filtered systems that demonstrate low levels of risk will not be required to provide additional treatment. Unfiltered systems under this rule must achieve at least a 2-log inactivation of *Cryptosporidium* if the mean level in the source water remains below 0.01 oocysts/L. If an unfiltered system's mean level of *Cryptosporidium* exceeds 0.01 oocysts/L, the LT2ESWTR requires the system to provide a minimum 3-log inactivation of *Cryptosporidium*. All unfiltered systems also are required to utilize a minimum of two disinfectants in their treatment process.

The LT2ESWTR also addresses systems with unfinished water storage facilities. Under this rule, systems must either cover their storage facilities or achieve inactivation and/or removal of 4-log virus, 3-log *Giardia lamblia,* and 2-log *Cryptosporidium* on a state-approved schedule. Lastly, the rule extends the requirement of the disinfection profiles mandated under the LT1ESWTR to the proposed Stage 2 D/DBPR. Neither well sources are classified as GWI; therefore, this rule is not applicable.

Groundwater Rule

The EPA promulgated the Groundwater Rule (GWR) to reduce the risk of exposure to fecal contamination that may be present in public water systems that use groundwater sources. The GWR also specifies when corrective action (which may include disinfection) is required to protect consumers who receive water from groundwater systems from bacteria and viruses. The GWR applies to public water systems that use groundwater and to any system that mixes surface and ground waters if the groundwater is added directly to the distribution system and provided to consumers without treatment equivalent to surface water treatment.

The rule targets risk through an approach that relies on the following four major components:

1. Periodic sanitary surveys of groundwater systems that require the evaluation of eight critical elements and the identification of significant deficiencies (such as a well located near a leaking septic system). DOH conducted its most recent sanitary survey of WSH's water system in August 2021.
2. Source water monitoring to test for the presence of *E. coli*, enterococci, or coliphage in the sample. There are two monitoring provisions.
    - Triggered monitoring for systems that do not already provide treatment that achieves at least 99.99-percent (4-log) inactivation or removal of viruses and that have a total coliform positive routine sample under the Revised Total Coliform Rule sampling in the distribution system.

- Assessment monitoring is a complement to triggered monitoring. A state has the option to require systems to conduct source water assessment monitoring at any time to help identify high risk systems.

3. Corrective actions required for any system with a significant deficiency or source water fecal contamination. The system must implement one or more of the following corrective action options: correct all significant deficiencies; eliminate the source of contamination; provide an alternate source of water; or provide treatment that reliably achieves 99.99-percent inactivation or removal of viruses.
4. Compliance monitoring to ensure that treatment technology installed to treat drinking water reliably achieves at least 99.99-percent inactivation or removal of viruses.

No significant deficiencies or findings were identified during the most recent sanitary survey of WSH's system. WSH complies with all other requirements of the rule.

Per- and Polyfluoroalkyl Substances

In 2016, the EPA established a combined health advisory level for two per- and polyfluoroalkyl substances (PFAS) at 70 parts per trillion (ppt). DOH proposed a regulation for PFAS in 2017, and state action levels (SALs) for these substances are now in effect as of April 9, 2022. The SALs are 10 ppt for perfluorooctanoic acid (PFOA), 15 ppt for perfluorooctanesulfonic acid (PFOS), 9 ppt for perfluorononanoic acid (PFNA), 65 ppt for perfluorohexanesulphonic acid (PFHxS), and 345 ppt for perfluorobutanesulfonic acid (PFBS). All water systems in Washington State are required to sample their sources for PFAS by December 2025. Water systems that find PFAS in their supply are required to complete additional monitoring, and systems that exceed a SAL are required to notify all customers. The primary source of PFAS contamination was the historical use of PFAS-based firefighting foam used by the U.S. Armed Forces, local fire departments, and airports.

In April 2024, the EPA finalized MCLs for PFOS and PFOA each at 4 ppt; PFHxS, PFNA, and hexafluoropropylene oxide dimer acid (HFPO-DA, commonly known as GenX) at 10 ppt each; and mixtures containing two or more of PFBS, PFHxS, PFNA, and GenX through a combined Hazard Index (HI). The HI normalizes each of the 4 compound levels to a Health-Based Water Concentration of 2,000 ppt for PFBS and 10 ppt for PFNA, PFHxS, and GenX. The sum of normalized values must be less than 1. Compliance with MCLs will be determined based on a running annual average. PFAS MCLs will supersede DOH SALs when they take effect in 2029. All community and non-transient non-community public water systems must test for PFAS under the final rule. WSH collected water samples from both wells and analyzed them for PFAS compounds in May 2023. No PFAS compounds were detected at the Farm Well, but 4 regulated PFAS compounds were detected at East Campus Well, with PFOS, PFOA, and PFHxS levels exceeding finalized MCLs at 34, 4.2, and 18 ppt, respectively. A repeat PFAS compound analysis on July 2023 confirmed PFAS contamination. WSH has since taken the East Campus Well offline and has relied on only the Farm Well for water supply.

Future Regulations

Drinking water regulations are continuously changing in an effort to provide higher quality and safer drinking water. Modifications to the existing rules described previously and implementation of new rules are planned for the near future. A summary of upcoming drinking water regulations that will most likely affect WSH is presented in the following sections.

Radon

In July of 1991, the EPA proposed a regulation for radon, as well as three other radionuclides. The 1996 SDWA Amendments required the EPA to withdraw the 1991 proposal due to several concerns that were raised during the comment period. A new proposed regulation was published in the Federal Register on November 2, 1999. Comments on the proposed rule were due to the EPA by February 4, 2000. Final federal requirements for addressing radon were delayed until 2008 but have not yet been published. The rule proposes a 300 pCi/L MCL for community water systems that use groundwater or an alternative, less stringent MCL of 4,000 pCi/L for water systems where their state implements an EPA-approved program to reduce radon risks in household indoor air and tap water. It is not currently known when or what a radon regulation may require as adopted by the EPA or what the implementation schedule for the rule will be. Because the final radon rule requirements are uncertain, the impact of this rule on WSH is unknown at this time.

Unregulated Contaminant Monitoring Rule Revisions

In accordance with the original UCMR and the SDWA, once every 5 years the EPA will issue a new list of no more than 30 unregulated contaminants to be monitored by public water systems. The fifth UCMR was proposed on March 11, 2021, and includes a list of 30 chemicals that will be monitored during the 2022 through 2026 monitoring cycle and approves several new testing methods to conduct the monitoring. The 30 chemicals consist of 29 PFAS substances and lithium. For this upcoming cycle, all systems serving more than 10,000 people and a larger representative sample of smaller water systems will be required to monitor for contaminants. The rule also requires additional water system data to be reported with the monitoring results, establishes a procedure for determining minimum reporting levels, and proposes several revisions to the implementation of the monitoring program.

SOURCE WATER QUALITY

This section presents the current water quality standards for groundwater sources and the results of WSH's recent source water quality monitoring efforts. A discussion of the water quality requirements and monitoring results for WSH's distribution system is presented in the section that follows.

Drinking Water Standards

Drinking water quality is regulated at the federal level by the EPA and at the state level by DOH. Drinking water standards have been established to maintain high-quality drinking water by limiting the levels of specific contaminants (i.e., regulated contaminants) that can adversely

affect public health and are known or likely to occur in public water systems. Non-regulated contaminants do not have established water quality standards and are generally monitored at the discretion of the water purveyor and in the interest of customers.

The regulated contaminants are grouped into two categories of standards – primary and secondary. Primary standards are drinking water standards for contaminants that could affect health. Water purveyors are required by law to monitor and comply with these standards and notify the public if water quality does not meet any one of the standards. Secondary standards are drinking water standards for contaminants that have aesthetic effects, such as unpleasant taste, odor, or color (staining). The national secondary standards are unenforceable federal guidelines or goals where federal law does not require water systems to comply with them. However, states may adopt their own enforceable regulations governing these contaminants. The State of Washington has adopted regulations that require compliance with some of the secondary standards. Water purveyors are not required to notify the public if their water quality does not meet the secondary standards.

Source Monitoring Requirements and Waivers

WSH is required to perform water quality monitoring at each of its active sources for inorganic chemical and physical substances, organic chemicals, and radionuclides. The monitoring requirements that WSH must comply with are specified in WAC 246-290-300. A description of the source water quality monitoring requirements and procedures for each group of substances is contained in WSH's Water Quality Monitoring Plan, which is included as **Appendix K**.

DOH has developed the Susceptibility Assessment Survey Form for water purveyors to complete for use in determining a drinking water source's potential for contamination. The results of the susceptibility assessment may provide monitoring waivers that allow reduced source water quality monitoring. Based on the results of the susceptibility assessment survey for each source, DOH assigned a high susceptibility rating to the East Campus Well and a low susceptibility rating to the Farm Well.

Source Monitoring Results

The East Campus Well was last monitored for IOCs in September 2016. No contaminants were detected above their MCL and WSH has a 9-year waiver for IOCs with the next sample due September 2025. VOCs were last monitored in August 2019. No contaminants were detected above their MCL and WSH has a 6-year waiver for VOCs with the next sample due August 2025. SOCs were last monitored in March 2021 and no contaminants were detected above their MCL. Radionuclides were last monitored in October 2017 and no contaminants were detected above their MCL. The East Campus Well also is sampled yearly for nitrates and nitrate has never been detected above its MCL. PFAS compounds were analyzed from samples collected in May 2023 and July 2023 confirming elevated concentrations of a few compounds. WSH has since taken the East Campus Well offline. Based on WSH's water quality monitoring schedule, future source monitoring is not required for the East Campus Well.

The Farm Well was last monitored for IOCs in June 2021. No contaminants were detected above their MCL and WSH has a 9-year waiver for IOCs. VOCs were last monitored in August

2019. No contaminants were detected above their MCL and WSH has a 6-year waiver for VOCs with the next sample due August 2025. SOCs were last monitored in March 2021 and no contaminants were detected above their MCL. This source also is sampled yearly for nitrates and every 3 years for arsenic, and neither contaminant has ever been detected above its MCL. The most recent radionuclides sample was collected in October 2017 for the East Campus Well and November 2015 for the Farm Well and no contaminants were detected above their MCL. Gross alpha and radium 228 samples were collected in June 2022 and no contaminants were detected above their MCL. PFAS compounds were analyzed from a sample collected in May 2023 and no contaminants were detected.

DISTRIBUTION SYSTEM WATER QUALITY

Monitoring Requirements and Results

WSH is required to perform water quality monitoring within the distribution system for coliform bacteria, disinfectant (free-chlorine) residual concentration, DBPs, lead and copper, and asbestos in accordance with Chapter 246-290 WAC. A description of the distribution system water quality monitoring requirements and procedures are contained in WSH's Water Quality Monitoring Plan that is included in **Appendix K**.

Coliform Monitoring

WSH is required to collect a minimum of three coliform samples per month from different locations throughout the system. There have been multiple positive total coliform samples taken in the last few years, however, positive coliform samples have not been detected since the implementation of the chlorination system in 2023. **Table 6-8** summarizes all positive coliform detections for the past 13 years.

Table 6-8

Historical Distribution Total Coliform Detections

Date	Location	Type of Sample	Notes
7/19/2021	Building 32 Restroom Sink	Repeat	--
7/15/2021	Building 32 Restroom Sink	Routine	--
3/2/2021	Building 10 Men's Restroom Sink	Routine	--
11/5/2020	Building 17 Ground Floor Breakroom Sink	Repeat	--
11/5/2020	Building 9 1st Floor Men's Restroom Sink	Repeat	--
11/5/2020	Building 7 KT	Repeat	--
11/5/2020	Building 17 Men's Restroom Sink	Repeat	--
11/5/2020	Building 18 Ground Floor Main Lavatory	Repeat	--
11/5/2020	Building 15 Women's Restroom Sink	Repeat	--
11/2/2020	Building 17 Ground Floor Breakroom	Routine	--
11/2/2020	Building 27 KT Lavatory	Routine	--
8/3/2020	Building 27 KT Lavatory	Routine	--
8/3/2020	Building 54 Laundry Room Sink	Routine	--
7/7/2020	Building 32 Restroom	Repeat	E. coli also Detected
7/7/2020	Building 10 Men's Lavatory	Repeat	--
7/1/2020	Building 32 Restroom Lavatory	Routine	--
10/6/2017	Building 21 S1 Breakroom Sink	Repeat	--
10/2/2017	Building 16 D/S Lavatory	Routine	--
10/2/2017	Building 24 1st Floor Co-Ed Lavatory	Routine	--
9/8/2009	Building 15 Lavatory	Routine	--

Bacteria can thrive in an unchlorinated water system and can negatively impact customer health. Detecting *E. coli* in one sample as well as having total coliform detected in numerous repeat follow-up samples were the main reasons DOH issued a formal compliance agreement to mandate WSH to implement a free-chlorine residual throughout distribution. This will function as a barrier to prevent bacteria from thriving and ensure sanitary drinking water to users.

Disinfectant Residual Concentration Monitoring

Temporary chlorination was implemented in 2023 throughout the WSH water system. WSH is now required to comply with the disinfection requirements contained in WAC 246-290-310. This states that a disinfectant residual concentration shall be detectable in all active parts of the distribution system and that the maximum residual disinfectant level shall be 4.0 mg/L for chlorine and chloramines. WSH targets a free-chlorine residual around 1.0 mg/L at the entry to distribution to ensure a detectable residual throughout the distribution system. The free-chlorine residual should be at least 0.5 mg/L throughout distribution to mitigate *Legionella* per WSH's Water Management Plan. WSH has complied with these chlorine residual goals since the chlorination system started with only a few outlier days of free-chlorine distribution dropping below 0.5 mg/L.

Disinfectants/Disinfection Byproducts Monitoring

THM and HAA5 are DBPs that are formed when free chlorine reacts with organic substances (i.e., precursors), most of which occur naturally. Formation of THM and HAA5 are dependent on such factors as the amount and type of chlorine used, water temperature, concentration of precursors, pH, and chlorine contact time. THM have been found to cause cancer in laboratory animals and are suspected to be human carcinogens. Since chlorination has been implemented within the distribution system, WSH must collect and report a minimum of two TTHM and two HAA5 samples, one of each for two locations on a yearly basis. WSH reported samples in November 2023 following implementation of temporary chlorination, and all sample DBP levels were below MCLs.

Lead and Copper Monitoring

The Lead and Copper Rule identifies the action level for lead at 15 µg/L and the action level for copper at 1.3 mg/L. Every 3 years, WSH must collect and report a minimum of 10 samples. WSH last sampled for lead and copper in November of 2023. All previous samples indicate WSH is in compliance with these regulations.

Under the LCRR, which is effective in October 2024, samples exceeding a lead trigger level of 10 µg/L require additional monitoring and planning. WSH also must submit a completed LSLI to DOH by October 16, 2024. WSH has begun documenting service line materials and will provide DOH with the LSLI.

Asbestos

Asbestos monitoring is required if the sources are vulnerable to asbestos contamination or if the distribution system contains more than 10 percent of asbestos cement (AC) pipe. The current MCL for asbestos is 7 million fibers per liter and greater than 10 microns in length. Monitoring must be accomplished during the first 3-year compliance period of each 9-year compliance cycle. The water sample must be taken at a tap where asbestos contamination is most likely to occur. WSH obtained a waiver through 2028 requiring no further asbestos sampling.

7 | WATER SYSTEM ANALYSIS

INTRODUCTION

This chapter presents the analysis of Western State Hospital's (WSH) existing water system. Individual water system components were analyzed to determine their ability to meet policies and design criteria under existing and future water demand conditions. The policies and design criteria are presented in **Chapter 5**, and the water demands are presented in **Chapter 4**. A description of the water system facilities and current operation is presented in **Chapter 2**.

The Capital Improvement Program (CIP) presented in **Chapter 9** is based on the water system analyses described in this chapter. Two CIP scenarios are presented in **Chapter 9**; one scenario describes the required program if DSHS maintains ownership of the WSH water system; and the second scenario describes the CIP projects required if Lakewood Water District (LWD) assumes ownership of the WSH water system and consolidates the system into LWD's water system. The future capacity and hydraulic analyses in this chapter were performed for the scenario where DSHS maintains ownership of the WSH water system. If LWD consolidates the WSH into their system, LWD should perform additional analyses with the two systems connected to confirm that the consolidated system has sufficient capacity as a whole.

PRESSURE ZONES

The ideal static pressure of water supplied to customers is between 40 and 80 pounds per square inch (psi). Pressures within a water distribution system are commonly as high as 120 psi, requiring pressure reducing valves on individual service lines to reduce the pressure to 80 psi or less. Except during a fire or other emergency condition, the Washington State Department of Health (DOH) requires WSH to maintain a minimum pressure of 30 psi.

WSH operates with one pressure zone that maintains a hydraulic grade of 389 feet. **Table 7-1** lists WSH's one pressure zone, the highest and lowest elevation served in the zone, and the minimum and maximum distribution system pressures within the zone based on maximum static water conditions (full reservoirs with no demand). While this table presents the results of the pressure evaluations based on the adequacy of the pressure zones (under static conditions), the hydraulic analysis section later in this chapter presents the results of the pressure evaluation based on the adequacy of the water mains (under dynamic conditions).

Table 7-1

Minimum and Maximum Distribution System Static Pressures

Highest Elevation Served		Lowest Elevation Served	
Elevation (ft)	Static Pressure (psi)	Elevation (ft)	Static Pressure (psi)
246	62	172	94

Static pressures in the water system range from 62 psi to 94 psi.

SOURCE CAPACITY EVALUATION

This section evaluates the combined capability of WSH's existing sources to determine if they have sufficient capacity to meet the overall demands of the water service area based on existing and future water demands. The section that follows will address the evaluation of the individual facilities to determine if they have sufficient capacity to meet the existing and future demands of the water system. This section also identifies facility deficiencies that are not related to the capacity of the sources.

Analysis Criteria

Supply facilities must be capable of adequately and reliably supplying high-quality water to the system. In addition, supply facilities must provide a sufficient quantity of water at pressures that meet the requirements of Washington Administrative Code (WAC) 246-290-230. The evaluation of the combined capacity of the sources in this section is based on the criteria that they provide supply to the system at a rate that is equal to or greater than the maximum day demand (MDD) of the system.

Source Capacity Analysis Results

The combined capability of WSH's active sources to meet both existing and future demand requirements, based on existing and projected pumping and treatment capacities of the individual supply facilities, is presented in **Table 7-2**. The demands used in the evaluation for 2034 and 2044 are future demand projections without reductions from water use efficiency efforts, as shown in **Table 4-5** of **Chapter 4**. Therefore, if additional reductions in water use are achieved through water use efficiency efforts, the total source capacity required in the future will be less than that shown in **Table 7-2**. The future analyses are based on the scenario where DSHS maintains ownership of the WSH water system. If LWD consolidates the WSH water system into the LWD system, a source capacity analysis that includes the WSH system should be performed in LWD's evaluation of their future system as a whole.

Table 7-2

Water Source Capacity Evaluation

Description	Existing	2034 (+10 Years)	2044 (+20 Years)
Required Source Capacity (gpm)			
MDD	241	328	328
Available Source Capacity (gpm)			
East Campus Well (Offline)	0	0	0
Farm Well	1,000	1,000	1,000
Surplus or Deficient Source Capacity (gpm)	**759**	**672**	**672**

The results of the analysis indicate that WSH has approximately 759 gallons per minute (gpm) of surplus source capacity to meet existing (year 2023) demands and will have a source capacity surplus of approximately 672 gpm by 2034 and at the end of the 20-year planning period without

improvements. WSH plans to work with LWD to facilitate new intertie connection points along with the eventual consolidation of the WSH water system into the LWD water system. When LWD has fully consolidated the WSH water system, LWD will be responsible for ensuring source capacity requirements are met throughout the existing WSH retail water service area.

Facility Deficiencies

East Campus Well

The East Campus Well does not have remote operation and monitoring capability and lacks the required sanitary control area around the well. Additionally, this source has been offline since June 2023 due to higher than allowable concentrations of per- and polyfluoroalkyl substances (PFAS) detected. WSH plans to drill a new replacement well to make full use of its water rights and to provide redundancy to the Farm Well. It is assumed this new well will be equipped with a 1,400 gpm pump, emergency generator set, and automatic transfer switch (Capital Improvement Program (CIP) F6) as described in **Chapter 9**.

Farm Well

This well does not currently have any structural or water quality deficiencies. However, it is not equipped with an emergency generator set with an automatic transfer switch. During a power outage, this well cannot be relied upon to continue functioning. WSH staff must manually bring the well back online and water supply must be provided by either the reservoirs or through the LWD intertie. CIP F7 in **Chapter 9** describes upgrades to provide backup power at this site.

STORAGE FACILITIES

This section evaluates WSH's existing water storage tanks to determine if they have sufficient capacity to meet the existing and future storage requirements of the system. This section also identifies facility deficiencies that are not related to the capacity of the water tanks.

Analysis Criteria

Water storage is typically made up of the following components: operational storage, equalizing storage, standby storage, fire flow storage, and dead storage. Each storage component serves a different purpose and will vary from system to system. A definition of each storage component and the criteria used to evaluate the capacity of WSH's storage tanks is provided as follows.

Operational Storage – Volume of the reservoir used to supply the water system under normal conditions when the source or sources of supply are not delivering water to the system (i.e., sources are in the off mode). Operational storage is essentially the average amount of drawdown in the reservoir during normal operating conditions, which represents a volume of storage that most likely not will be available for equalizing storage, fire flow storage, or standby storage. The operational storage is based on the amount of storage between the fill or pump starting setpoint level, and the overflow elevation of the tank.

Equalizing Storage – Volume of the reservoir used to supply the water system under peak demand conditions when the system demand exceeds the total rate of supply of the sources. DOH requires that equalizing storage be stored above an elevation that will provide a minimum pressure of 30 psi at all service connections throughout the system under peak hour demand (PHD) conditions. Because WSH's supply sources primarily operate on a "call on demand" basis to fill the reservoirs, the equalizing storage requirements are determined using the standard DOH formula that considers the difference between the system PHD and the combined capacity of the supply sources:

$$\mathbf{ES = (PHD - Q_S)(150\ minutes)}\text{, but in no case less than zero}$$

Where:

ES = Equalizing Storage, in gallons;

PHD = Peak Hour Demand, in gpm;

Q_S = Sum of all installed and active sources, except emergency supply, in gpm.

If the capacities of the sources that supply each zone are sufficient to meet the peak hour demands of their zones, the equalizing storage requirement for that supply area is zero.

Standby Storage – Volume of the reservoir used to supply the water system under emergency conditions when supply facilities are out of service due to equipment failures, power outages, loss of supply, transmission main breaks, and any other situation that disrupts the supply source. DOH requires that standby storage be stored above an elevation that will provide a minimum pressure of 20 psi at all service connections throughout the system. The criteria for determining the standby storage requirements for WSH's system is based on the DOH recommendation that standby storage equal 1 day of maximum day demands. This volume may be reduced for pressure zones with multiple sources of supply that each have permanent backup power that starts automatically. The calculated volume is sufficient to supply the system for a 24-hour period when the primary supply facility is out of service and the system is experiencing maximum day demands:

$$\mathbf{SB = (1\ day)[(ERU_{MDD})(N) - (1\ day)(Q_S\text{-}Q_L)]}$$

Where:

SB = Standby Storage, in gallons;

ERU_{MDD} = MDD per equivalent residential unit (ERU), in gallons per day (gpd) per ERU;

N = Number of ERUs;

Q_S = Sum of all installed and continuously available sources with permanent backup power that starts automatically, except emergency supply, in gpd;

Q_L = The capacity of the largest continuously available source with permanent backup power that starts automatically available to the system, in gpd.

DOH recommends that the minimum standby storage volume be no less than 200 gallons per ERU.

Fire Flow Storage – Volume of the reservoir used to supply water to the system at the maximum rate and duration required to extinguish a fire at the building with the highest fire flow requirement. The magnitude of the fire flow storage is the product of the fire flow rate and duration of the system's maximum fire flow requirement established by the local fire authority.

DOH requires that fire flow storage be stored above an elevation that will provide a minimum pressure of 20 psi at all points throughout the distribution system under MDD conditions.

