LYNNWOOD
WASHINGTON

City of Lynnwood

Sewer Comprehensive Plan

January 2023

Final Draft

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FINAL DRAFT

Volume 1

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Glossary of Terms and Abbreviations

The following terms and abbreviations are used in this Plan:

303d List	Washington State's list of impaired and threatened waters
AAF	Average Annual Flow, or Average Daily Flow. This flow condition captures all daily flows during the year.
AC	Asbestos Cement
Act	Washington Unemployment Insurance Act
ArcMap	Computer program utilized for geographic information system mapping
Amp	Ampere
ATAD	Autothermal Thermophilic Aerobic Digestion
ATS	Automatic Transfer Switch
AWWD	Alderwood Water and Wastewater District
Basin	An area that is served, or will be served, by a specific part of a wastewater system. Basins generally correspond to natural drainage areas.
BHC	BHC Consultants, LLC
BOD	Biochemical Oxygen Demand
CBE	Chavond Berry Engineering Corp
CCF	Charge per Hundred Cubic Feet
CCTV	Closed-Circuit Television
CDL	Commercial Driver's License
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
CIPP	Cured-in-Place-