Dead Storage – Volume of the reservoir that cannot be used because it is stored at an elevation that does not provide system pressures that meet the minimum pressure requirements established by DOH. This unusable storage occupies the lower portion of most ground-level reservoirs. Water that is stored below an elevation that cannot provide a minimum pressure of 20 psi is considered dead storage for the analyses that follow.

Storage Analysis Results

As shown in **Table 7-3**, the system has an existing maximum storage capacity of approximately 0.73 million gallons (MG) provided by the Upper and Lower Reservoirs.

Table 7-3

Storage Capacity Evaluation

Description	Existing 2023	Projected 2034[1] (+10 Years)	Projected 2044[1] (+20 Years)
Usable Storage (MG)			
Maximum Storage Capacity	0.73	0.73	0.73
Dead (Non-Usable) Storage	0.00	0.00	0.00
Total Usable Storage	**0.73**	**0.73**	**0.73**
Required Storage (MG)			
Operational Storage	0.15	0.15	0.15
Equalizing Storage	0.00	0.00	0.00
Standby Storage	0.35	0.47	0.47
Fire Flow Storage	0.96	0.96	0.96
Total Required Storage	**1.45**	**1.58**	**1.58**
Surplus or Deficient Storage (MG)	**(0.72)**	**(0.85)**	**(0.85)**

[1] = Assumes available storage remains constant.

The operational storage component is assumed to equal the volume of the top 10 feet of the two existing reservoirs. Construction of a future reservoir (CIP F3) may impact this volume, and it should be re-evaluated during the predesign phase for the new reservoir.

Currently, no equalizing storage is required because the supply capacity exceeds the system's peak hour demand.

Because the facilities have no backup power, a substantial amount of WSH's storage capacity must be maintained through the required standby storage. Installation of emergency generator sets with automatic transfer switches (CIP F6 and CIP F7) will impact this volume.

The required fire flow storage of 0.96 MG is based on WSH's maximum planning-level fire flow requirement of 4,000 gpm for 4 hours.

As shown in **Table 7-3**, without construction of additional storage, WSH will have a storage deficiency of approximately 0.85 MG in 2034 and 2044. These future storage analyses are based on the scenario where DSHS maintains ownership of the WSH water system. If LWD consolidates the WSH water system into the LWD system, a storage capacity analysis that includes the WSH system should be performed in LWD's evaluation of their future system as a whole. As described in **Chapter 9**, if DSHS maintains ownership of the WSH water system, DSHS plans to complete a reservoir siting study (CIP F2) and construct one new reservoir with a total storage of at least 1.23 MG (CIP F3) by 2034 to remedy the projected storage deficiency. It is assumed that this reservoir would be constructed adjacent to the existing reservoirs.

Table 7-4 illustrates the existing 2023 deficiency and the projected storage if the proposed reservoir as described in CIP F3 is constructed and operational and the replacement East Campus Well has been completed per CIP F6.

Table 7-4

Storage Capacity Evaluation with Proposed Reservoir and East Campus Well Improvements

Description	Existing 2023	Projected 2034[1] (+10 Years)	Projected 2044[1] (+20 Years)
Usable Storage (MG)			
Maximum Storage Capacity	0.73	1.23	1.23
Dead (Non-Usable) Storage	0.00	0.00	0.00
Total Usable Storage	**0.73**	**1.23**	**1.23**
Required Storage (MG)			
Operational Storage	0.15	0.15	0.15
Equalizing Storage	0.00	0.00	0.00
Standby Storage	0.35	0.12	0.12
Fire Flow Storage	0.96	0.96	0.96
Total Required Storage	**1.45**	**1.23**	**1.23**
Surplus or Deficient Storage (MG)	**(0.72)**	**0.00**	**0.00**

[1] = Assumes East Campus Well replacement is drilled and operational (CIP F5).

Facility Deficiencies

The Lower Reservoir and Upper Reservoir are 121 years old and 84 years old, respectively, and have reached the end of their design life. As described in **Chapter 9**, WSH plans to demolish the two reservoirs due to structural deficiencies (CIP F1). CIP F3 describes the construction of one new reservoir sized to provide the required storage. In the event the WSH water system is consolidated into LWD's water system, it will be the responsibility of LWD to determine if storage is required after the demolition of the existing tanks and, if so, to facilitate the design and construction of additional storage to support the WSH water system.

DISTRIBUTION AND TRANSMISSION SYSTEM

This section evaluates WSH's existing distribution and transmission system (i.e., water mains) to determine if they are adequately sized and looped to provide the necessary flow rates and pressures to meet the existing and future requirements of the system. This section also identifies deficiencies that are not related to the capacity of the water mains.

Analysis Criteria

Distribution and transmission mains must be capable of adequately and reliably conveying water throughout the system at acceptable flow rates and pressures. The criteria used to evaluate WSH's distribution and transmission system are the state mandated requirements for Group A water systems contained in WAC 246-290-230 – Distribution Systems. The pressure analysis criteria state that the distribution system "…shall be designed with the capacity to deliver the design PHD quantity of water at 30 psi (210 kPa) under PHD flow conditions measured at all existing and proposed service water meters…" It also states that if fire flow is to be provided, "… the distribution system shall also provide MDD plus the required fire flow at a pressure of at least 20 psi (140 kPa) at all points throughout the distribution system…"

Hydraulic analyses of the existing system were performed under existing PHD conditions to evaluate its current pressure capabilities and identify existing system deficiencies. The existing system also was analyzed under existing MDD conditions to evaluate the current fire flow capabilities and identify additional existing system deficiencies. Additional hydraulic analyses were then performed with the same hydraulic model under future PHD and MDD conditions with the proposed improvements to demonstrate that the identified improvements will eliminate the deficiencies and meet the requirements far into the future. The following is a description of the hydraulic model, the operational conditions, and facility settings used in the analyses.

Hydraulic Model

Description

A computer-based hydraulic model of the existing water system was developed in the WaterGEMS program (developed by Bentley Systems, Inc.). All known water mains in the water system, including dead-end mains, were included in the model and were based on water system mapping and as-built records provided by the Washington State Department of Social and Health Services. Junction node elevations were assigned based on 2-foot-interval contour data obtained from Pierce County.

Demand Data

The hydraulic model of the existing system contains demands based on historical water demand data provided by WSH. The peaking factors calculated in **Chapter 4** were used to analyze the system under PHD and MDD conditions.

The hydraulic model of the proposed system contains 10-year demand levels that are projected for the year 2034, and 20-year demand levels that are projected for the year 2044.

Facilities

The hydraulic model of the existing system contains all active existing system facilities. For the proposed system analyses in the years 2034 and 2044, the hydraulic model contains all active existing system facilities and proposed system improvements identified in **Chapter 9** for the 10- and 20-year planning periods, respectively.

The facility settings for the pressure analyses corresponded to a PHD event in the water system. All sources of supply that currently are available to the system or will be available in the future for the years 2034 and 2044 analyses during a peak period were operating at their typical high demand pumping rates. The reservoir levels were modeled to reflect full utilization of operational and equalizing storage. The operational conditions for the pressure analyses are summarized in **Table 7-5**.

Table 7-5

Hydraulic Analyses Operational Conditions

Description	PHD Pressure Analysis			Fire Flow Analysis		
	2023	2034	2044	2023	2034	2044
Demand	2023 PHD	2033 PHD	2043 PHD	2023 MDD	2023 MDD	2044 MDD
Lower Reservoir HGL (ft)	379	382	382	329	335	335
Upper Reservoir HGL (ft)	379	382	382	329[1]	335	335
East Campus Well	OFF	OFF	OFF	OFF	ON[2]	ON[2]
Farm Well	ON	ON	ON	ON	ON	ON
Lakewood Water District Emergency Intertie	OFF	OFF	OFF	OFF	OFF	OFF

HGL = hydraulic grade line

[1] = Reservoir level set to empty to maintain the hydraulic grade with the Lower Reservoir.

[2] = Assumes East Campus replacement well is drilled and operational.

Separate fire flow analyses were performed on the system to size distribution system improvements and calculate fire flow availability. The hydraulic model for the fire flow analyses contains settings that correspond to MDD events. All sources of supply that currently are available to the system during a peak period were operating at their normal pumping rates, and reservoir levels were modeled to reflect full utilization of operational, equalizing, and fire flow storage based on the maximum planning-level fire flow requirement. **Table 7-5** summarizes the operational conditions for the fire flow analyses for the existing and future planning periods.

Calibration

Hydraulic model calibration is the process of adjusting hydraulic model data so the model closely reflects actual system pressures and flows under similar demand and operating conditions. Initial Darcy-Weisbach roughness coefficients were entered into the model based on computed estimates of the coefficients from available pipe age and material data. For example, assuming that the internal surface of water pipes becomes rougher as it gets older, older water mains were assigned higher roughness coefficients than new water mains.

The hydraulic model was calibrated to reflect actual system pressures and flows. Hydrant flow tests were performed in 2021, with hydrant flows, static pressures, and residual pressures measured during each test for use in calibrating the hydraulic model. Pressure transducers recording at

2-second intervals were installed throughout the system during the flow tests to confirm the static and residual pressures at intermediate points in the system. The tests were performed with and without the LWD intertie supplying the system.

The majority of WSH's field fire flow results were found to be consistent with the hydraulic model results after adjusting pipe roughness coefficients within typical ranges in the hydraulic model. One inconsistent testing result was found in the south-central portion of the distribution system, between Buildings 20 and 21, while the LWD emergency intertie was supplying the system. This likely is due to closed or partially closed valves, incorrect water main diameters, or other differences between the modeled system configuration and field conditions. WSH will continue to investigate discrepancies, which will enable the hydraulic model calibration to be improved over time.

Hydraulic Analysis Results

Hydraulic analyses were performed to determine the capability of the system to meet the pressure and flow requirements identified in **Chapter 5** and contained in WAC 246-290-230. The first analysis was performed to determine the pressure throughout the system under existing (i.e., 2023) PHD conditions. The results of this analysis were used to identify locations of low and high pressures. To satisfy the minimum pressure requirements, the pressure at all water service locations must be at least 30 psi during PHD conditions. In addition, the system should not have widespread areas with high pressures, generally considered to be more than 120 psi. A summary of the available pressures from the results of this analysis is shown on **Figure 7-1**.

The second set of analyses was performed to determine the capability of the existing water system to provide fire flow throughout the system under MDD conditions. A separate fire flow analysis was performed for each node in the model where fire flow is provided to determine the available fire flow at a minimum residual pressure of 20 psi at all points throughout the distribution system and a maximum allowable water main velocity of 8 feet per second (fps). For each node analyzed, the resulting fire flow was compared to its general planning-level fire flow requirement, which was assigned according to the fire flow requirements listed in **Table 4-6**. As is typical of most water systems, WSH's distribution system was constructed to meet fire flow requirements that were in place at the time of construction. Increases in fire flow requirements over time may create deficiencies. A summary of the results of this analyses for distribution system nodes is shown on **Figure 7-2**.

Deficiencies

As shown on **Figure 7-1**, customer pressures range from 44 psi to 89 psi throughout the distribution system. The highest pressures are observed north of Building 22. The lowest pressures in the system are in the southern portion of the system, between the Farm Well and the Upper and Lower Reservoirs. As pressure ranges are within DOH requirements, no improvements are necessary to resolve distribution system pressure deficiencies.

While some areas of the system can currently provide planning-level fire flow while maintaining pressures above 20 psi and velocities below 8 fps, many areas of the system are not capable of providing planning-level fire flow within these parameters, as shown on **Figure 7-2**. This does not

necessarily represent an existing deficiency, as existing buildings were approved with the fire flow available at the time of their construction. CIP WM1, described in **Chapter 9**, identifies the water main improvements required to increase the available fire flow to at least the planning-level requirements shown in **Table 4-6**. All new water main installations are required to use cement mortar lined ductile iron water main in accordance with WSH's Construction Standards and Specifications, which are contained in **Appendix H**.

Figure 7-3 and **Figure 7-4** illustrate the future distribution system pressures and available fire flow with the improvements discussed in **Chapter 9** incorporated. These future hydraulic analyses are based on the scenario where DSHS maintains ownership of the WSH water system. If LWD consolidates the WSH water system into the LWD system, additional hydraulic analyses that include the WSH system should be performed in LWD's evaluation of their future system as a whole.

TELEMETRY AND SUPERVISORY CONTROL SYSTEM

This section evaluates WSH's telemetry and supervisory control system to identify deficiencies related to its condition and current operational capability.

Evaluation and Deficiencies

WSH does not have a supervisory control and data acquisition (SCADA) system and as such, does not have remote operation and monitoring capability. Instead, WSH manually tracks reservoir levels and well pump flows and pressures. WSH will install a SCADA system in the future as described in CIP M7 in **Chapter 9**.

SYSTEM CAPACITY SUMMARY

This chapter, along with the analyses contained in **Chapter 6**, evaluates the capacity of WSH's existing and future water system components (supply, storage, transmission, and water rights) to determine whether it can support existing and new water service connections under the scenario where DSHS maintains ownership of the WSH water system.

Based on the results of the analyses, storage is the limiting factor in the capacity of the existing supply, storage, transmission, and water rights components of the water system. All other components of the existing system have excess capacity; however, they have other deficiencies not related to capacity that should be resolved with the CIP projects recommended in **Chapter 9**.

Once the proposed storage improvements are complete, the water system in the future will be limited by the annual water rights capacity. Although the annual water rights are more than sufficient to meet the projected demand requirements of the system through 2044, the projects recommended in **Chapter 9** are required to support the future system for non-capacity related needs such as system redundancy, reliability, and improved operations and maintenance.

The growth of the WSH water system is based upon the number of beds available for the patient population. If WSH is interested in growing beyond what is described in **Chapter 4** and the *Western State Hospital Master Plan 2020*, it will need to confirm sufficient storage and water rights are available to support that growth.

If LWD consolidates the WSH into their system, LWD should perform additional analyses with the two systems connected to confirm that the consolidated system has sufficient capacity as a whole.

Legend

- Western State Hospital Campus Area
- Western State Hospital Water Service Area (Retail and Future)

Water System Facilities

- Reservoir
- Well
- Intertie

Water Main by Diameter

- < 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- Lakewood Water District Water Main

Peak Hour Demand Pressures

- 40 psi to 50 psi
- 50 psi to 60 psi
- 60 psi to 70 psi
- 70 psi to 80 psi

Lakewood Water District Emergency Intertie (81st St SW)

East Campus Well (500 gpm) (Offline)

Lakewood Water District
Oakbrook Tank
0.50 MG
Ground Elev: 225'
Base Elev: 370'
Overflow Elev: 404'

Oakbrook Wells
O-2 (1,000 gpm) & O-3 (1,000 gpm)

Oakridge Group Home

Lower Reservoir
0.32 MG
Overflow Elev: 389'
Height: 60'

Upper Reservoir
0.41 MG
Overflow Elev: 389'
Height: 44'

Farm Well (1,000 gpm)

Waughop Lake

GOLF COURSE RD SW
81ST ST SW
GARRISON SPRINGS RD
SETTLERS ST
SOUTH ST
BRANCH ST
FORT ST
COTTAGE ROW
STEILACOOM BLVD SW
WAUGHOP LAKE RD SW
ANGLE LN SW
KIDS FIRST PL
TERRACE RD SW
DALTON DR SW
HAVILAND AV SW
NIXON AV SW
92ND ST SW
NORTH WY SW
94TH ST SW
FIR GLEN RD SW
RUSTIC LN SW
95TH ST SW
ELWOOD DR SW
HIPKINS RD SW
WEDGEWOOD CT SW
FARWEST DR SW
MARIETTA ST
MT TACOMA DR SW
93RD STCT SW
92ND STCT SW
91ST STCT SW

Vicinity Map

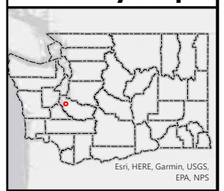


Figure 7-1
Peak Hour Demand Pressure
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services
Transforming lives

1 inch : 300 Feet

0 150 300 600 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00668\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: LMOJARAB PLOT DATE: SEP 20, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

Legend

- Western State Hospital Campus Area
- Western State Hospital Water Service Area (Retail and Future)

Water System Facilities

- Reservoir
- Well
- Intertie

Water Main by Diameter

- < 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- Lakewood Water District Water Main

Available Fire Flow

- < 1,500 gpm
- 1,500 to 2,000 gpm
- 2,000 to 2,500 gpm
- 2,500 to 3,500 gpm

Lakewood Water District Emergency Intertie (81st St SW)

East Campus Well (500 gpm) (Offline)

Lakewood Water District
Oakbrook Tank
0.50 MG
Ground Elev: 225'
Base Elev: 370'
Overflow Elev: 404'

Oakbrook Wells
O-2 (1,000 gpm) & O-3 (1,000 gpm)

Oakridge Group Home

Lower Reservoir
0.32 MG
Overflow Elev: 389'
Height: 60'

Upper Reservoir
0.41 MG
Overflow Elev: 389'
Height: 44'

Farm Well (1,000 gpm)

Waughop Lake

2,350 gpm
380 gpm
340 gpm
390 gpm

1,870 gpm
700 gpm
2,080 gpm
1,860 gpm
1,940 gpm
1,960 gpm
2,190 gpm
1,190 gpm
1,870 gpm
2,000 gpm
700 gpm
2,130 gpm
2,190 gpm
2,440 gpm
2,320 gpm
1,210 gpm
630 gpm
2,290 gpm
1,250 gpm
2,100 gpm
1,530 gpm
1,250 gpm
1,940 gpm
2,280 gpm
2,310 gpm
1,250 gpm
2,050 gpm
2,490 gpm
550 gpm
710 gpm
2,430 gpm
2,020 gpm
700 gpm
2,240 gpm
700 gpm
1,260 gpm
870 gpm
1,950 gpm
440 gpm
2,230 gpm
990 gpm
1,910 gpm
2,310 gpm
3,230 gpm
1,850 gpm
1,800 gpm
1,870 gpm
3,450 gpm

1 2 3 4 5 6 8 9 10 11 13 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 32 33 34 35 36 41 42 43 44 50 51 52 53 54 55 56

GARRISON SPRINGS RD
79TH ST SW
81ST ST SW
ONYX DR SW
GOLF COURSE RD SW
KIDS FIRST PL
82ND ST SW
83RD ST SW
84TH ST SW
AV SW
STEILACOOM BLVD SW
FORT ST
WAUGHOP LAKE RD SW
PICKETT ST
SENTINEL DR
WEST ST
RIGNEY RD
MARIETTA ST
91ST ST CT SW
92ND ST CT SW
93RD ST SW
93RD ST CT SW
95TH ST SW
MT TACOMA DR SW
FARWEST DR SW
CARVER RD SW
HAVOC SW
DAWSON ST SW
TERRACE RD SW
DALTON DR SW
HAVILAND AV SW
NIXON AV SW
LENOX AV SW
HOPKINS RD SW
WEDGEWOOD CT SW
ELWOOD DR SW
ANGLE LN SW
NORTH WY SW
94TH ST SW
FIR GLEN RD SW
RUSTIC LN SW
93RD ST SW

This map is a graphic representation derived from the Dept. of Social and Health Services (DSHS) Geographic Information System. It was designed and intended for DSHS staff use only; it is not guaranteed to survey accuracy. This map is based on the best information available on the date shown on this map.

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Vicinity Map

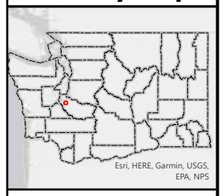

Figure 7-2
Existing Available Fire Flow
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services
Transforming lives

1 inch : 300 Feet

0 150 300 600 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00689\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSPIDSHS_WSH_2024WSP.APRX BY: LMOJARAB PLOT DATE: SEP 20, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

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- Intertie

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- 8-inch
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- 12-inch
- 16-inch
- Lakewood Water District Water Main

Peak Hour Demand Pressures

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- 50 psi to 60 psi
- 60 psi to 70 psi
- 70 psi to 80 psi

Lakewood Water District Emergency Intertie (81st St SW)

East Campus Well Replacement (1,400 gpm) (CIP F5)

Lakewood Water District
Oakbrook Tank
0.50 MG
Ground Elev: 225'
Base Elev: 370'
Overflow Elev: 404'

Oakbrook Wells
O-2 (1,000 gpm) & O-3 (1,000 gpm)

Oakridge Group Home

Proposed Reservoir
1.71 MG
Overflow Elev: 389'
Height: 60'

Farm Well (1,000 gpm)

Waughop Lake

GOLF COURSE RD SW
79TH ST SW
81ST ST SW
ONYX DR SW
GARRISON SPRINGS RD
WEST ST
SENTINEL DR
PICKETT ST
SOUTH ST
FORT ST
STEILACOOM BLVD SW
WAUGHOP LAKE RD SW
KIDS FIRST PL
82ND ST SW
83RD ST SW
84TH ST SW
AV SW
TERRACE RD SW
DALTON DR SW
HAVILAND AV SW
NIXON AV SW
92ND ST SW
NORTH WY SW
94TH ST SW
95TH ST SW
FIR GLEN RD SW
RUSTIC LN SW
LENOX AV SW
HAWKINS RD SW
WEDGEWOOD CT SW
ELWOOD DR SW
ANGLE LN SW
MARIETTA ST
91ST STCT SW
92ND STCT SW
93RD ST SW
93RD STCT SW
FARWEST DR SW
CHAMBERS CREEK RD W
DIVISION LN SW
95TH ST SW
MT TAHOMA DR SW

60 psi 59 psi 56 60 psi 51 50 64 psi 62 psi 28 29 66 psi 71 psi 67 psi 22 68 psi 54 58 psi 52 53 63 psi 66 psi 62 psi 55 64 psi 35 32 33 2 34 36 63 psi 1 3 4 5 6 8 9 62 psi 41 42 61 psi 17 10 15 11 62 psi 13 43 44 61 psi 60 psi 60 psi 16 18 27 24 63 psi 26 25 23 21 20 19 62 psi 63 psi 64 psi 63 psi 56 psi 63 psi 44 psi

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Vicinity Map

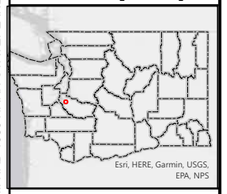


Figure 7-3
Peak Hour Demand Pressure
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services
Transforming lives

1 inch : 300 Feet

0 150 300 600 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00668\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: LMOJARAB PLOT DATE: SEP 20, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

Figure 7-4
2044 Available Fire Flow
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Legend

- Western State Hospital Campus Area
- Western State Hospital Water Service Area (Retail and Future)

Water System Facilites

- Reservoir
- Well
- Intertie

Water Main by Diameter

- < 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 16-inch
- Lakewood Water District Water Main

Available Fire Flow

- 2,500 to 3,000 gpm
- 3,000 to 3,500 gpm
- 3,500 to 4,000 gpm
- > 4,000 gpm

Lakewood Water District Emergency Intertie (81st St SW)

East Campus Well Replacement (CIP F5) (1,400 gpm)

Lakewood Water District
Oakbrook Tank
0.50 MG
Ground Elev: 225'
Base Elev: 370'
Overflow Elev: 404'

Oakbrook Wells
O-2 (1,000 gpm) & O-3 (1,000 gpm)

Oakridge Group Home

Proposed Reservoir
1.71 MG
Overflow Elev: 389'
Height: 60'

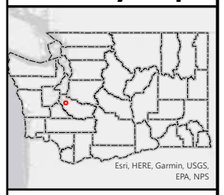
Farm Well (1,000 gpm)

Waughop Lake

4,930 gpm
5,400 gpm
4,210 gpm
4,300 gpm
4,840 gpm
5,120 gpm
4,890 gpm
4,650 gpm
4,000 gpm
4,430 gpm
2,810 gpm
3,550 gpm
3,950 gpm
4,790 gpm
4,610 gpm
4,390 gpm
5,490 gpm
4,810 gpm
5,300 gpm
4,110 gpm
4,500 gpm
4,530 gpm
4,730 gpm
4,440 gpm
4,340 gpm
4,720 gpm
4,680 gpm
4,040 gpm
6,090 gpm
5,100 gpm

GARRISON SPRINGS RD
GOLF COURSE RD SW
81ST ST SW
ONYX DR SW
KIDS FIRST PL
82ND ST SW
83RD ST SW
84TH ST SW
AV SW
STEILACOOM BLVD SW
FORT ST
WAUGHOP LAKE RD SW
PICKETT ST
WEST ST
SOUTH ST
SENTINEL DR
FARWEST DR SW
MARIETTA ST
91ST STCT SW
92ND STCT SW
93RD ST SW
93RD STCT SW
95TH ST SW
MT TACOMA DR SW
DALTON DR SW
HAVILAND AV SW
NIXON AV SW
92ND ST SW
NORTH WY SW
94TH ST SW
FIR GLEN RD SW
RUSTIC LN SW
95TH ST SW
ELWOOD DR SW
HIPKINS RD SW
WEDGEWOOD CT SW
ANGLE LN SW
TERRACE RD SW
LENOX AV SW

Vicinity Map



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Washington State Department of Social & Health Services
Transforming lives

1 inch : 300 Feet
0 150 300 600 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00681PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: LMOJARAB PLOT DATE: SEP 20, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

8 | OPERATIONS AND MAINTENANCE

INTRODUCTION

The Western State Hospital (WSH) water operations and maintenance (O&M) program consists of the following elements:

1. Normal operation of the water supply, treatment, and distribution system.
2. Emergency operation of the water system, with one or more of the components not available for normal use due to natural or human-made events.
3. Preventive maintenance program for ensuring the water system is maintained in accordance with generally accepted standards.
4. Cross-connection control program, as required by state law, to ensure there is no threat to the integrity of the water supply due to contamination from a customer's operations.

NORMAL OPERATIONS

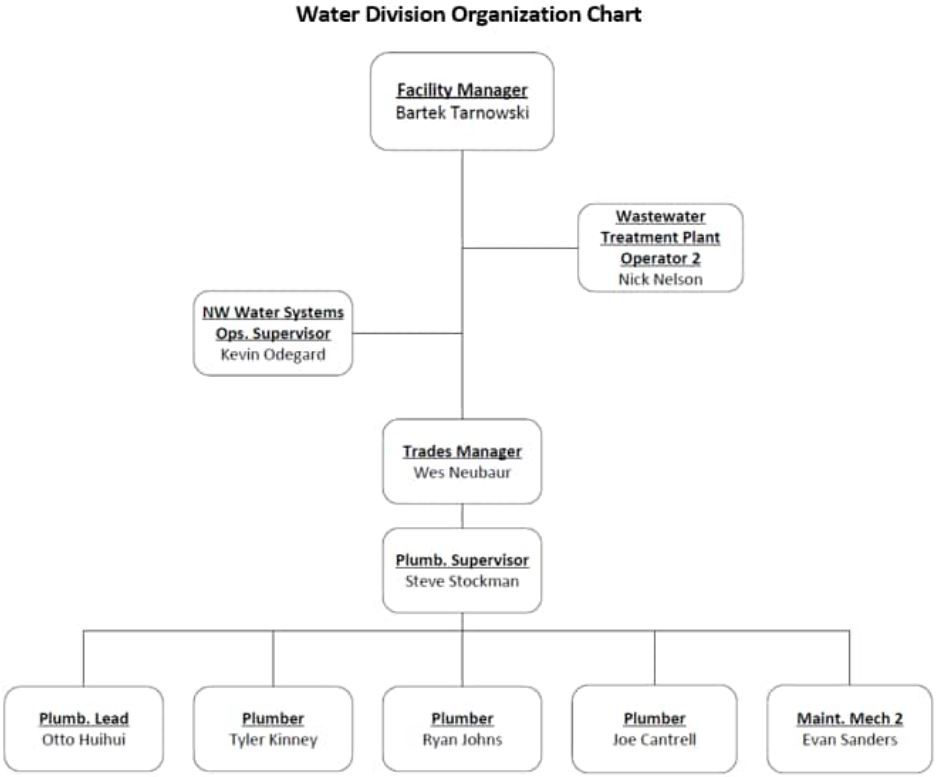
WSH Personnel

WSH's water system personnel are under the direction of the Facility Manager. As shown in **Figure 8-1**, the Water Distribution Manager supervises daily operation of the Water and Sewer, and reports to the Facility Manager. The Trades Manager, who also reports to the Facility Manager, supervises daily operations of the Plumbing Division.

As shown in **Figure 8-1**, the Water Division Operations staff consists of one Water Distribution Manager and cross-connection control specialist, one system operator on record, one trades manager, one Plumbing Supervisor, and several operations and maintenance staff that function under the Facility Manager of the Division. The water system tasks that are performed by the Water Division include inspecting, testing, installing, and repairing system facilities, routine operation and preventive maintenance, recordkeeping, administrative tasks, general clerical work, and corrective or breakdown maintenance required in response to emergencies.

Figure 8-1

Water Division Organization Chart



Personnel Responsibilities

The key responsibilities of the water operations and maintenance staff are summarized in **Table 8-1**.

Table 8-1

Personnel Duties and Responsibilities

Personnel	Duties and Responsibilities
Facility Manager	Annual Budget Capital Improvement Planning Annual Work Planning Public and Press contact Emergency Response Records
Water Distribution Manager (WDM2 CCS)	Emergency response Capital Improvement Planning Annual Work Planning State & Federal Compliance Records Quality Monitoring
System Operator	Annual Work Planning State and Federal Compliance Administrative Support Records Annual Work Planning
Trades Manager	Emergency Response Annual Work Planning Work Plan Implementation Trouble Reports Quality Monitoring
Plumbing Supervisor / Shop	Source Maintenance & Trouble Shooting New service Install Fire Hydrant Maintenance Valve Exercising
Office of Capital Programs	Design Services & Construction Engineering Bids Calls & Permits Records

Certification of Personnel

Chapter 246-292 Washington Administrative Code (WAC) requires that WSH's water system is operated under the direct supervision of a Certified Operator. WSH's water system requires a Water Distribution Manager. In addition, specialty certification is required for backflow device inspection and testing.

WSH is in full compliance with current laws and regulations regarding staff certification and training. Numerous WSH employees possess Washington State Department of Health (DOH) certifications. **Table 8-2** shows the current certifications of WSH's O&M staff that are pertinent

to the operation of the water system. It is a WSH policy to maintain a well-qualified, technically trained staff. WSH annually allocates funds for personnel training, certification, and membership in professional organizations such as the American Water Works Association (AWWA). WSH believes that the time and money invested in training, certification, and professional organizations are repaid many times in improved safety, skills, and confidence.

Table 8-2

Personnel Certification

Operator Name	Certifications	Certificate
Nick Nelson Water Distribution Manager	WDM2 WDS CCS WTP0-IT1 BTO	#10392
Kevin Odegard System Operator	WDM3 WDS CCS WTP01 BTO	#6962
Sean Burns System Operator	WDM2 WTP01 CCS	#12946
Steve Stockman	WDM1	#15136
Otto HuiHui	BAT	B-7901
Evan Sanders	BAT	B-8088

Available Chemicals and Equipment

Rolling Stock

The Water Division owns its own stock and are readily available for use any given moment. The Water Division utilizes one pickup, two vans, one crane truck, and one flatbed truck on a regular basis. Larger pieces of equipment (dump trucks, loaders, mini-hoe, Vactor truck) are available for use when needed and part of the WSH fleet. A complete list of WSH's available rolling stock is in **Table 8-3**.

Table 8-3

WSH Rolling Stock

Asset #	Make	Model
A263259	FORD	RANGER
A610164	FORD	F350 CRANE TRUCK
A628114	CHEVY	ASTROVAN
A630798	FORD	E-150
A491738 A491737 A491735	INTERNATIONAL INTERNATIONAL INTERNATIONAL	BOX TRUCK BOX TRUCK BUCKET TRUCK
A405579	CHEVY	3500
A680647 A676047 A680701 A684909 A644761 A644762	ISUZU ISUZU ISUZU ISUZU ISUZU ISUZU	BOX TRUCK BOX TRUCK FLATBED BOX TRUCK BOX TRUCK BOX TRUCK
A491734	PETERBUILT	SEMI TRUCK
WSH-001 WSH-021 WSH-007	GENIE GENIE JLG	TELEHANDLER TELEHANDLER TELEHANDLER
WSH-014 WSH-019 WSH-032	HYSTER HYSTER HYSTER	FORKLIFT FORKLIFT FORKLIFT
WSH-024 WSH-026	JOHN DEERE JOHN DEERE	BACKHOE BACKHOE
WSH-85	JETTER	JETTER

Small Equipment

The Water Division has a variety of small equipment that it purchases and maintains on its own. This includes dewatering pumps, pipe cutters, shovels, wrenches, water jitters, etc.

Supplies

Supply items are maintained in inventory by the Warehouseperson. It is the Plumbing supervisor's responsibility to set stock quantities. The Warehouseperson will maintain the

inventory above the minimum levels. The inventory of supplies with their re-order level is maintained in a computer database.

Chlorine

All orders are handled directly with the vendor and the Water Distribution Manager. Chlorine is ordered on an as-needed basis. An annual contract is maintained between WSH and Garret Callahan to ensure chlorine deliveries/availability and routine maintenance on the chlorination system.

Routine Operations

Routine operations involve the analysis, formulation, and implementation of procedures to ensure that the facilities are functioning efficiently, and meeting pressure requirements and other demands of the system. The utility's maintenance procedures include prompt response and repairs to ensure customers receive high-quality water service.

Continuity of Service

WSH has the structure, stability, authority, and responsibility to ensure that water service will be continuous. For example, changes in the City Council or staff would not have a pronounced effect on WSH's customers or quality of service.

Routine Water Quality Sampling

DOH has adopted federal regulations that specify minimum monitoring requirements for water systems. The sampling requirements depend on the population served, source type, and treatment provided. The specific requirements and the minimum monthly routine coliform sampling requirements are contained in WAC 246-290-300. DOH also provided WSH with an annual summary of all required water quality testing. WSH currently performs all routine coliform sampling throughout the distribution system. Further discussion of the water quality monitoring program is contained in **Chapter 6** and **Appendix L**.

Cross-Connection Control

WSH has adopted a cross-connection control program to comply with WAC 246-290-490 pertaining to contamination of potable water due to cross connections. WSH's Cross-Connection Control Program is included in **Appendix F**. Backflow prevention devices are required at service connections where a potential for contamination exists.

Recordkeeping and Reporting

DOH has enacted regulations for recordkeeping and reporting that may be found in WAC 246-290-480. The regulations identify recordkeeping and reporting procedures for operations and water quality testing.

Records are compiled and stored by each respective division that is responsible for the activity being documented. The Facility Manager, Office of Capital Programs, and the Water Distribution Manger all maintain records of capital projects, records of water quality programs and drinking water regulations, and records of water distribution system operation and maintenance/repairs. Standard monitoring and public notification forms can be found in **Appendix M**. also maintain records of purchasing, bidding (non-capital projects), and other miscellaneous records. Official capital project bidding and construction documents are maintained by the Office of Capital Programs. Records are maintained in accordance with the Washington State records retention regulations. The Facility Manager maintains the retention schedule of all WSH documents. The Facility Manager, Office of Capital Programs, and the Water Distribution Manger assists with records retention for Public Works, including Engineering, Water Quality, and Water Operations. The Office of Capital Programs maintain a schedule of project files, file numbering system, and file storage location. Other records are stored locally at each division. Water operations, maintenance, and repair records are maintained electronically through WSH's file system. Each year maintenance records are reviewed for the annual report. The Facility Manager and WDM are responsible for submitting all state-required monthly forms to the appropriate agencies.

Recordkeeping

Records shall be kept for chlorine residual and other information as specified by DOH. DOH requires retention of critical records dealing with facilities and water quality issues as summarized as follows:

- Bacteriological analysis results: 5 years.
- Chemical analysis results: for as long as the system is in operation.
- Daily source meter readings: 10 years.
- Other records of operation and analyses as may be required by DOH: 3 years.
- Documentation of actions to correct violations of primary drinking water standards: 3 years after last corrective action.
- Records of sanitary surveys: 10 years.
- Project reports, construction documents and drawings, inspection reports, and approvals: life of the facility.
- Construction Completion Reports: life of the facility.

Reporting

1. WSH must report the following to DOH:
    - Within 48 hours: A failure to comply with the primary standards or treatment technique requirements specified in Chapter 246-290 WAC.
    - Within 48 hours: A failure to comply with the monitoring requirements specified in Chapter 246-290 WAC.

- As soon as practical, but no later than 24 hours: All Tier 1 violations, including a violation of a primary maximum contaminant level (MCL). A complete list of Tier 1 violations is located in Code of Federal Regulations (CFR) 141.202.
- As soon as practical, but no later than 24 hours: A backflow incident per WAC 246-290-490(8)f.

2. WSH must submit to DOH all applicable reports required by Chapter 246-290 WAC. Monthly reports are due by the tenth day of the following month, unless otherwise specified.
3. Daily source meter readings must be made available to DOH on request.
4. Total annual water production records for each source must be made available to DOH upon request.
5. A Water Facilities Inventory (WFI) form must be submitted to DOH within 30 days of any change in name, category, ownership, or responsibility for management of the water system.
6. WSH must notify DOH of the presence of:
    - Coliform in a sample within 10 days of notification by the testing laboratory; and
    - Fecal coliform or *E. coli* in a sample by the end of the business day in which WSH is notified by the testing laboratory.
7. When a coliform MCL violation is determined, WSH must:
    - Notify DOH within 24 hours of determining acute coliform MCL violations;
    - Notify DOH before the end of the next business day when a non-acute coliform MCL is determined; and
    - Notify water customers in accordance with WAC 246-290-495.
8. If volatile organic compound (VOC) monitoring is required, a copy of the results of the monitoring and any public notice must be sent to DOH within 30 days of receipt of the test results.

Other Reports

Several other reports are required for Washington State agencies, including the Department of Revenue, Department of Labor and Industries, Department of Social and Health Services, Department of Ecology, and the Employment Security Department. All these reports are completed according to their instructions.

Operations and Maintenance Records

WSH records include, but are not limited to, the information presented in **Table 8-4**.

Table 8-4

WSH Records

Record Type	Duration Kept
Source Meter Readings	Daily Records Kept Indefinitely
Maximum Day Demand	Records Kept Indefinitely
Service Meter Readings	No Meters, N/A
Bacteriological Test Results	Records Kept Indefinitely
DOH Correspondence, incl. Sanitary Surveys	Records Kept Indefinitely
Legal Documents	Records Kept Indefinitely
Backflow Device Inspections	Records Kept Indefinitely
Water Quality Complaints	Records Kept Indefinitely
O&M Manuals	Records Kept Indefinitely
Personal Records	Records Kept Indefinitely

Safety Procedures and Equipment

Safety is a primary concern and responsibility of all water O&M staff. WSH has taken steps toward educating its staff and providing resources to ensure a safe working environment. WSH will strive to improve its safety program on an ongoing basis. AWWA publishes a manual entitled *Safety Practices for Water Utilities (M3)* that describes safety programs and provides guidelines for safe work practices and techniques for a variety of water utility work situations.

The following identifies procedures to be followed for O&M tasks that involve the most common potential workplace hazards in the water system.

Use of Chlorine or Chlorine Products

Standard Procedure – Handle with care, provide adequate ventilation, and wear safety glasses and rubber gloves. Follow material safety data sheets (MSDS).

Use of Water Treatment Chemicals

Standard Procedure – Follow material safety data sheets (MSDS) and facility standard operating procedures.

Working in Confined Spaces

Standard Procedure – Follow state requirements for confined space entry and adhere to MOD safety program.

Working around Heavy Equipment

Standard Procedure – Obtain proper training and follow all safety procedures and programs.

Working in Traffic Areas

Standard Procedure – Wear proper clothing and provide adequate signage and flagging for work area.

Working on or around Water Reservoirs

Standard Procedure – Follow proper safety harness procedures for working on tall structures and adhere to MOD safety programs.

Working in or around Pump Stations

Standard Procedure – Obtain proper training and follow all safety procedures for working on pumps and electrical equipment.

Working on Asbestos Cement Water Main

Standard Procedure – Obtain proper training and follow all safety procedures for working with asbestos materials.

The Public Works & Utilities Department follows all appropriate Occupational Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) regulations in its day-to-day operations and complies with the following state requirements:

- WAC 296-62-145 to 14529 Part M – Entry into confined spaces.
- WAC 296-155-650 to 66411 Part N – Shoring of open ditches.
- WAC 296-155-429 – Lockout-tagout for work on energized or de-energized equipment or circuits.
- Chapter 296-155 WAC Part C1 – Fall restraint for access to the top of WSH's water reservoirs.
- *Manual on Uniform Traffic Control Devices* (MUTCD) – Traffic control for work in the public right-of-way.

Additional safety procedures are documented in the Water Division's Safety Manual.

EMERGENCY OPERATIONS

Capabilities

WSH is well equipped to accommodate short-term system failures and abnormalities in accordance with WAC 246-290-420. Its capabilities are as described in the sections that follow.

Emergency Equipment

WSH is equipped with the necessary tools to deal with common emergencies. If a more serious emergency should develop, WSH/OCP will hire a local contractor who has a stock of spare parts necessary to make repairs to alleviate the emergency condition.

Emergency Telephone

During the regular workday, water emergencies are routed to the appropriate department and facility manager. After-hours water emergencies are routed to the 24/7 monitored phone line in the powerhouse (253-756-2519) and/or WSH switchboard. The powerhouse has a preset list of instructions and phone numbers for all after hour emergent events, resulting in the facility manager being notified of the event. Any calls made to 911 are received by the local police department, which is in operation 24 hours a day, 7 days a week year-round. Police records personnel make direct contact with the standby duty person and relay the emergency information.

On-Call Personnel

WSH maintenance and operations division is staffed 24/7, 7 days a week and located on campus of WSH. In the event of an after-hours emergency, the trouble shooter or maintenance technician responds, assesses the situation, and takes appropriate action to resolve the emergency. Appropriate action may include calling out other qualified, knowledgeable, or appropriately certified individuals. The duty person notifies the Facility Manager about all water emergencies as they occur.

New employees are not placed into duty until they are familiar with the water system and maintenance procedures and have met the minimum standards, certification, and qualifications.

Material Readiness

Some critical repair parts, tools, and equipment are on-hand and kept in fully operational condition. As repair parts are used, they are re-ordered. Inventories are kept current and adequate for most common emergencies that reasonably can be anticipated. WSH has ready access to an inventory of repair parts, including parts required for repair of each type and size of pipe within the service area.

Notification Procedures

If a water quality emergency develops, the current procedure is for the Facility Manager or Water Distribution Manager to contact DOH either at work or at home to discuss the situation. If it is determined that public notification is necessary, the Facility Manager will notify the WSH public affairs chief as soon as possible, as per the WSH Emergency Response Plan. The Facility Manager shall notify the Tacoma-Pierce County Health Department that day or the following day if during non-working hours. In addition, businesses served by the water source, will be notified of the situation. If it is deemed necessary, fliers may be delivered to the service connections that are affected.

Reservoirs

The risk of loss of a reservoir itself is considered low; however, it could conceivably become contaminated or otherwise inoperable for a period of time. If a reservoir must be inactivated, a Lakewood intertie will be opened to assist in providing system pressure.

Multiple Supply Capability

WSH could lose the operation of one of its supply sources without adversely impacting its ability to provide emergency supply to customers.

Distribution System

WSH has attempted to loop water mains wherever possible to improve water circulation (i.e., water quality) and minimize impacts to the system if a portion of the distribution system must be taken out of service for maintenance or repairs.

Vandalism

Vandalism to WSH's water system could take many forms. WSH's Emergency Response Plan (ERP) discusses the potential impacts of vandalism. If vandalism results in contamination or suspected contamination to the water system, the procedures discussed in the ERP would be followed.

Training

WSH's training procedures for emergency response are described in Chapter 6 of the ERP. These include drills, tabletop exercises, practice exercises, and full-scale exercises for water utility emergency events and region-wide events.

Vulnerability Assessment and Emergency Response Plan

A Vulnerability Assessment and Emergency Response Plan have been prepared that conform to the requirements of the Bioterrorism Act of 2002. The documents contain a vulnerability assessment of WSH's water system facilities, a contingency operation plan for responding to emergency events, a list of water personnel responsible for making decisions in emergency

situations, and other elements. The Vulnerability Assessment and Emergency Response Plan also contain action plans and other confidential information that is exempt from public disclosure under the provisions of Revised Code of Washington (RCW) 42.56.210. These documents are available for review by authorized personnel on a need-to-know basis. Contact the Emergency Response Plan Administrator for additional details.

Per America's Water Infrastructure Act (AWIA), which was enacted in 2018, WSH is required to complete an all-hazards risk and resilience assessment (RRA) and ERP. WSH's deadline to complete the RRA and submit a certification letter to the U.S. Environmental Protection Agency (EPA) is June 30, 2021. The ERP must be completed within 6 months of the RRA certification, or by December 31, 2021. The RRA and ERP documents have been prepared and certificates of completion were submitted to the EPA prior to the due dates.

Public Notification

The Federal Safe Drinking Water Act (SDWA) and WAC 246-290-495 require purveyors to notify their customers if any of the following conditions occur:

- Failure to comply with a primary MCL described under WAC 246-290-310.
- Failure to comply with a surface water treatment technique.
- Failure to comply with monitoring requirements under Chapter 246-290 WAC.
- Failure to comply with testing requirements.
- Failure to comply with a DOH order.
- Failure to comply with a variance or exemption schedule from DOH.
- If the system is identified as a source of waterborne disease outbreak.
- If DOH issues the system a category red operating permit.
- If DOH issues an order.
- If the system is operating under a variance or exemption.

Specific notice content, distribution channels, and time limit requirements, as specified in WAC 246-290-495, must be in compliance when notification is required.

WSH's public notification processes are included in the ERP. ERP Chapter 3 describes communications. ERP Appendix A includes a list of emergency contact people and organizations, including key staff, local, state, and federal agency contacts, contacts for utilities, including power, sewer, other water utilities, etc., chemical suppliers, and equipment suppliers. ERP Appendix C contains WSH communications staff roles and contact information for WSH's media outlets. ERP Appendix F1 contains priority water customer contact information.

Customer Complaint Process

Complaints are collected by office staff via e-mail or phone and routed to the Facility Manager Trades Supervisor, or Field Supervisors for follow up or crew dispatch in a timely manner. Follow-up results are reviewed by the Facility Manager, Trades Supervisor, or Field Supervisors

and recorded into the CMMS system. An Infrastructure Computerized Maintenance Management System is used to provide complaint tracking and confirm effective response.

PREVENTIVE MAINTENANCE

Maintenance schedules that meet or exceed manufacturer's recommendations have been established for all critical components in WSH's water system. Water quality and maintenance technicians conduct inspections and perform preventative/corrective maintenance on reservoirs, pressure reducing valves (PRVs), and other distribution system components at the frequency indicated in **Table 8-5**. Job standards have been developed for most maintenance tasks/activities performed by these technicians and are on file with WSH. **Table 8-5** shows the summarized operations and maintenance activities and the frequency by which they are completed.

Table 8-5

Operation and Maintenance Practices

Activity	Frequency
Well Inspection	Daily (Mon-Fri)
Chlorination System Inspection	Daily (Mon-Fri)
Record Well Production and Reservoir Data	Daily (Mon-Fri)
Flush Dead End Mains	Annually
Flush Fire Hydrants	Annually
Cross Connection Devices	Annually
Inspect and Clean Reservoir	5-Year
Exercise Generators	Weekly/Monthly/Annually
Control Valve Inspections	Monthly
Water Level Test	Daily
Water Tower Exterior Inspection	Quarterly
Control Valve Test	Annually

The following subsections list key preventive maintenance tasks that are performed by WSH.

Sources

Chlorination equipment and pumps are maintained at WSH's supply sources.

Pumps and Motors

When needed, pumps and motors are sent out to private companies for rebuilding and/or repair.

Chlorination Equipment

Chlorination equipment is checked daily. During daily checks, if any problems are immediately evident, the maintenance person will handle the repairs needed.

Reservoirs

A visual inspection of the Upper and Lower Reservoirs' interiors are conducted in 5-year intervals.

Emergency Generators

Emergency generators are inspected and ran Weekly, Monthly, and Annually. Emergency generators are serviced annually by WSH shop personnel under a 4-hour full load test as per NFPA 110.

Distribution System

WSH conducts several tasks with regard to the distribution system as part of its preventive maintenance program. These tasks include leak detection and repair, hydrant testing and repair, valve exercising, cross-connection device testing, meter inspection, and air and vacuum valve maintenance.

Hydrant Testing

WSH maintains over 50 hydrants throughout the water system. The Water Division personnel exercise approximately 54 hydrants every year. When Water Division personnel discover a problem with a hydrant, they fill out a work request through a CMMS system to the Water Foreperson. The Foreperson then schedules the hydrant for repair; the Foreperson also sets the priority for repairing the hydrant. The hydrant repair book and manufacturer's catalog are kept in the Foreperson's office. The Foreperson also is responsible for ordering parts needed to repair hydrants.

Cross-Connection Devices

Approximately 110 backflow prevention assemblies/devices are installed in the water system. An inventory of the backflow prevention assemblies/devices is maintained by the

Cross-Connection Control Specialist. Each of the assemblies/devices are inspected and tested annually by a Washington State certified backflow assembly tester. The Cross-Connection Control Specialist notifies the property owner in advance by email that testing of the cross-connection device is required. The Cross-Connection Control Specialist then follows up on the notice and completes the necessary paperwork so the inventory of backflow assemblies/devices can be updated.

Meters

WSH Currently does not have any customer-based meters associated to buildings. A current project under the purview has been initiated to address the current need of building metering campus wide.

Air and Vacuum Assemblies

WSH maintains 1 air and vacuum valve in the water system that is located along the transmission line. Maintenance consists of semi-annual inspection for leaks by the Pump Maintenance Person. The air and vacuum valve are designed to be operated until failure; therefore, when leaks appear, the air and vacuum valves are rebuilt.

STAFFING

The preventive maintenance procedures, as well as the normal and emergency operations of the utility, are described in the previous sections. The hours of labor and supervisory activity required to effectively provide this ongoing maintenance and operations schedule forms the basis for determining adequate staffing levels.

Current Staff

Current staff include a Water distribution Manager that also serves as a cross-connection control specialist, a trades manager, a plumber supervisor, plumber lead, 3 plumbing staff members who serve as backflow assembly testers, 1 supporting maintenance mechanic, 6 after hour trouble shooter mechanics, a Facility Manager, a contracted Water Management firm, Contracted Chlorination system vendor, and office personnel engaged in operating and maintaining the water system. There are currently 15 full-time employees supporting the water system.

Recommended Staff Level

A water system is a complex assortment of equipment and parts that require both operation and maintenance. The estimated level of effort required to provide effective operation and maintenance in this document is based on a compilation of national standards, such as those provided by AWWA, and the pro-forma standards provided by similar water systems in the Pacific Northwest.

The available hours of a person during a year are not the total hours worked. There are many hours spent in training, non-work status, and other activities that deduct from the 2,080 hours in pay status during a year. The total available hours are typically reduced to 1,540, as shown in **Table 8-6**.

Table 8-6

Annual Available Hours per Person

Beginning Hours Available	2,080
Less average vacation of 3 weeks per year	-120
Less average sick leave of 2 weeks per year	-80
Less holidays of 10 days per year	-80
Less average training of 40 hours per year	-40
Less average 1 hour per day for miscellaneous tasks	-220
Net Total Available Hours Per Year Per Person	1,540

Preventive maintenance is the work performed to keep the water system in the condition necessary to provide the expected service. Preventive maintenance needs are based on the physical composition of the water system. Each component has a preventive maintenance need that ranges from minor to significant. **Table 8-7** provides the detail of the recommended staffing level for the water system's preventive maintenance program. As shown in **Table 8-7**, approximately 0.8 full-time employees are recommended for the preventive maintenance program.

Table 8-7

Preventive Maintenance Staff Needed

Description	Total Units in System	Frequency (Times/Year)	Time/Unit (Hours)	Time/Year (Hours)
Fire Hydrants	52	1	1	52
Isolation/Hydrant Valves	180	1	2	360
Air/Vacuum Release Valves	1	1	2	2
Blow-Off Assemblies	N/A	N/A	N/A	N/A
Source Meters	2	1	2	4
Leak Survey of Water Mains	7.2miles	N/A	N/A	N/A
Flushing of Water Mains	7.2miles	1	80	80
Sources	2	4	3	24
Reservoirs	2	4	16	128
Telemetry and Control Systems	1	1	3	3
Chlorination System	2	12	2	48
Back Flow Assemblies	110	1	2	220
Flushing of Dead Legs	10	4	2	80
Total Hours Required				1001
Total Full-Time Staff Required				.8

The other component of O&M staffing is operations. Operations includes all activities other than preventive maintenance, such as water meter reading and repair of broken water mains. As a system ages, many of these activities can be expected to increase. Some operations staff demands can be reduced by replacing infrastructure with more efficient technology. Each technology or equipment upgrade should be analyzed for cost effectiveness. **Table 8-8** provides the recommended staffing level for the water system's operations program and assumes meters will be installed on all service connections. As shown in **Table 8-8**, approximately 3.2 full-time employees are recommended for the operations program.

Table 8-8

Operations Staff Needed

Description	Total Units in System	Frequency (Times/Year)	Time/Unit (Hours)	Time/Year (Hours)
Monitor System (Hi/Lows)	1	2190	1	2190
False Alarm Response (Chlorine)	1	36	1	36
Meter Reading	2	260	.5	260
Groundskeeping	4	4	9	144
Inventory	1	1	40	40
Meter Repairs	2	1	1	2
Main Breaks	2	1	40	80
System Failures	1	4	8	32
Hydrant Repairs	52	1	1	52
Service Connections	572	1	1	572
Main Connections	2	2	32	128
Water Quality Sampling	1	12	8	96
Administration	1	260	4	1040
Residual Readings	1	260	1	260
Total Hours Required				4932
Total FTE Required (**based on 1533 hours per year**)				3.2

To achieve the level of operations and maintenance shown in **Table 8-9**, approximately 4 full-time personnel are required for the water system alone. In addition, as the water system expands in the future, additional review of staffing needs will be required. WSH plans to add staff to optimize preventive maintenance and meet the additional requirements from system expansion as the budget allows.

Table 8-9

Total Staffing Recommendation

Preventative Maintenance Hours	1001
Operations Hours	4932
Total Hours	**5933**
FTE Required	**3.9**

ASSET MANAGEMENT

WSH currently has a formal asset management program in place using a computerized maintenance management system (CMMS) software known as Asset Planner. The system software manages all WSH campus assets including life of asset, preventative maintenance schedules of asset, and corrective measures and/or repairs.

9 | WATER SYSTEM IMPROVEMENTS

INTRODUCTION

This chapter presents proposed improvements to Western State Hospital's (WSH) water system that are necessary to resolve existing system deficiencies and accommodate the projected growth of water customers. The water system improvements were identified from an evaluation of the results of the water system analyses presented in **Chapter 7**. The water system improvements were sized to meet both the existing and future demand conditions of the system.

The following Capital Improvement Program (CIP) scenarios have been developed for the purposes of this Water System Plan (WSP):

- **CIP Scenario 1:** DSHS maintains ownership of the WSH water system.
- **CIP Scenario 2:** Lakewood Water District (LWD) assumes ownership of the WSH water system and consolidates the system into LWD's water system.

The two CIP scenarios include various recommended water system improvements, which have each been assigned a CIP number. Some CIP projects are required under either scenario, whereas some projects are required for only one specific scenario. The CIP projects, along with their assigned numbers, are shown in plan view on **Figures 9-1** for CIP Scenario 1 and **Figure 9-2** for CIP Scenario 2. Each of the figures has accompanying detailed figures that show the projects at a larger scale. These detailed figures are shown in **Figure 9-1a** through **Figure 9-1l** for CIP Scenario 1 and **Figure 9-2a** through **Figure 9-2l** for CIP Scenario 2. The improvements also are illustrated in the hydraulic profile of the future water system on **Figure 9-3** for CIP Scenario 2.

The improvements are organized and presented in this chapter according to the following categories.

- Recent Water System Improvements
- Water Main Improvements
- Facility Improvements
- Miscellaneous Improvements
- Lakewood Water District Improvements

The remainder of this chapter presents a brief description of each group of improvements, the criteria for prioritization, the basis for the cost estimates, and the schedule for implementation.

DESCRIPTION OF IMPROVEMENTS

This section provides a general description of each group of improvements and an overview of the deficiencies they will resolve. Most of the improvements are necessary to resolve existing system deficiencies.

Recent Water System Improvements

The water system has not undergone many changes in the past 10 years. **Table 9-1** lists the projects that have been completed and are ongoing. As part of the New Forensic Hospital project, a

significant portion of the water main on the west campus in the vicinity of the project will be replaced with 12-inch water main. The new water main is currently being designed and is shown in **Figures 9-1** and **9-2**.

Table 9-1

Recent Improvements In Progress and Completed

Project Description	Year Completed
Temporary Disinfection Improvement Project	2021
New Forensic Hospital	Ongoing

Water Main Improvements

The following water main improvements were identified from the results of the distribution and transmission system analyses discussed in **Chapter 7**.

CIP WM1: Water Main Improvement Program

Background: Most of the water main improvements shown in **Figures 9-1** and **9-2** have been identified as required to meet planning-level fire flow requirements throughout the distribution system. As described in **Chapter 7**, these water mains do not necessarily represent an existing deficiency, as existing buildings were approved with the fire flow available at the time of their construction. CIP WM1 is intended to guide WSH's water main improvement program by identifying the approximate water main sizes required to meet planning-level fire flow throughout the system.

Improvements: Replace existing water main with new ductile iron water main in accordance with WSH's Construction Standards and Specifications, which are contained in **Appendix G**. The individual water main improvements grouped under this project are numbered 1, 2, 3, etc., as shown in **Figures 9-1** and **9-2**. The project design should include a review of the existing alignment, the location of service connections, hydrant spacing, and other adjacent water main and should make appropriate adjustments to meet the needs of the existing and future system to accommodate the *Western State Hospital Master Plan 2020*. The phasing of improvements should be planned to maintain an appropriate level of fire flow service throughout the implementation of the CIP.

A number of the projects listed in the Water Main Improvement Program will not be necessary under CIP Scenario 2 if LWD consolidates the WSH water system into their water system. **Table 9-2** presents the individual water main projects in CIP WM1 and identifies whether they are required under CIP Scenario 1 or 2.

Table 9-2

WM1 CIP Projects

CIP No.	Length (ft)	Existing Diameter (in)	Proposed Diameter (in)	Applicability	
				CIP Scenario 1 DSHS Maintains Ownership	CIP Scenario 2 WSH Consolidates into LWD System
1	3,305	10	12	X	
2	140	8	12	X	
3	1,351	12	16	X	
4	892	--[1]	3	X	
5	594	8	12	X	X
6	100	6	12	X	X
7	757	8	12	X	X
8	1,243	8	12	X	X
9	558	--[1]	12	X	X
10	1,497	10	12	X	X
11	1,027	8	12	X	X
12	1,588	10	12	X	X
13	332	6	12	X	X
14	8	--[1]	12	X	X
15	1,521	--[1]	12	X	
16	1,194	3	12	X	
17	1,245	6	12	X	X
18	2,045	--[1]	12	X	X
19	691	4	12	X	X
20	7	6	12	X	X
21	1,082	8	12	X	X
22	32	8	12	X	X
Total Linear Feet of Pipe to be Upsized:				**16,185**	**10,195**
Total Linear Feet of Pipe to be Constructed for System Looping:				**5,024**	**2,611**
Total All WM1 Projects:				**21,209**	**12,806**

[1] = New pipes recommended for system looping

CIP WM2: Hydrant Relocation Program

Background: A number of fire hydrants are located on dead ends. The campus' large fire flow requirements necessitate a minimum of 16-inch-diameter water main for hydrants located on dead-end water mains. Large water mains on dead ends may cause water quality issues and would be an expensive solution to providing the required fire flow.

Improvements: Where possible, relocate hydrants from dead ends to looped portions of the campus' water main. Hydrant relocations should be reviewed by Pierce County Fire and Rescue before completion.

CIP WM3: Abandon Water Main

Background: Portions of the water system are superfluous and may be abandoned.

Improvements: Abandon approximately 6,250 feet of water main that cannot or should not be used throughout the distribution system. The timing of the water main abandonment should be coordinated with other water main improvement projects to ensure adequate fire flow is maintained once the old water main is taken offline and water service connections are relocated to new or existing water main to remain.

Facility Improvements

The following water system facility improvements were identified from the results of the water system analyses that are discussed in **Chapter 7**.

CIP F1: Decommission Existing Lower and Upper Reservoirs

Background: The Lower and Upper Reservoirs have reached the end of their useful life.

Improvements: Demolish the existing Lower and Upper Reservoirs, which have reached the end of their useful life. Under CIP Scenario 1, this project should be coordinated with the proposed reservoir replacements projects, CIP F2 and CIP F3.

CIP F2: Reservoir Siting Study

Background: The existing Lower and Upper Reservoirs do not have sufficient storage capacity to meet the existing or future water system needs and have reached the end of their useful life. WSH is aware of environmental limitations on property adjacent to the existing reservoirs and desires to complete a reservoir siting study to determine a suitable location for the new reservoir.

Improvements: Complete a reservoir siting study to recommend a location for the proposed replacement reservoir (CIP F3). The proposed reservoir should have a minimum useful storage capacity of 1.23 million gallons (MG). Under CIP Scenario 2, CIPs F2 and F3 may not be necessary. It will be the responsibility of LWD to determine if additional storage will need to be constructed if the WSH water system is consolidated into the LWD system.

CIP F3: New 1.23 MG Reservoir

Background: The existing Lower and Upper Reservoirs do not have sufficient storage capacity to meet the existing or future water system needs and have reached the end of their useful life.

Improvements: Following completion of CIP F2, construct a new reservoir on the selected site adjacent to the existing Upper and Lower Reservoirs to remedy the storage deficiency. The proposed reservoir should have a minimum useful storage capacity of 1.23 MG. Under CIP Scenario 2, CIPs F2 and F3 may not be necessary. It will be the responsibility of LWD to determine if additional storage will need to be constructed if the WSH water system is consolidated into the LWD system.

CIP F4: East Campus Well Siting Study

Background: Water quality of the water pumped from the East Campus Well exceeds the Maximum Contaminant Level for per- and polyfluoroalkyl substances (PFAS). At the current concentration, this water is not safe for consumption. The sanitary control area and wellhead protection areas for the existing well has been encroached by campus building expansions and a parking lot.

Improvements: Complete a well siting study to recommend a location for the proposed 1,400 gallons per minute (gpm) well (CIP F6).

CIP F5: Decommission East Campus Well

Background: Water quality of the water pumped from the East Campus Well exceeds the Maximum Contaminant Level for PFAS. At the current concentration, this water is not safe for consumption. The sanitary control area and wellhead protection areas for the existing well has been encroached by campus building expansions and a parking lot.

Improvement: Coordinate with the Department of Ecology to determine if the East Campus Well may be maintained as a monitoring well and perform necessary steps to transition the facility. If it cannot be maintained as a monitoring well, decommission the East Campus Well per Washington Administrative Code (WAC) 173-160-381.

CIP F6: Replace East Campus Well

Background: Water quality of the water pumped from the East Campus Well exceeds the Maximum Contaminant Level for PFAS. At the current concentration, this water is not safe for consumption. The sanitary control area and wellhead protection areas for the existing well has been encroached by campus building expansions and a parking lot.

Improvements: After completing CIP F4, construct a replacement East Campus Well with a capacity of 1,400 gpm to provide a reliable source of clean drinking water. It is assumed the replacement of the East Campus Well will include the installation of an emergency generator with an automatic transfer switch and the associated conduit and conductors for integrating the generator and transfer switch into the existing electrical and control system. The cost estimate for this project also assumes that PFAS treatment will be needed for the replacement well. However, water from the replacement well may not be contaminated with PFAS and, therefore may not require PFAS treatment.

CIP F7: Install Farm Well Emergency Generator

Background: With the East Campus Well currently offline, the Farm Well is the only well supplying WSH. The well house is not equipped with an emergency generator. An emergency generator at the Farm Well will allow WSH to fill the Lower and Upper Reservoirs during a power outage.

Improvements: Install an emergency generator and automatic transfer switch at the Farm Well. The installation should include an outdoor-rated generator with sub-base fuel tank on a concrete pad within close proximity to the building, bollards for vehicle protection of the generator and fuel tank, an outdoor-rated automatic transfer switch, and the associated conduit and conductors for integrating the generator and transfer switch into the existing electrical and control system. Under

CIP Scenario 2, CIP F7 may not be necessary. It will be the responsibility of LWD to determine the need for emergency power at the Farm Well if the WSH water system is consolidated into the LWD system.

CIP F8: Metering and Premise Isolation Improvements

Background: WSH does not have service meters on most connections to the distribution system. Many of the meters that are installed have not been maintained. The status of many of the meters and premise isolation valves throughout the system are unknown.

Improvements: Evaluate the existing meters and isolation valves to determine necessary improvements and subsequently install and replace the service meters and isolation valves to properly equip each connection in the system. This will be an ongoing program to ensure accurate measuring of water usage in the system. If, during the evaluation of the meters and premise valves, service lines requiring replacement due to material or condition are discovered, these lines will be replaced with the budget set aside for this project.

CIP F9: Source Metering Improvements

Background: The source meters have not been inspected for calibration and their existing condition is unknown. The East Campus Well meter will be removed when the well is decommissioned.

Improvements: Inspect and evaluate the existing Farm Well source meter to determine its existing condition. The source meter should be recalibrated on a regular basis and, as necessary, replaced.

CIP F10: Farm Well Evaluation and Rehabilitation

Background: The Farm Well is an aging facility at 20 years old. Mechanical components of wells typically have a useful life of approximately 20 to 30 years before rehabilitation is required. A condition assessment of the building surrounding the Farm Well found no structural or electrical deficiencies, but the mechanical components likely will need rehabilitation or replacement in the 20-year planning period.

Improvements: Perform a condition assessment of the Farm Well. The assessment should evaluate the existing mechanical conditions to establish any improvements that may be required to ensure the continued safe and effective operation of the supply facility. In particular, the Preferred Operating Range of the Farm Well pumps should be evaluated to determine if they are capable of meeting future demands. Under CIP Scenario 2, it is likely the Farm Well transmission main will be connected to the existing LWD water main in Angle Lane.

Miscellaneous Improvements

The following improvements are planning efforts and program elements that are required to comply with various water regulations or are improvements that do not fit into one of the previous categories.

CIP M1: Risk and Resiliency Assessment and Emergency Response Plan

Background: America's Water Infrastructure Act of 2018 requires WSH to develop or update its Risk and Resiliency Assessment and Emergency Response Plan; on a 5-year interval.

Improvements: Update the Risk and Resiliency Assessment and Emergency Response Plan every 5 years to meet the requirements that are in effect at the time of the update. Under CIP Scenario 2, this CIP will not be necessary.

CIP M2: Water System Plan Update

Background: WAC 246-290-100 requires that WSH's WSP be updated every 10 years and submitted to the Washington State Department of Health for approval.

Improvements: Update the WSP every 10 years to meet the requirements that are in effect at the time of the update. Under CIP Scenario 2, this CIP will not be necessary.

CIP M3: Develop and Maintain Annual Wellhead Protection Program

Background: WSH does not have a wellhead protection ordinance and program that meets current state requirements.

Improvements: WSH will perform a more detailed delineation of the wellhead protection area boundaries utilizing a combined analytical and hydrogeological approach. WSH also will conduct a detailed inventory of potential sources of groundwater contamination and notify the required owners/operators. WSH will develop and adopt an improved wellhead protection ordinance that addresses restricted uses in the 1-year time of travel zones. In addition, WSH will carry out other wellhead protection program requirements as outlined in the Wellhead Protection Program included in **Appendix I**.

CIP M4: Develop Water System Construction Standards

Background: WSH does not have an established set of water system construction standards to ensure appropriate engineering criteria and practices are used in the design and construction of the water system.

Improvements: Develop a set of water system construction standards. Under CIP Scenario 2, LWD will use its own existing water system construction standards and this CIP will not be necessary.

CIP M5: Annual Cross-Connection Control Program

Background: The Cross-Connection Control Plan is an ongoing program that needs continual support to provide protection to the water system from backflow contamination.

Improvements: WSH will be fully compliant for high hazard backflow devices. WSH will carry out other Cross-Connection Control Program requirements as outlined in **Appendix E**. Under CIP Scenario 2, LWD will continue with its existing Cross-Connection Control Program and CIP M5 will not be necessary.

CIP M6: Annual Water Use Efficiency Program

Background: The existing water system most likely has leaks, based on the age of the majority of the system. However, because WSH does not have service meters on all connections, it is not possible to directly calculate distribution system leakage (DSL) and the water system is not compliant with WAC 246-290-496.

Improvements: WSH must install service meters on all connections to the distribution system (CIP F8) and monitor for the next 4 years to enable the system to calculate DSL. WSH will continue its water main replacement program (CIP WM1), which will reduce the amount of older and potentially leaking water mains. WSH will perform other ongoing water use efficiency measures, including public education programs, as outlined in the Water Use Efficiency Program included in **Appendix D**. Under CIP Scenario 2, LWD will continue with its existing water use efficiency program and CIP M6 will not be necessary.

CIP M7: Install Telemetry System

Background: Telemetry system improvements are needed to provide access to historical data and improve data backup procedures. The telemetry system also will need to be upgraded on a regular basis to accommodate additional facilities to be monitored and to maintain up-to-date equipment to ensure reliable and continuous operation of the telemetry system.

Improvements: Install a telemetry system to accommodate the monitoring of existing and future facilities and upgrade the hardware and software as necessary to keep the system up to date.

CIP M8: Annual Water Quality Monitoring Program

Background: Water quality monitoring is important for monitoring water quality at the sources and in the distribution system in accordance with drinking water regulations contained in WAC 246-290-300.

Improvements: Maintain the existing Water Quality Monitoring Program and update as necessary. Under CIP Scenario 2, LWD will continue with its existing water quality monitoring program and CIP M8 will not be necessary.

CIP M9: Seismic Resiliency Study

Background: Earthquakes have historically occurred throughout the Puget Sound region. Large earthquakes have caused loss of life and over a billion dollars in property damage. Pierce County is susceptible to three types of earthquakes: deep, crustal, and Cascadia Subduction Zone. Earthquakes directly and indirectly affect all of Pierce County, whether from ground shaking and liquefaction or resulting landslides and tsunamis. Although the WSH campus is at low risk for liquefaction, additional seismic resiliency studies should be performed to establish any additional risk and mitigation strategies to employ.

Improvements: Commission a seismic resiliency study for the WSH campus water system.

CIP M10: Operations and Maintenance Program

Background: WSH has an informal operations and maintenance (O&M) program that generally guides the normal and emergency operation, as well as the preventative maintenance of the water supply, treatment, and distribution system.

Improvements: Adopt the O&M program in Chapter 8 of this WSP as WSH's formal program. Reference the water utility's O&M program in the hospital's O&M documentation. Under CIP Scenario 2, this CIP will not be necessary.

CIP M11: Water Utility Billing

Background: Should WSH maintain management and control of its water system, appropriate utility rates and a billing system will need to be determined to show the consumption history for off-campus water use such as irrigation in Steilacoom Park and service to the Oakridge Group Home. Water used for construction projects is not tracked by WSH.

Improvements: Establish utility rates and a utility billing system for normal water service and for construction water use and update the rates as necessary over time. Consider transferring water service in Steilacoom Park to LWD. Under CIP Scenario 2, LWD will continue with its existing utility billing system and CIP M11 will not be necessary.

CIP M12: Annual O&M, Management, and Engineering Support

Background: WSH does not currently have enough dedicated FTEs to support the operations and maintenance of the water utility. Some staff support the water utility as well as other plumbing and building maintenance needs. WSH also requires dedicated staff and budget to support the management and engineering needs for a safe and reliable water system.

Improvements: Add additional FTEs as needed to support the O&M of the WSH water utility. FTEs should be dedicated to the water utility and have appropriate Washington State Waterworks Operator certification. Add additional FTEs for the management and engineering of the WSH water utility. Establish an annual budget for the O&M program, as well as a budget for supplemental specialized management or engineering support from vendors or consultants to carry out the CIP program and ongoing system needs. This item is not a CIP project; therefore, the budget should be funded through the O&M program. Under CIP Scenario 2, these services will be provided by LWD.

Lakewood Water District Improvements

The following improvements are planning efforts and program elements that are necessary to complete only under CIP Scenario 2 where the WSH system consolidates into the LWD water system. **Table 9-3** lists CIP projects and their applicability in the two CIP scenarios.

Table 9-3

CIP Project Applicability to CIP Scenarios

CIP No.	CIP Description	Applicability	
		CIP Scenario 1 DSHS Maintains Ownership	**CIP Scenario 2** WSH Consolidates into LWD System
	Water Main Improvements		
WM1	Water Main Replacement Program	See Table 9-2	See Table 9-2
WM2	Hydrant Relocation Program	X	X
WM3	Abandon Water Main	X	X
	Facility Improvements		
F1	Decommission Existing Lower and Upper Reservoirs	X	X
F2	Reservoir Siting Study	X	
F3	New 1.23 MG Reservoir	X	
F4	East Campus Well Siting Study	X	X
F5	Decomission East Campus Well	X	X
F6	Replace East Campus Well	X	X
F7	Install Farm Well Emergency Generator	X	
F8	Metering and Premise Isolation Improvements	X	X
F9	Source Metering Improvements	X	X
F10	Farm Well Evaluation and Rehabilitation	X	X
	Miscellaneous Improvements		
M1	Risk and Resiliency Assessment and Emergency Response Plan	X	
M2	Water System Plan Update	X	
M3	Develop and Maintain Annual Wellhead Protection Program	X	X
M4	Develop Water System Construction Standards	X	
M5	Annual Cross-Connection Control Program	X	
M6	Annual Water Use Efficiency Program	X	
M7	Install Telemetry System	X	X
M8	Annual Water Quality Monitoring Program	X	
M9	Seismic Resiliency Study	X	X
M10	Operations and Maintenance Program	X	
M11	Water Utility Billing	X	
M12	Annual O&M, Management, and Engineering Support	X	
	LWD Improvements		
LW1	Lakewood Water District Intertie Facilities		X

CIP LW1: Lakewood Water District Intertie Facilities

Background: Under CIP Scenario 2, permanent supply connections between the WSH water system and LWD will need to be established. Some water main is planned to be abandoned under the scenario, and connections to services and facilities will need to be reestablished for supply from LWD.

Improvements: Construct two intertie connections between the WSH and LWD water systems that will tie into the existing LWD water main in Steilacoom Boulevard SW. Install approximately 373 feet of 12-inch water main from the Farm Well to the existing LWD water main in Angle Lane SW to serve as the new transmission main from the Farm Well to the LWD water system. Connect

the existing non-WSH water users (Fort Steilacoom Park and Oakridge Group Home) to the adjacent LWD water mains and install LWD customer service meters. Under CIP Scenario 1, this CIP will not be necessary.

ESTIMATING COSTS OF IMPROVEMENTS

Project costs for the proposed improvements were estimated based on costs of similar, recently constructed water projects in the western Washington area and are presented in 2024 dollars. The project cost estimates include the estimated construction cost of the improvement, sales tax of 10.1 percent, and a 30-percent contingency, as well as indirect costs estimated at 35 percent of the construction cost for engineering preliminary design, final design, and construction management services, permitting, legal, and administrative services. An additional 15 percent was added for DSHS project administration.

Construction cost estimates for water main projects were determined from the water main unit costs (i.e., cost per foot length) and the proposed diameter and approximate length of each improvement. The total project cost per foot length of water main, including construction and indirect costs, is shown in **Table 9-4**.

Table 9-4

Water Main Unit Costs

Water Main Diameter (inches)	Project Cost Per Foot Length (2024 $/LF)
3	$330
12	$460
16	$860

The unit costs for each water main size are based on estimates of all construction-related improvements, such as materials and labor for the water main installation, water services, fire hydrants, fittings, valves, connections to the existing system, trench restoration, asphalt surface restoration, other work necessary for a complete installation, indirect costs, contingency, and sales tax.

PRIORITIZING IMPROVEMENTS

The water system improvements were evaluated against established criteria to schedule projects that will correct the most deficiencies and meet the greatest need for improvement prior to projects correcting fewer deficiencies. A description of the criteria and method for prioritizing each category of improvements is provided in the sections that follow.

Water Main Improvements

Table 9-5 lists the criteria that were established for prioritizing the water main improvements. The criteria are based on the underlying deficiencies of the existing water main that will be replaced by the proposed water main improvements. The criteria are arranged in two different categories with a weight factor assigned to each category. The Existing Water Main Fire Flow Capability category ranks the water main improvements based on the ability of the existing water mains to provide the

required fire flow, as determined from the results of the hydraulic analyses in **Chapter 7**. The Existing Water Main Year of Installation category ranks the water main improvements based on the age of the existing water main.

Table 9-5

Water Main Improvements Priority Ranking Criteria

Points	Category	Weight Factor	Weighted Points
	Existing Water Main Fire Flow Capability		
3	Available Fire Flow is 75% or Less of Required Fire Flow	2	6
2	Available Fire Flow is 75-89% or Less of Required Fire Flow	2	4
1	Available Fire Flow is 90% or Greater of Required Fire Flow	2	2
	Existing Water Main Year of Installation		
3	Unknown or Before 1974	1	3
2	1974 to 1994	1	2
1	After 1994	1	1

The water main priority ranking criteria were applied to the annual water main replacement projects, which are grouped under CIP WM1. CIP WM1 Projects 1 through 22, as shown in **Figure 9-1**, are presented in **Table 9-6** and sorted by CIP number with their priority ranking.

Table 9-6

Prioritized Annual Water Main Replacement Projects

WM1 CIP No.	Length (ft)	Existing Diameter (in)	Proposed Diameter (in)	Priority	Rank	Estimated Total Project Cost (2024 $)	Applicability	
							Scenario 1 DSHS Maintains Ownership	Scenario 2 WSH Consolidates into LWD System
1	3,305	10	12	3	Medium	$1,521,000	X	
2	140	8	12	3	Medium	$65,000	X	
3	1,351	12	16	3	Medium	$1,162,000	X	
4	892	--[1]	3	3	Medium	$295,000	X	
5	594	8	12	9	High	$274,000	X	X
6	100	6	12	9	High	$46,000	X	X
7	757	8	12	9	High	$349,000	X	X
8	1,243	8	12	9	High	$572,000	X	X
9	558	--[1]	12	9	High	$257,000	X	X
10	1,497	10	12	9	High	$689,000	X	X
11	1,027	8	12	9	High	$473,000	X	X
12	1,588	10	12	9	High	$731,000	X	X
13	332	6	12	9	High	$153,000	X	X
14	8	--[1]	12	9	High	$4,000	X	X
15	1,521	--[1]	12	9	High	$700,000	X	
16	1,194	3	12	1	Low	$550,000	X	
17	1,245	6	12	9	High	$573,000	X	X
18	2,045	--[1]	12	9	High	$941,000	X	X
19	691	4	12	9	High	$318,000	X	X
20	7	6	12	9	High	$4,000	X	X
21	1,082	8	12	9	High	$498,000	X	X
22	32	8	12	9	High	$15,000	X	X
Total Estimated Project Cost of WM1 CIP							**$10,190,000**	**$5,897,000**

[1] = New pipes recommended for system looping

Other Improvements

The additional water main and facility improvements were prioritized based on existing deficiencies, safety concerns, maintenance requirements, and capacity requirements. The miscellaneous improvements were prioritized based on regulatory requirements and assessment of the water system needs. The priority order of these improvements is reflected in the schedule of improvements, which is presented in the next section.

SCHEDULE OF IMPROVEMENTS

The improvement prioritization results were used to assist in establishing an implementation schedule that can be used by WSH for preparing its budget. The implementation schedule for the proposed improvements is shown in **Table 9-7** for CIP Scenario 1 and in **Table 9-8** for CIP Scenario 2. A variable allowance per year has been established for the annual replacement of water mains based on WSH's available budget. WSH will identify and schedule the replacement of these water mains during its biannual budget process.

Future Project Cost Adjustments

All cost estimates shown in the tables are presented in year 2024 dollars. These cost estimates will need to be adjusted to account for the effects of inflation and changing construction market conditions to determine future costs at the actual time of project implementation. Future costs can be estimated using the Engineering News Record Construction Cost Index for the Seattle area or by applying an estimated rate of inflation that reflects the current and anticipated future market conditions.

Table 9-7

CIP Scenario 1 Proposed Improvements Implementation Schedule

No.	Description	Estimated Total Project Cost (2024 $)	CIP Scenario 1 20-Year Schedule of Improvements Planned Year of Project and Estimated Cost in 2024 $											
			2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2034-2044
Water Main Improvements														
WM1	Water Main Improvement Program	$10,190,000		$1,649,250	$1,649,250	$1,649,250	$1,649,250	$1,521,500	$1,521,500	$550,000				
WM2	Hydrant Relocation Program[1]	$5						$5						
WM3	Abandon Water Main[1]	$6,250						$6,250						
Facility Improvements														
F1	Decommission Existing Lower and Upper Reservoirs	$1,080,000						$1,080,000						
F2	Reservoir Siting Study	$50,000		$50,000										
F3	New 1.23 MG Reservoir	$8,590,000			$1,718,000	$3,436,000	$3,436,000							
F4	East Campus Well Siting Study	$50,000		$50,000										
F5	Decomission East Campus Well	$540,000								$540,000				
F6	Replace East Campus Well	$15,030,000				$2,505,000	$2,505,000	$5,010,000	$5,010,000					
F7	Install Farm Well Emergency Generator	$540,000		$540,000										
F8	Metering and Premise Isolation Improvements	$12,290,000		$614,500	$614,500	$614,500	$614,500	$614,500	$614,500	$614,500	$614,500	$614,500	$614,500	$6,145,000
F9	Source Metering Improvements	$40,000		$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$20,000
F10	Farm Well Evaluation and Rehabilitation	$940,000											$940,000	
Miscellaneous Improvements														
M1	Risk and Resiliency Assessment and Emergency Response Plan	$300,000		$75,000					$75,000					$150,000
M2	Water System Plan Update	$440,000											$220,000	$220,000
M3	Develop and Maintain Annual Wellhead Protection Program	$200,000		$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$100,000
M4	Develop Water System Construction Standards	$150,000			$150,000									
M5	Annual Cross-Connection Control Program	$210,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$100,000
M6	Annual Water Use Efficiency Program	$105,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$50,000
M7	Install Telemetry System	$1,400,000				$466,667	$933,333							
M8	Annual Water Quality Monitoring Program	$210,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$100,000
M9	Seismic Resiliency Study	$100,000							$100,000					
M10	Operations and Maintenance Program	$25,000		$25,000										
M11	Water Utility Billing	$110,000		$110,000										
M12	Annual O&M, Management, and Engineering Support	O&M Funded												
Lakewood Water District Improvements														
LW1	Lakewood Water District Intertie Facilities[2]	N/A												
CIP Scenario 1 Total Estimated Cost of DSHS Funded Improvements		**$52,596,255**	$25,000	$3,150,750	$4,168,750	$8,708,417	$9,175,083	$8,269,255	$7,358,000	$1,741,500	$651,500	$651,500	$1,811,500	$6,885,000

[1] = It is assumed these projects will be completed in conjunction and under the budget of WM1 CIP projects.

[2] = This project is only applicable under Scenario 2 where the WSH water system is consolidated into the LWD water system.

Table 9-8

CIP Scenario 2 Proposed Improvements Implementation Schedule

No.	Description	Estimated Total Project Cost (2024 $)	CIP Scenario 2 20-Year Schedule of Improvements Planned Year of Project and Estimated Cost in 2024 $											
			2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2034-2044
Water Main Improvements														
WM1	Water Main Improvement Program	$5,897,000		$1,965,667	$1,965,667	$1,965,667								
WM2	Hydrant Relocation Program[1]	$5			$5									
WM3	Abandon Water Main[1]	$6,250			$6,250									
Facility Improvements														
F1	Decommission Existing Lower and Upper Reservoirs	$1,080,000			$1,080,000									
F2	Reservoir Siting Study	N/A												
F3	New 1.23 MG Reservoir	N/A												
F4	East Campus Well Siting Study	$50,000		$50,000										
F5	Decomission East Campus Well	$540,000								$540,000				
F6	Replace East Campus Well	$15,030,000				$2,505,000	$2,505,000	$5,010,000	$5,010,000					
F7	Install Farm Well Emergency Generator	N/A												
F8	Metering and Premise Isolation Improvements	$12,290,000		$614,500	$614,500	$614,500	$614,500	$614,500	$614,500	$614,500	$614,500	$614,500	$614,500	$6,145,000
F9	Source Metering Improvements	$40,000		$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$20,000
F10	Farm Well Evaluation and Rehabilitation	$940,000											$940,000	
Miscellaneous Improvements														
M1	Risk and Resiliency Assessment and Emergency Response Plan	N/A												
M2	Water System Plan Update	N/A												
M3	Develop and Maintain Annual Wellhead Protection Program	$200,000		$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$100,000
M4	Develop Water System Construction Standards	N/A												
M5	Annual Cross-Connection Control Program	N/A												
M6	Annual Water Use Efficiency Program	N/A												
M7	Install Telemetry System	$1,400,000				$466,667	$933,333							
M8	Annual Water Quality Monitoring Program	N/A												
M9	Seismic Resiliency Study	$100,000							$100,000					
M10	Operations and Maintenance Program	N/A												
M11	Water Utility Billing	N/A												
M12	O&M, Management, and Engineering Support	O&M Funded												
Lakewood Water District Improvements														
LW1	Lakewood Water District Intertie Facilities[2]	$3,040,000		$1,520,000	$1,520,000									
CIP Scenario 2 Total Estimated Cost of DSHS Funded Improvements		**$40,613,255**	$0	$4,162,167	$5,198,422	$5,563,833	$4,064,833	$5,636,500	$5,736,500	$1,166,500	$626,500	$626,500	$1,566,500	$6,265,000

[1] = It is assumed these projects will be completed in conjunction and under the budget of WM1 CIP projects.

[2] = This project is only applicable under Scenario 2 where the WSH water system is consolidated into the LWD water system.

Legend

- Western State Hospital Campus Area
- Western State Hospital Water Service Area (Retail and Future)

Water System Facilities

- Reservoir
- Well
- Intertie

Water Main by Diameter

- < 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 16-inch
- Lakewood Water District Water Main
- CIP WM1 Projects
- New Forensic Hospital Water Main
- Water Main to be Abandoned (CIP WM3)
- Relocated Hydrants (CIP WM2)

Lakewood Water District Emergency Intertie (81st St SW)

East Campus Well Replacement (1,400 gpm) (CIP F6)

Lakewood Water District
Oakbrook Tank
0.50 MG
Ground Elev: 225'
Base Elev: 370'
Overflow Elev: 404'

Oakbrook Wells
O-2 (1,000 gpm) & O-3 (1,000 gpm)

Oakridge Group Home

Proposed Reservoir (CIP F3)
1.23 MG
Overflow Elev: 389'
Height: 60'

Reservoirs to be Abandoned (CIP F1)

Farm Well
(1,000 gpm)
Install Emergency Generator (CIP F7)
Evaluation and Rehabilitation (CIP F10)

Waughop Lake

GARRISON SPRINGS RD
CIRCLE DR
GOLF COURSE RD SW
81ST ST SW
ONYX DR SW
KIDS FIRST PL
82ND ST SW
83RD ST
87TH AVE SW
STEILACOOM BLVD SW
FORT ST
SOUTH ST
WEST ST
SENTINEL DR
WAUGHOP LAKE RD SW
DALTON DR SW
HAVILAND AV
NIXON
92ND ST
ELWOOD DR SW
NORTH WY SW
ANGLE LN SW
RUSTIC LN SW
95TH ST SW
FARWEST DR SW
MARIETTA ST
91ST ST CT SW
92ND ST CT SW
93RD ST SW
93RD ST CT SW
94TH AVE SW
DIVISION LN SW
CHERRY PARK DR SW
95TH ST SW
MT TACOMA DR SW

Key

CIP WM1 Project No.	Page No.
1	k, l
2	j
3	j
4	i
5	h
6	b
7	b
8	b
9	b
10	c
11	c
12	d
13	d
14	d
15	e
16	f
17	d
18	d, g
19	h
20	h
21	h
22	a

Vicinity Map

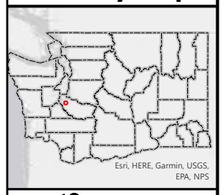


Figure 9-1
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services
Transforming lives

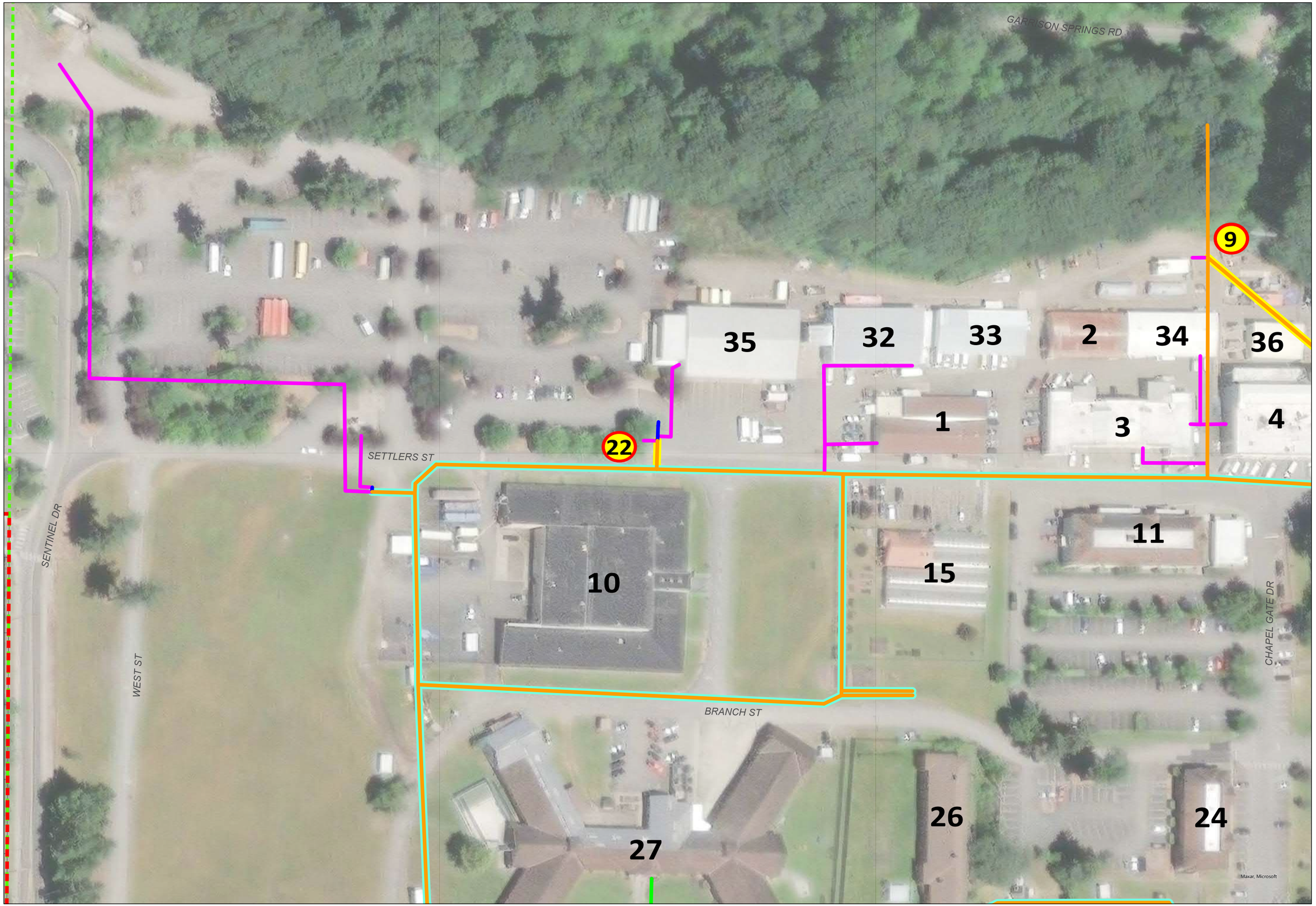
1 inch : 300 Feet
0 150 300 600 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\124-0068\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: LMOJARAB PLOT DATE: SEP 24, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



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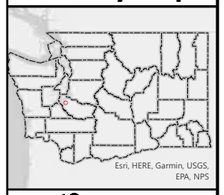

Figure 9-1a
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

0 25 50 100 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

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NORTH

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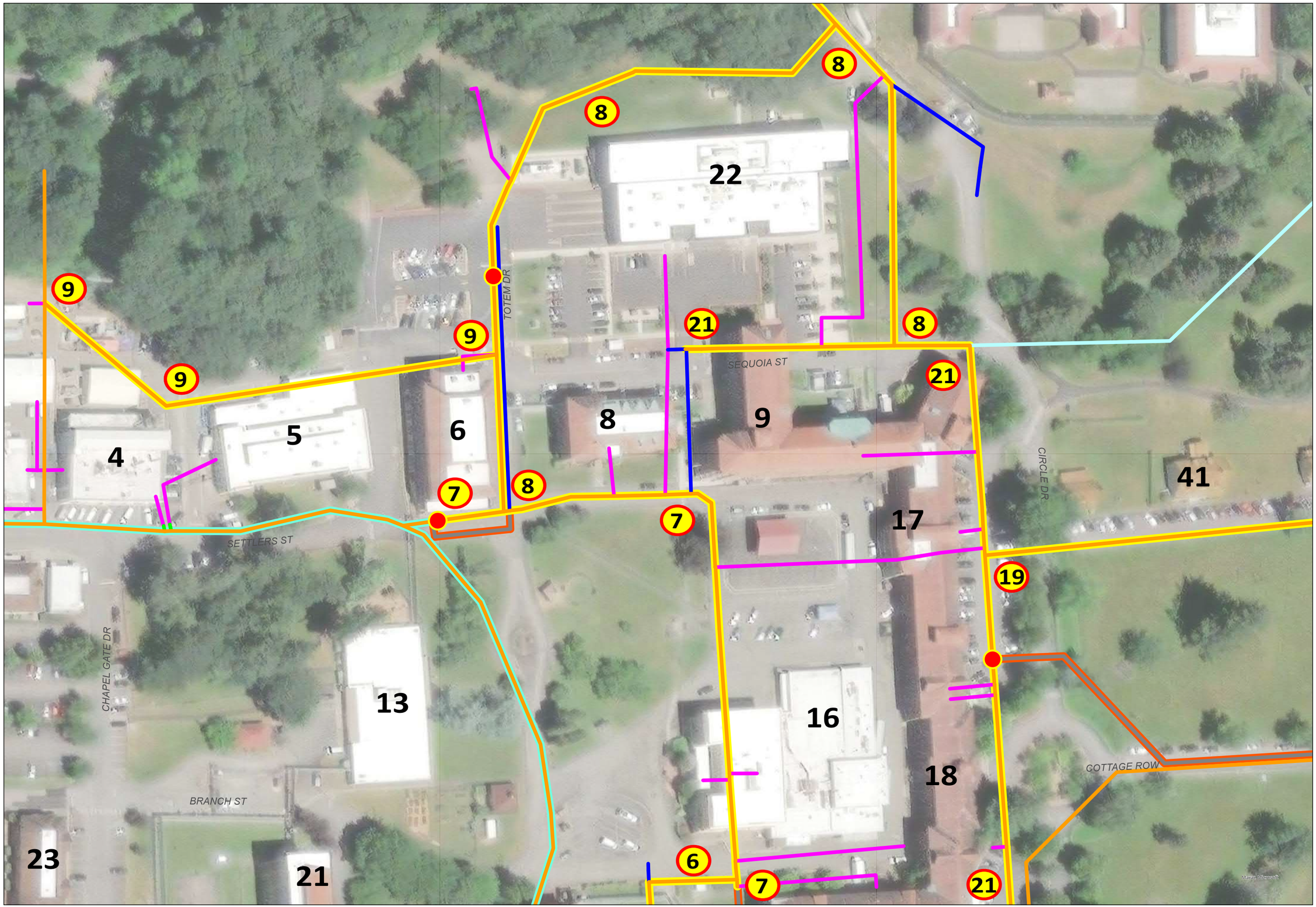

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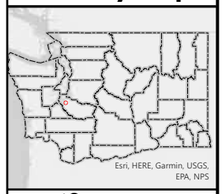

Figure 9-1b
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

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1 inch : 50 Feet

0 25 50 100 Feet

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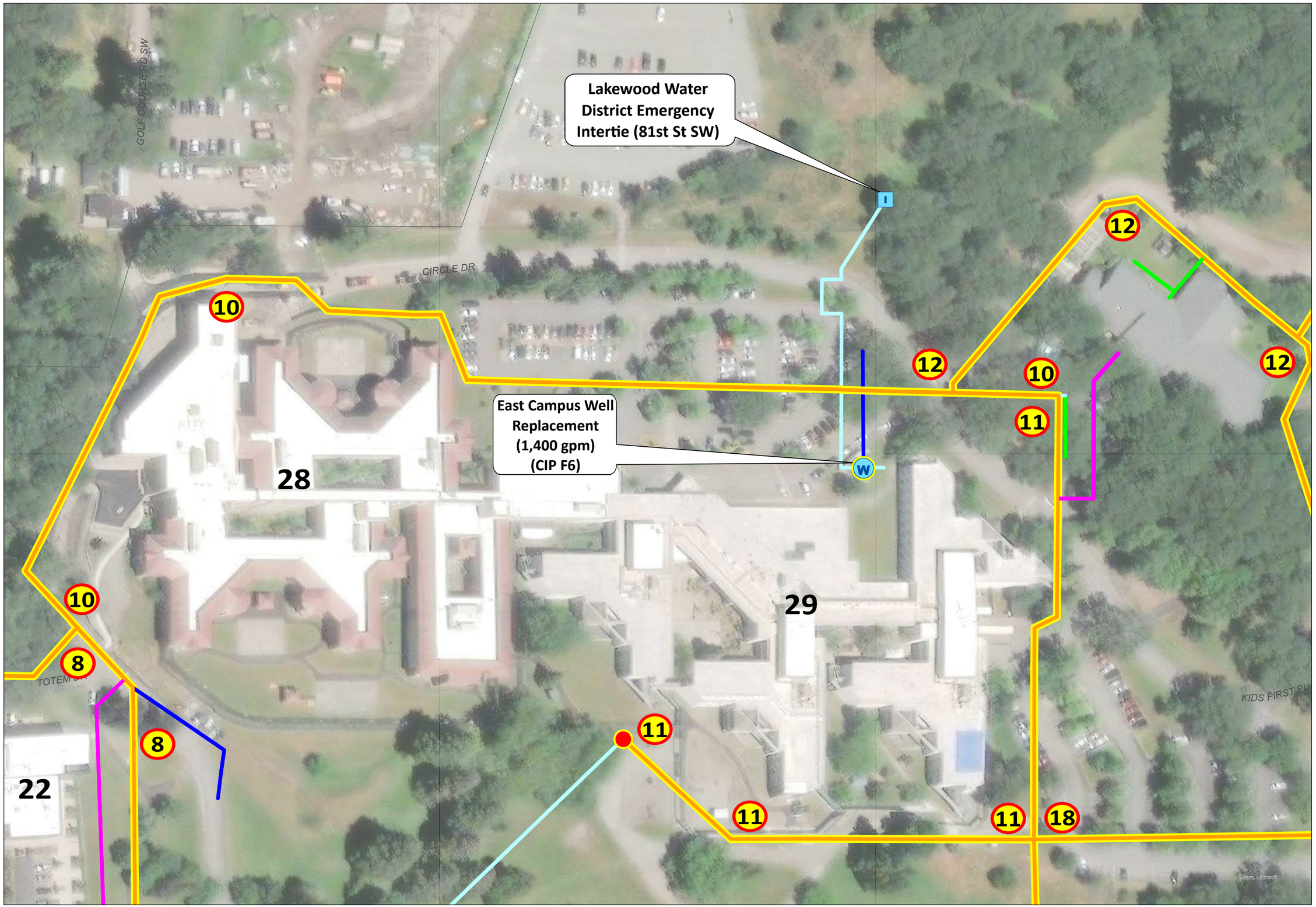

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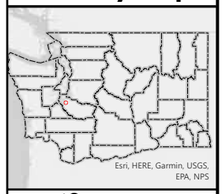

Figure 9-1c
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

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1 inch : 50 Feet

0 25 50 100 Feet

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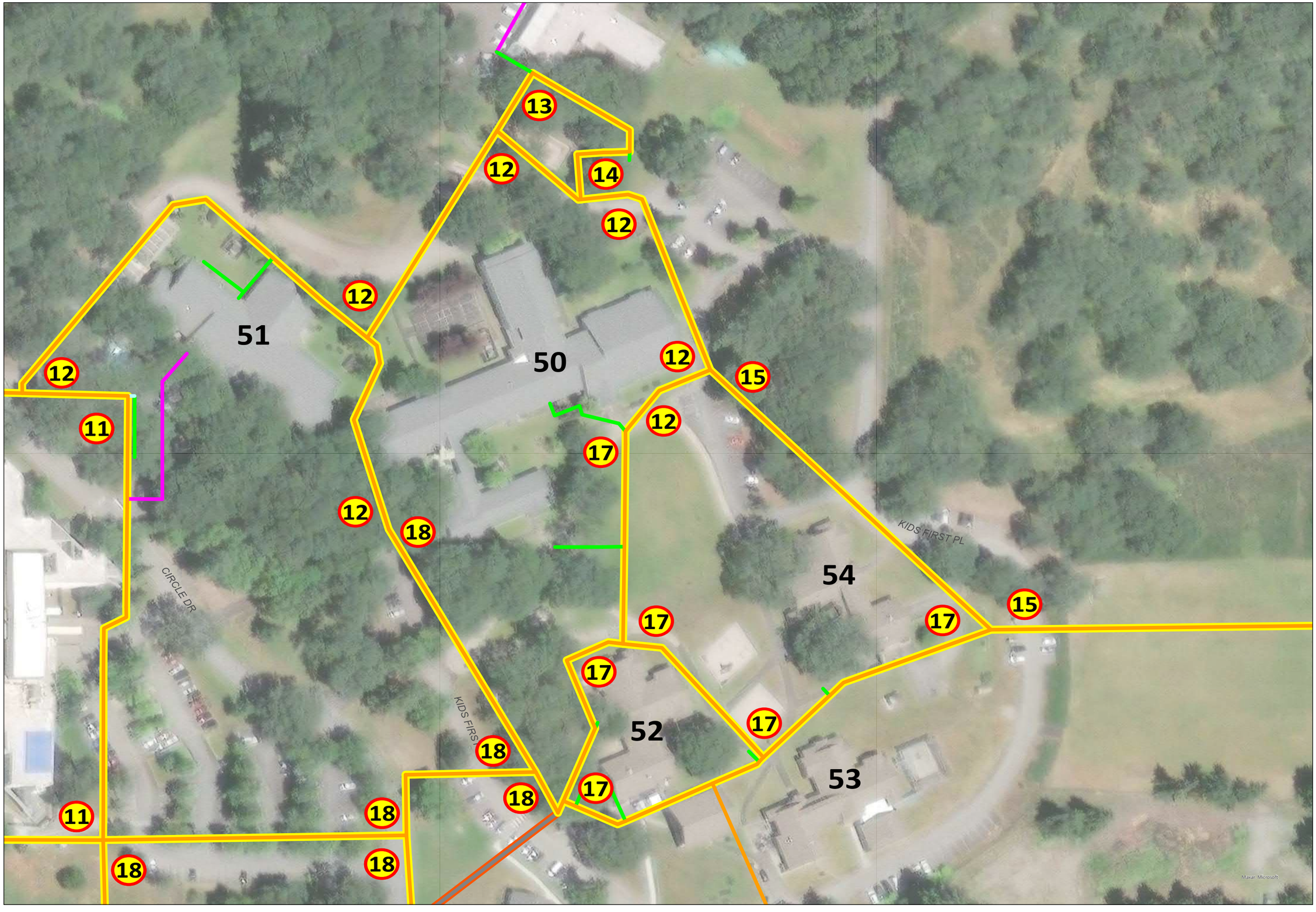

Vicinity Map

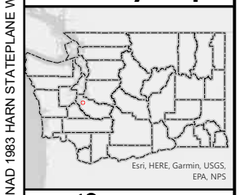

Figure 9-1d
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

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1 inch : 50 Feet

0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

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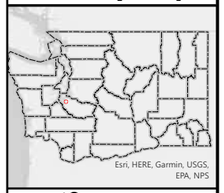

Figure 9-1e
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

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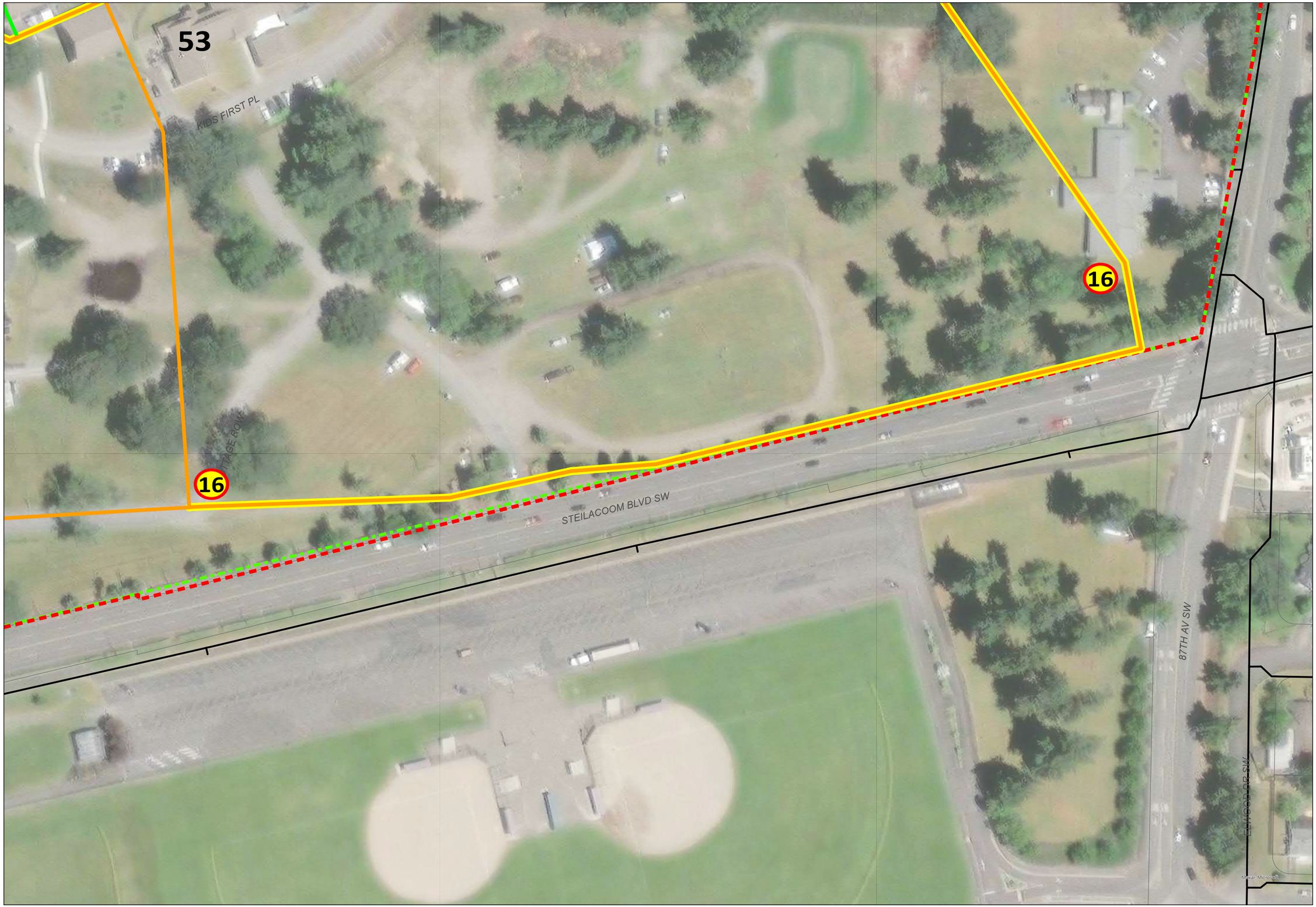

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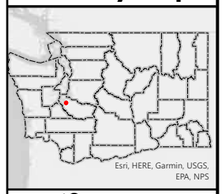

Figure 9-1f
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

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1 inch : 50 Feet

0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

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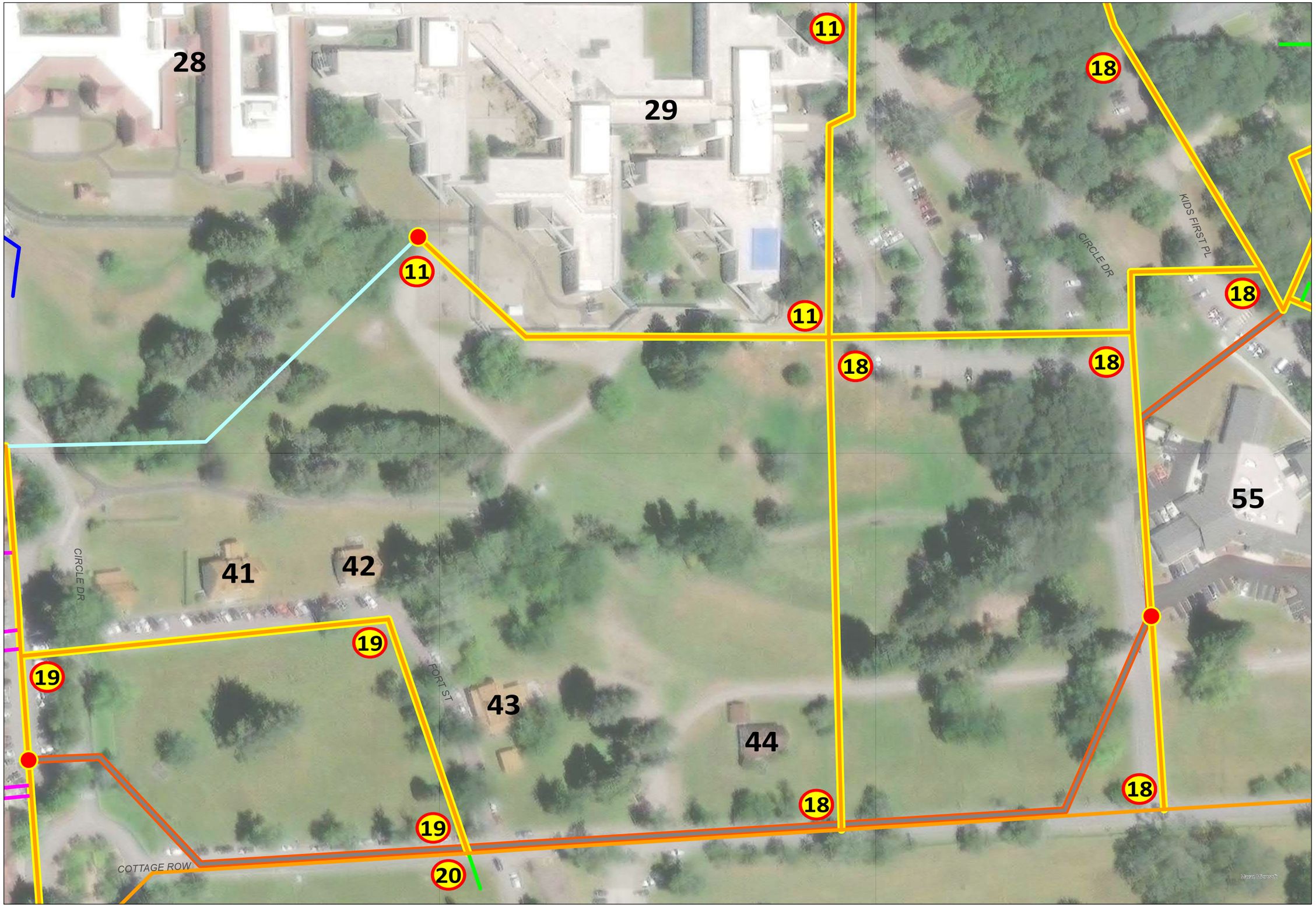

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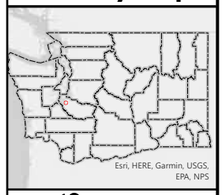

Figure 9-1g
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

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1 inch : 50 Feet

0 25 50 100 Feet

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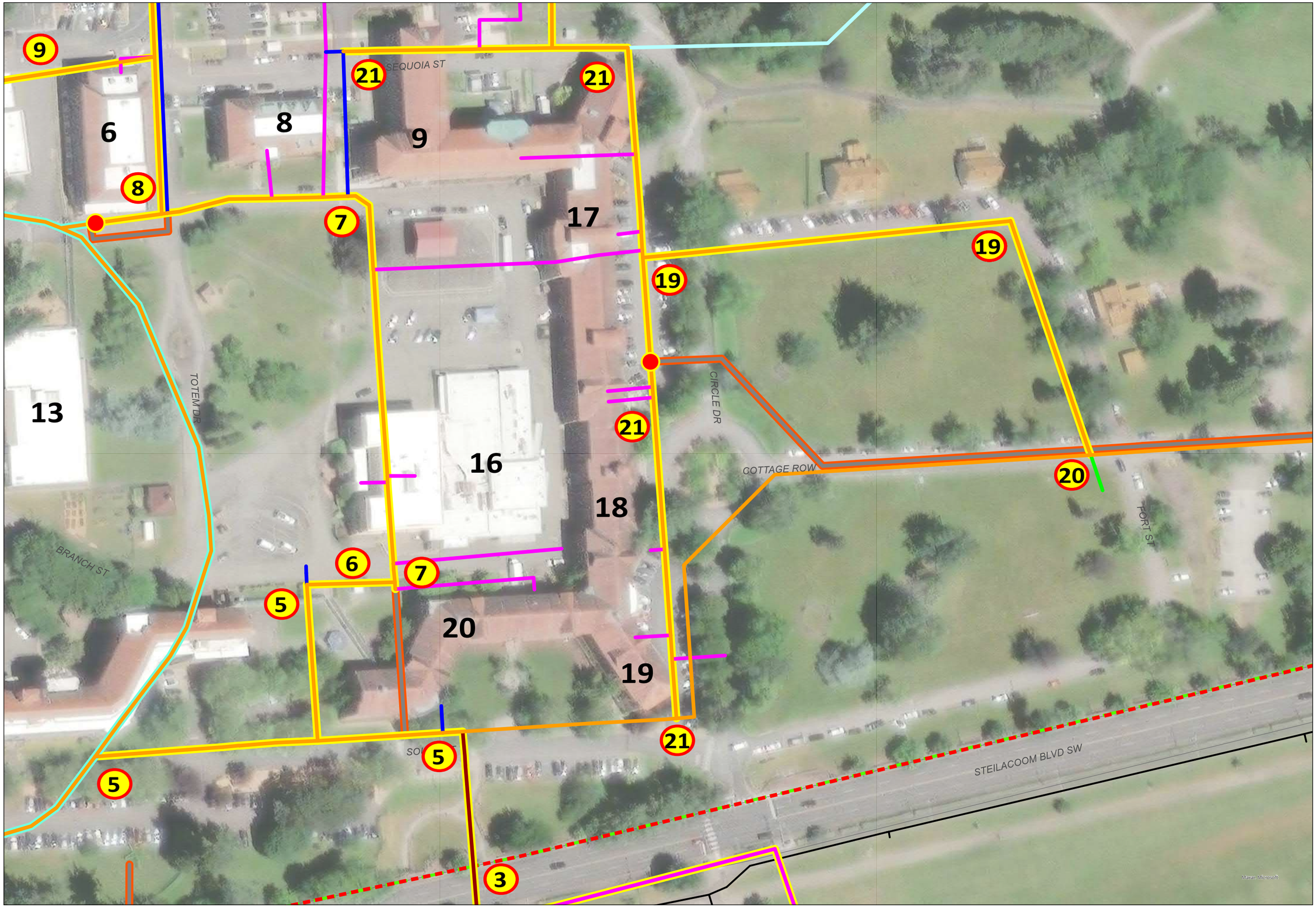


Vicinity Map

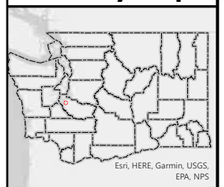


Figure 9-1h
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

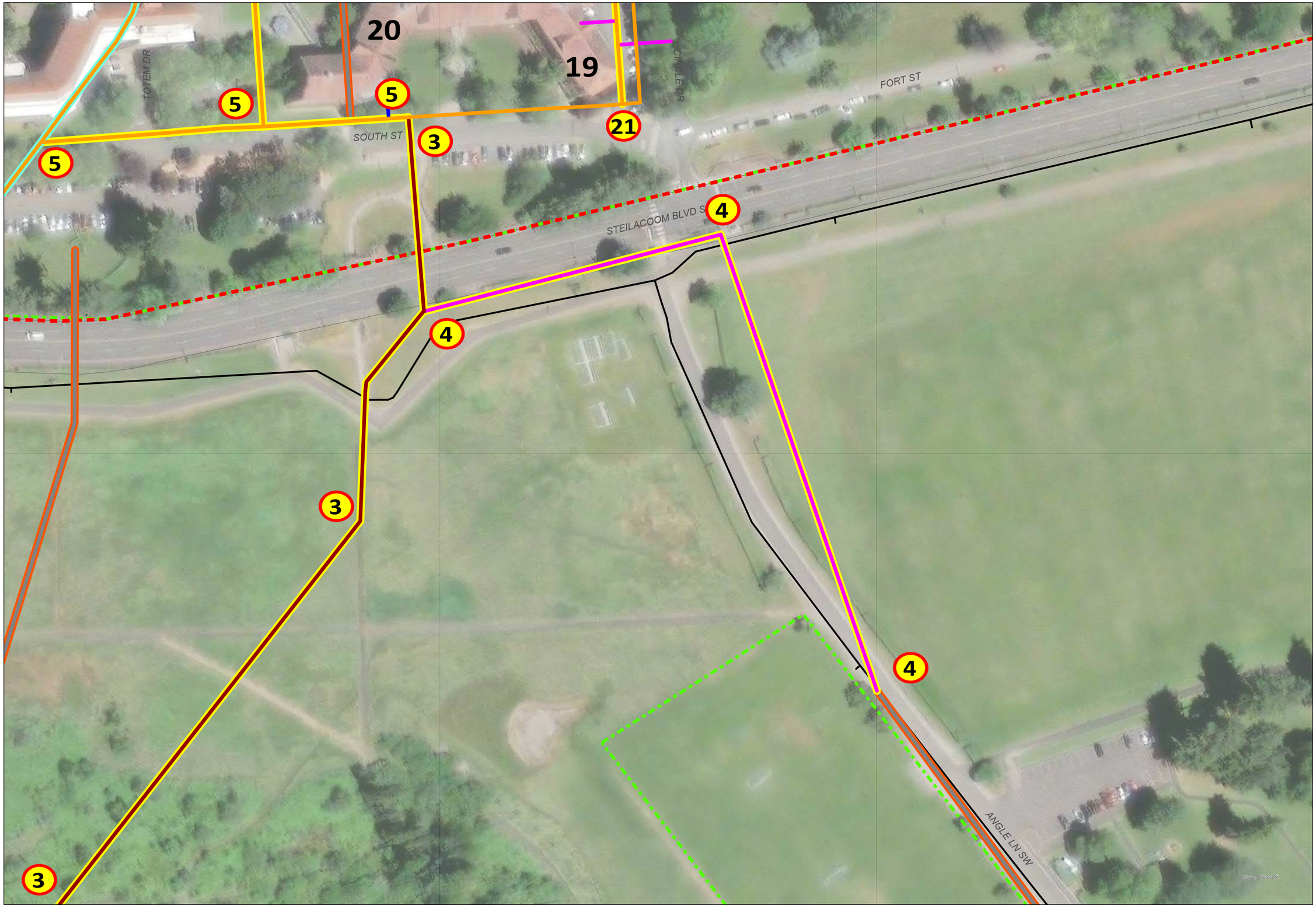
0 25 50 100 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00668\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



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Vicinity Map

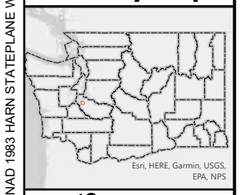


Figure 9-1i
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

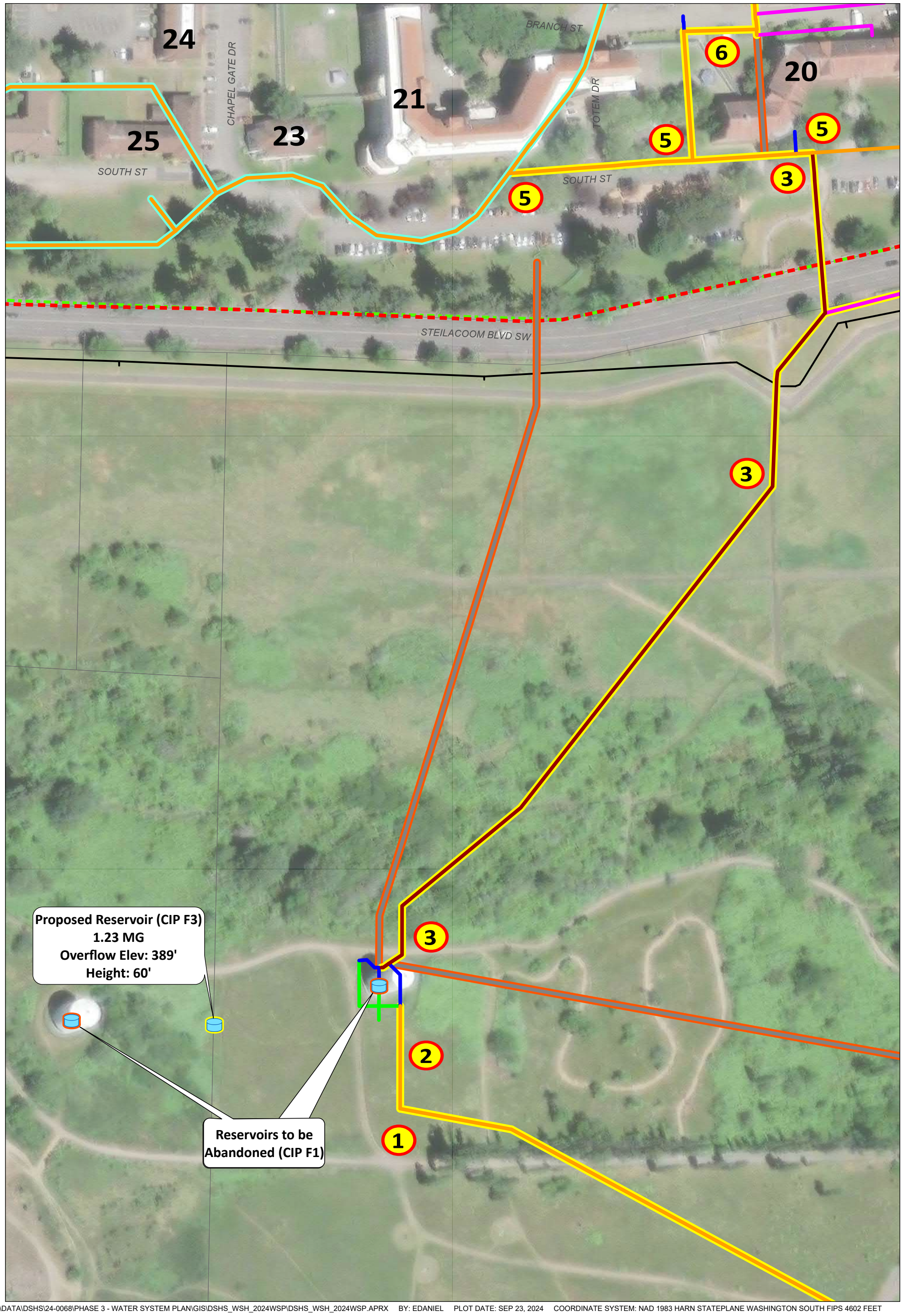
0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00680\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



J:\DATA\DSHS\24-0068\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

RH2

NORTH

1 inch : 60 Feet

0 30 60 120 Feet

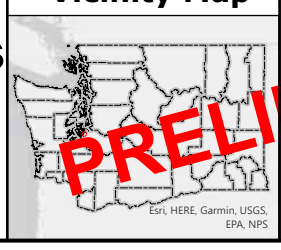
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

Washington State Department of Social & Health Services

Transforming lives

Figure 9-1j
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Vicinity Map



PRELIMINARY

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Vicinity Map

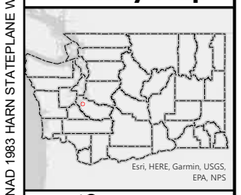

Figure 9-1k
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-0068\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

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Vicinity Map

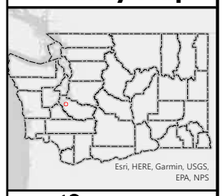

Figure 9-11
CIP Scenario 1 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00681PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

Legend

- Western State Hospital Campus Area
- Western State Hospital Water Service Area (Retail and Future)

Water System Facilities

- Reservoir
- Well
- Intertie

Water Main by Diameter

- < 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 16-inch
- Lakewood Water District Water Main
- CIP Projects
- New Forensic Hospital Water Main
- Water Main to be Abandoned (CIP WM3)
- Relocated Hydrants (CIP WM2)

Lakewood Water District Oakbrook Tank
0.50 MG
Ground Elev: 225'
Base Elev: 370'
Overflow Elev: 404'

Oakbrook Wells
O-2 (1,000 gpm) & O-3 (1,000 gpm)

Lakewood Water District Emergency Intertie (81st St SW)

East Campus Well Replacement (1,400 gpm) (CIP F6)

Oakridge Group Home

Proposed LWD Intertie (CIP LW1)

Reservoirs to be Abandoned (CIP F1)

Farm Well (1,000 gpm) Evaluation and Rehabilitation (CIP F10)

Proposed LWD Intertie (CIP LW1)

Waughop Lake

Key	
CIP WM1 Project No.	Page No.
5	h
6	b
7	b
8	b
9	b
10	c
11	c
12	d
13	d
14	d
17	d
18	d, g
19	h
20	h
21	h
22	a

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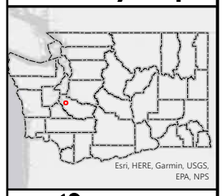


Figure 9-2
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services
Transforming lives

1 inch : 300 Feet

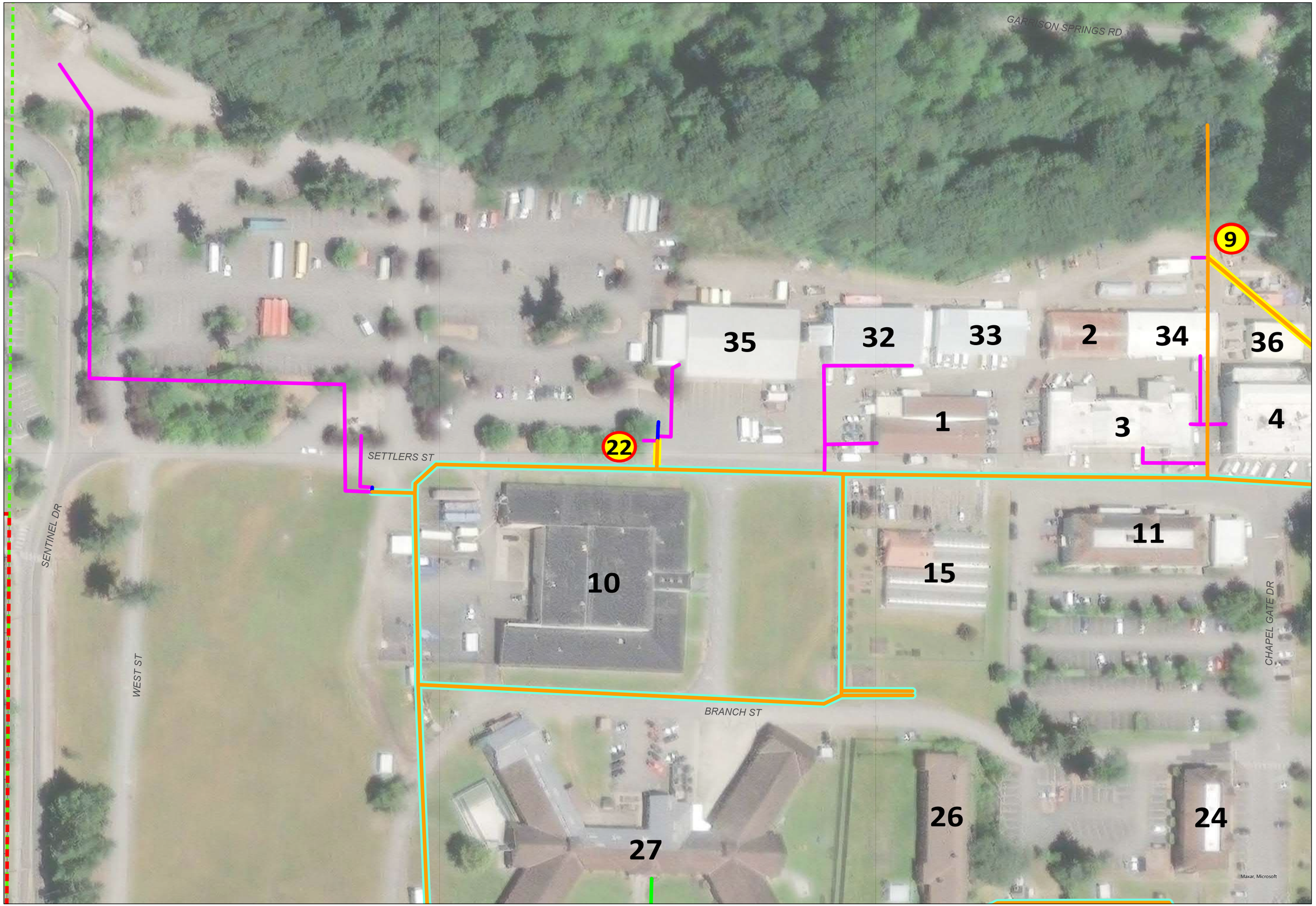
0 150 300 600 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00680\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSPIDSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



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Vicinity Map

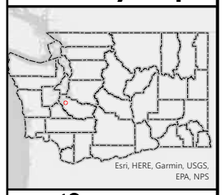


Figure 9-2a
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

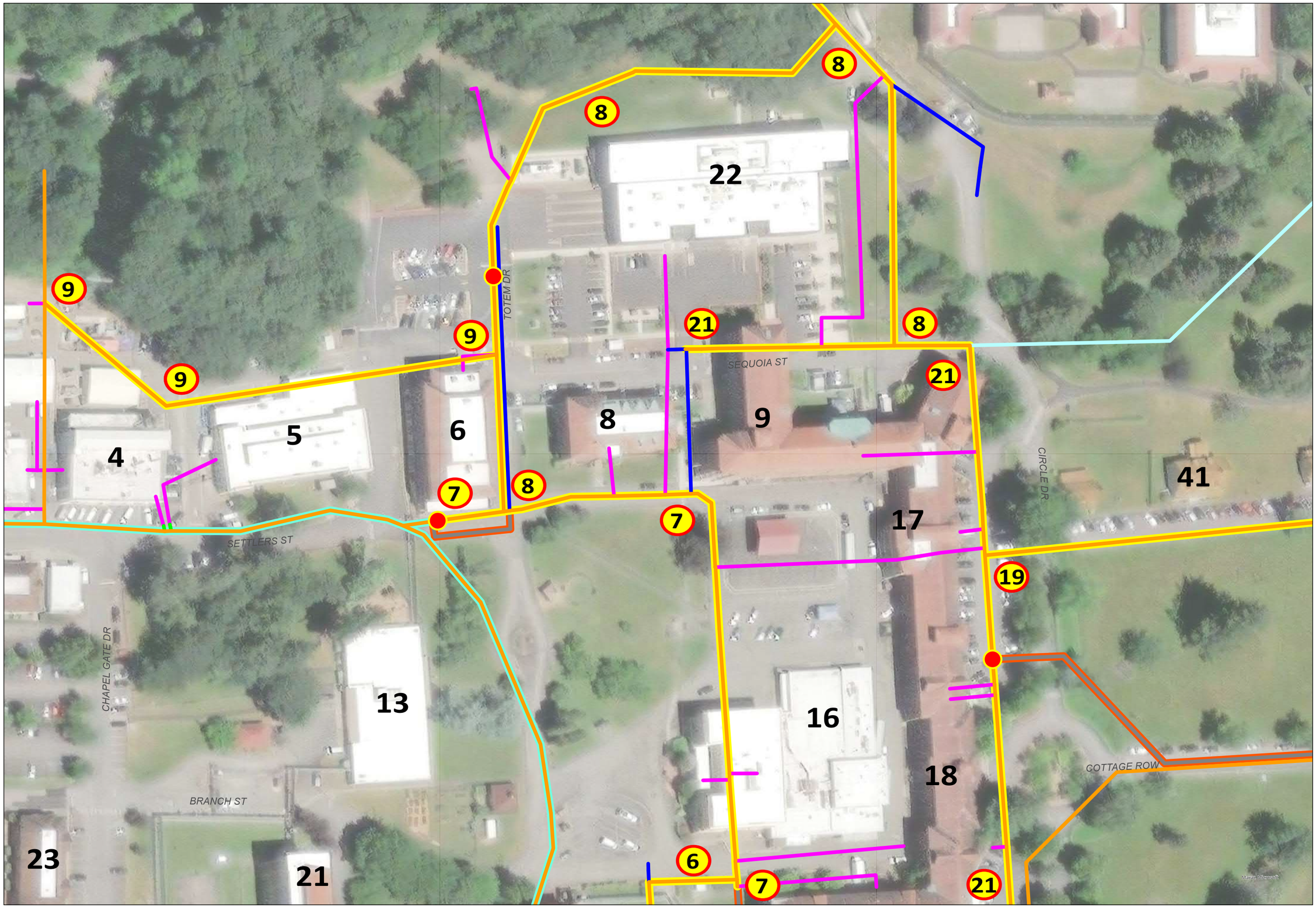
0 25 50 100 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-0068\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



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Vicinity Map

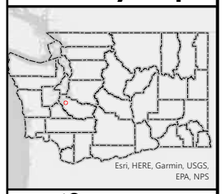


Figure 9-2b
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

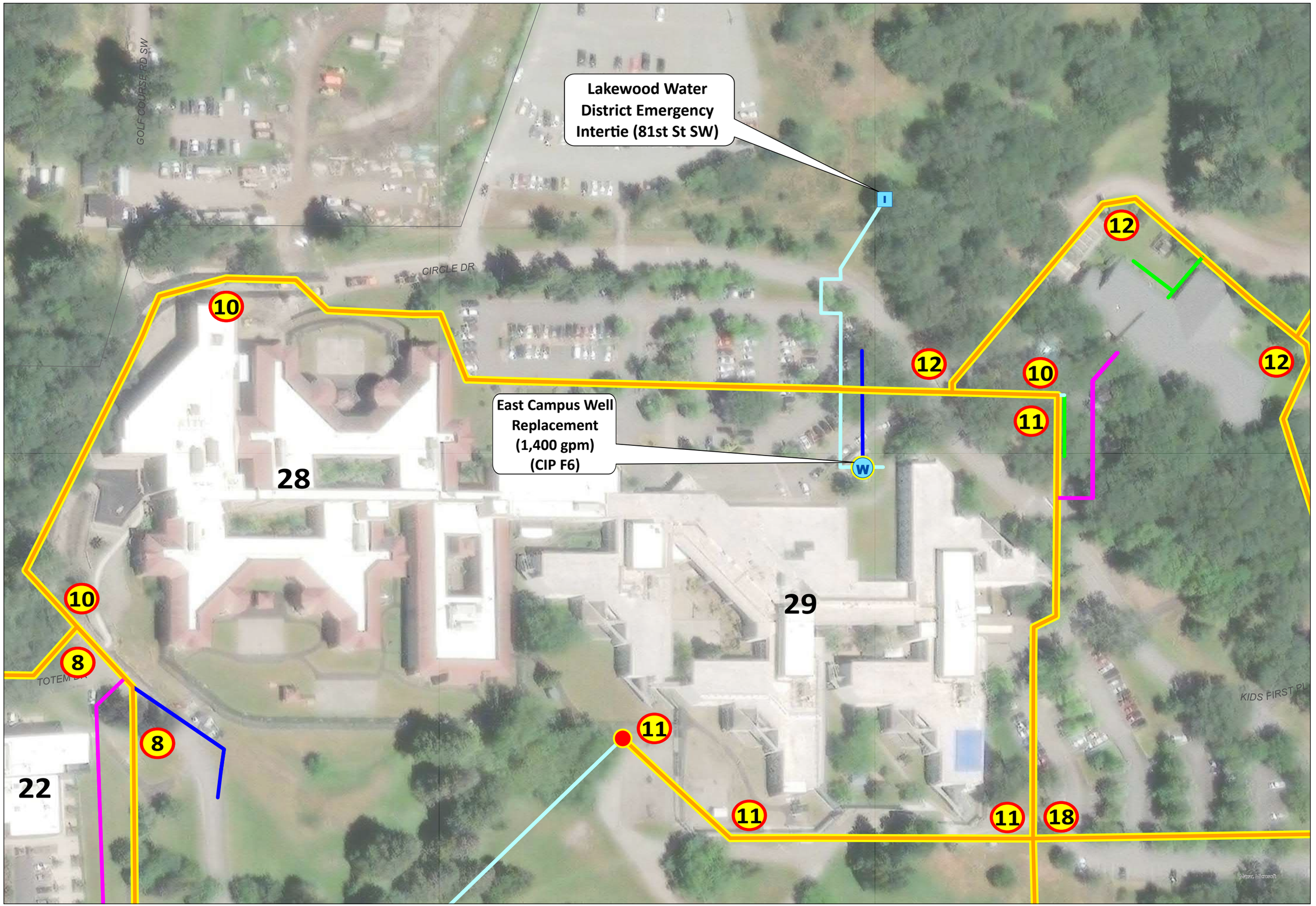
0 25 50 100 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00688\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



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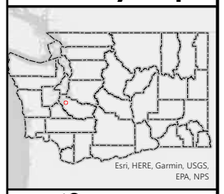


Figure 9-2c
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

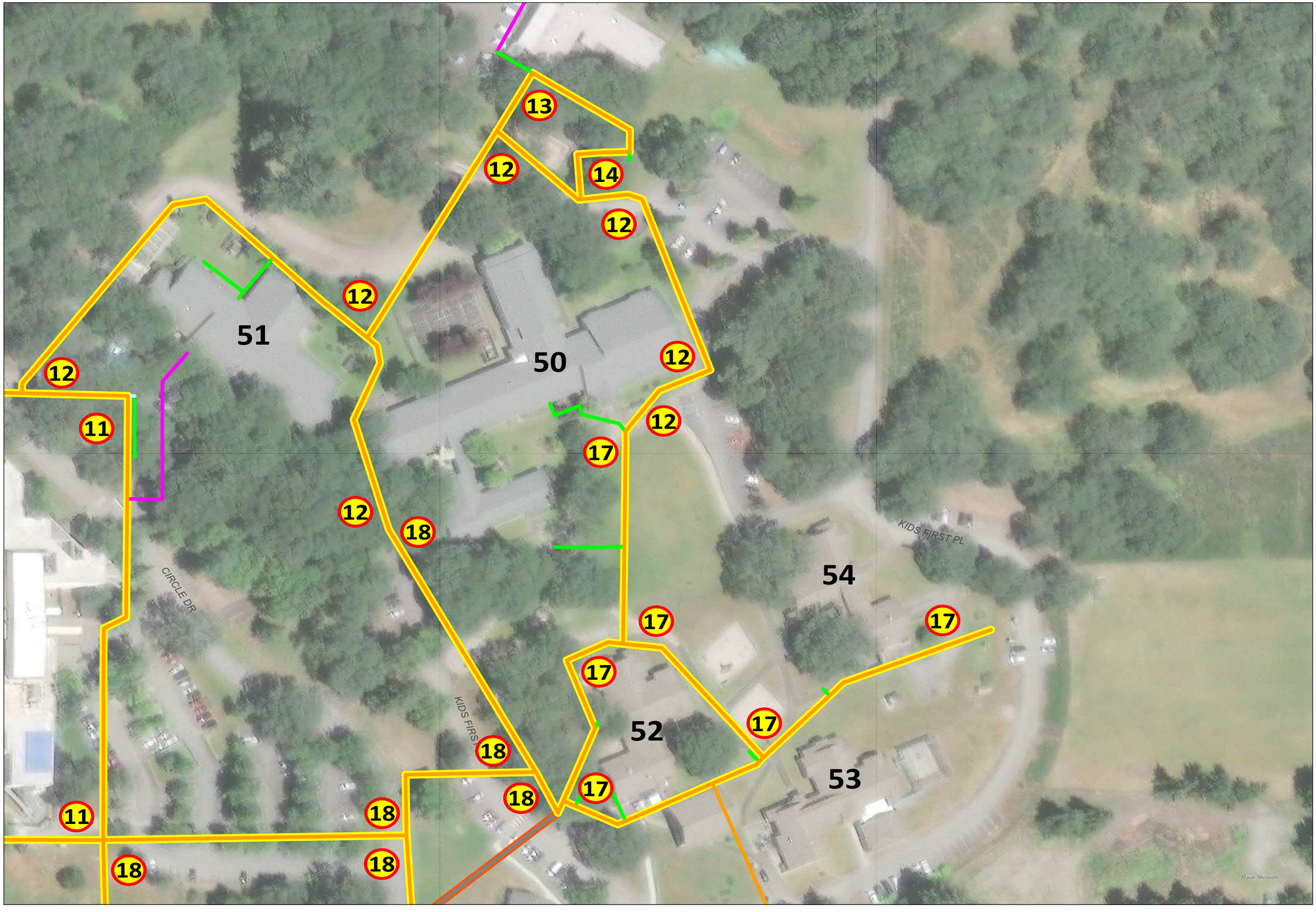
0 25 50 100 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00668\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



Vicinity Map

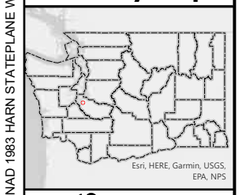


Figure 9-2d
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00680\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

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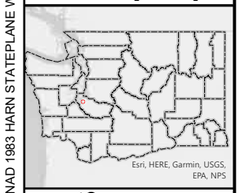

Figure 9-2e
CIP Scenario 2 Improvements
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00680\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

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Vicinity Map

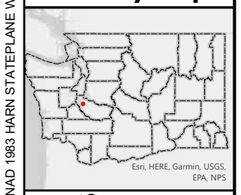


Figure 9-2f
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

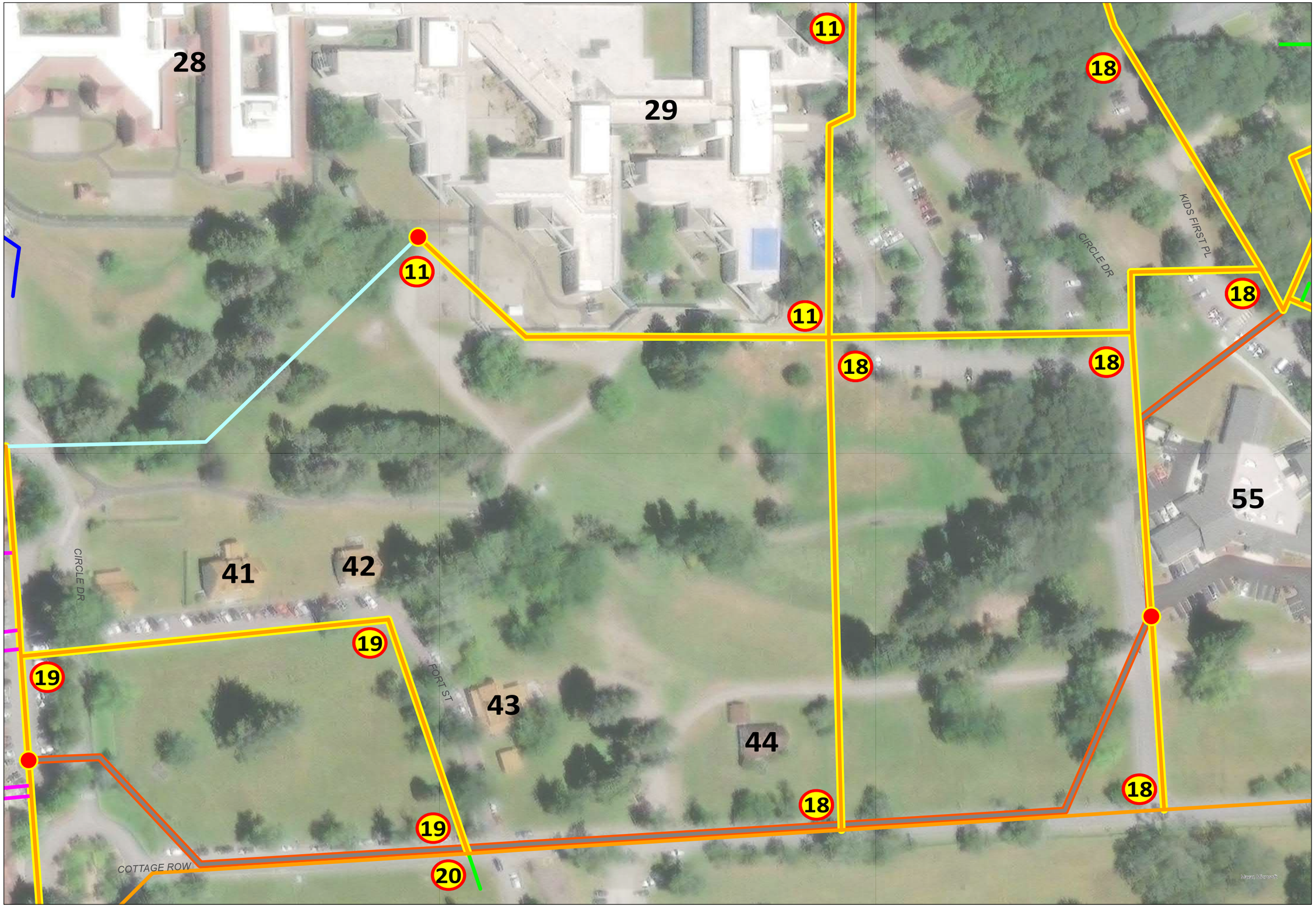
0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-0068\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



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Vicinity Map

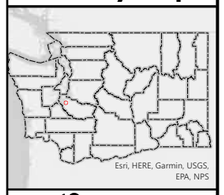


Figure 9-2g
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

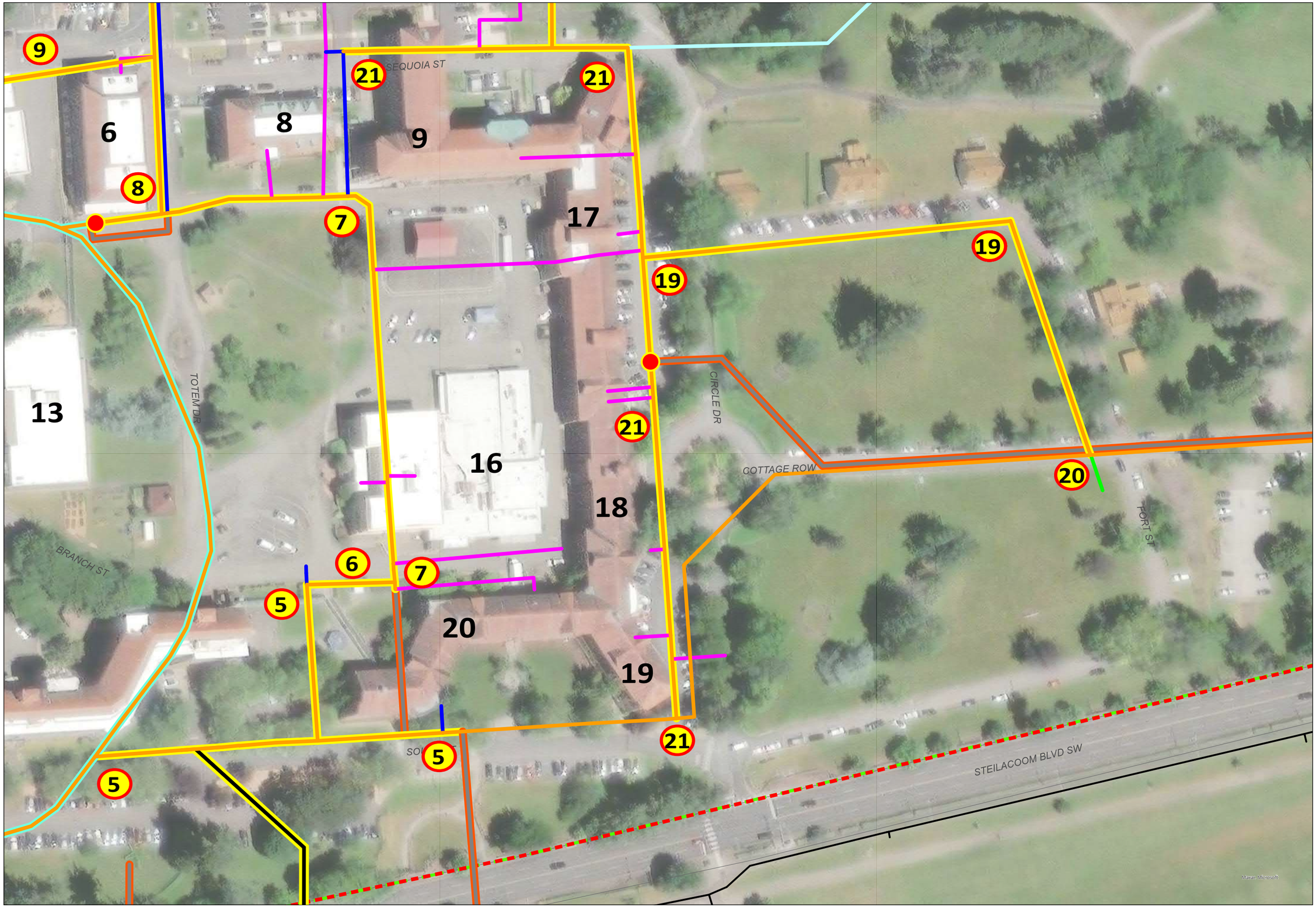
0 25 50 100 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-00681\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



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Vicinity Map

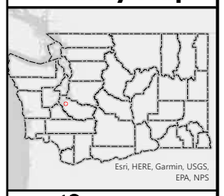


Figure 9-2h
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

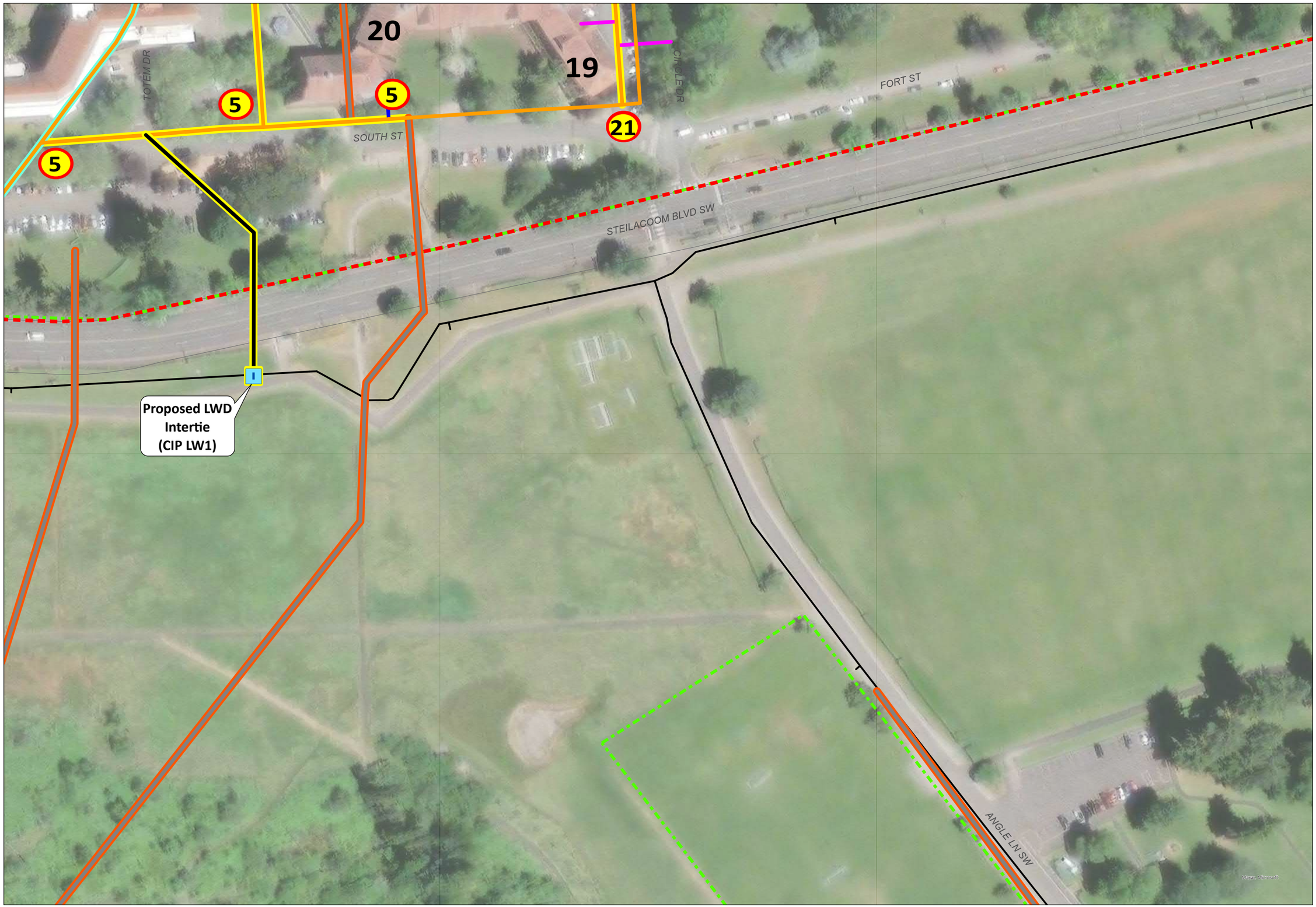
0 25 50 100 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-0068\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



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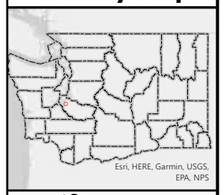


Figure 9-2i
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

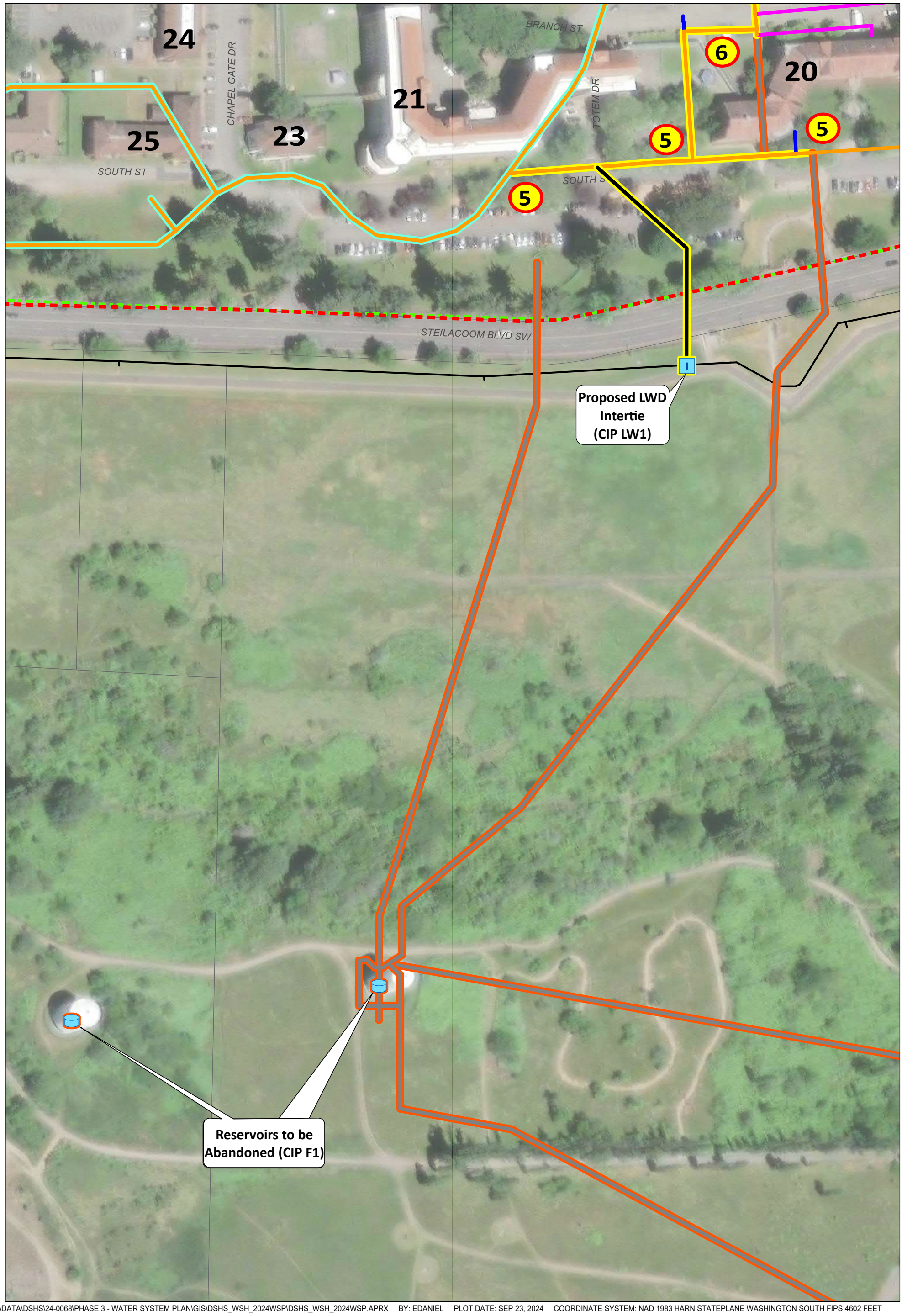
0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-0068\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET



J:\DATA\DSHS\24-0068\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

RH2

NORTH

1 inch : 60 Feet

0 30 60 120 Feet

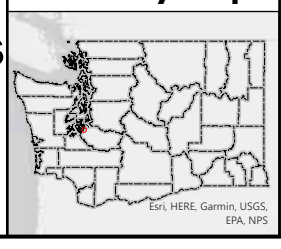
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

Washington State Department of Social & Health Services

Transforming lives

Figure 9-2j
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Vicinity Map



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Vicinity Map

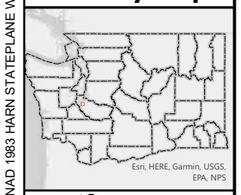


Figure 9-2k
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

Transforming lives

1 inch : 50 Feet

0 25 50 100 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\DSHS\24-0068\PHASE 3 - WATER SYSTEM PLAN\GIS\DSHS_WSH_2024WSP\DSHS_WSH_2024WSP.APRX BY: EDANIEL PLOT DATE: SEP 23, 2024 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

Vicinity Map

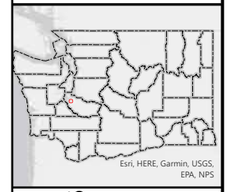


Figure 9-2I
CIP Scenario 2 Improvement Projects
Dept. of Social and Health Services
Western State Hospital
Water System Plan

Washington State Department of Social & Health Services

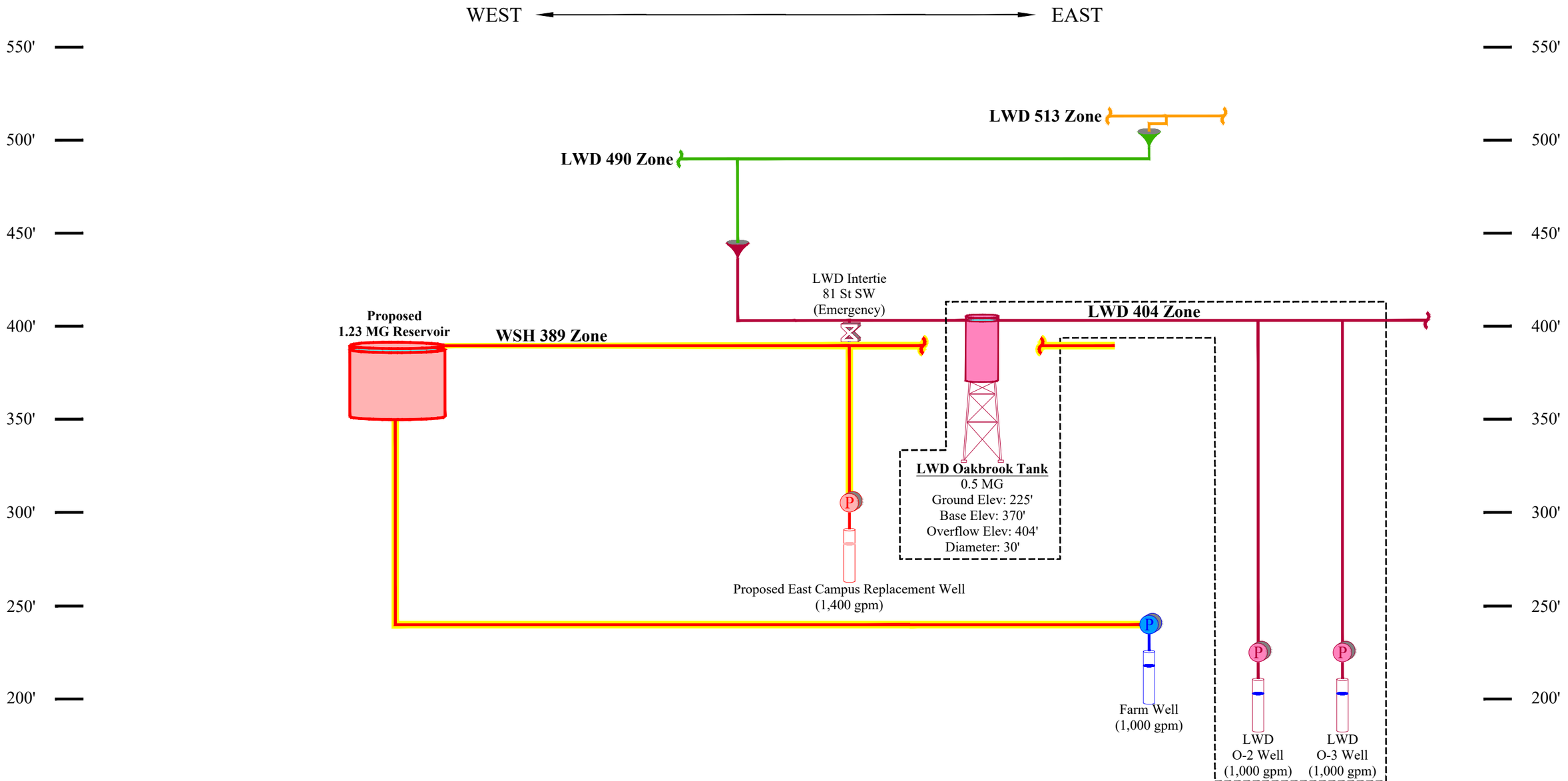
Transforming lives

1 inch : 50 Feet

DRAWING IS FULL SCALE
WHEN BAR MEASURES 2"

RH2

NORTH



Legend

- Proposed Improvement
- Lakewood Water District (LWD) 513 Zone
- LWD 490 Zone
- LWD 404 Zone
- Western State Hospital (WSH) Distribution
- Intertie
- Pressure Reducing Valve
- Well Source
- Facilities at Same Site

RH2

Washington State Department of Social & Health Services
Transforming lives

Figure 9-3
CIP Scenario 1 Proposed System Hydraulic Profile
Dept. of Social and Health Services
Western State Hospital Water System Plan

Date: Sep 25, 2024 Filename: J:\DATA\DSHS\21-0068\CAD\WSH-HPP.DWG

10 | FINANCIAL ANALYSIS

INTRODUCTION

The Washington State Department of Social and Health Services (DSHS) considers the water facilities of the Western State Hospital (WSH), including the reservoirs, wells, and distribution system, to be a valuable part of WSH's infrastructure. WSH has a commitment to the water system and will support the system to provide a safe and reliable water supply to its customers.

WATER CAPITAL IMPROVEMENTS

Chapter 9 of this Water System Plan identifies approximately $53 million in recommended capital improvements for the WSH water system during the 20-year planning horizon.

It is reasonable to assume that the costs will be higher in the future when projects are scheduled for completion. The estimated 2024 costs will need to be escalated to confirm that the funding is appropriate to match the anticipated cost escalation.

CAPITAL IMPROVEMENT FUNDING

To obtain funding for capital projects, DSHS begins by identifying needed maintenance and improvements. These can either be new requests or carry-over projects from past budgets that were not able to be funded. New requests can come from several scenarios, including a Governor's mandate, programmatic need, maintenance items that turn into replacement needs, etc.

DSHS submits a 10-year Capital Plan on even number years for an upcoming Capital Budget which is identified by odd numbered years. DSHS has an opportunity request funding also in odd number years as part of the Supplemental Capital Budget. Supplemental Capital Budget requests tend to have limited funding capacity.

The capital plan includes both minor and major projects; minor projects include a total project cost of up to $1.5 million or major projects includes a total project cost of $1.5 million or more. The capital plan provides both prioritization and programmatic type projects. Water systems improvements can be included in both types of projects depending on the need.

DSHS prioritizes projects based on known factors such as dependency, programmatic needs, citations and findings by Authorities Having Jurisdictions (AHJ), and building/asset condition. The list is then reprioritized with the Facilities, Finance, and Analytics Administration and DSHS Executive Offices.

A capital budget is passed every 2 years by the Washington State Legislature. The next capital budget will be finalized in early 2025. A supplemental budget is passed in even numbered years. Typically, less than 10 percent of DSHS' requests obtain funding.

DSHS evaluates the capital plan annually. DSHS identifies those projects not funded in previous requests for changes in conditions. This evaluation process provides direction if additional funding requests are needed.

DSHS operators conform to current water quality rules and regulations. If requirements are not met by the capital budget and cannot wait for the next budget cycle DSHS can use either operating budget appropriation or request funding through the Office of Financial Management (OFM). The Legislature has traditionally appropriated "emergency funds" to OFM for unplanned emergent needs that agencies incur.

DSHS requests maintenance funding with the State's Operating Budget. This request is coordinated with the Behavioral Health Administration. This funding includes water operators and maintenance of the water system as needed.

WSH has its own capital project requests, including the Capital Improvement Program in **Chapter 9**, that follow the same process.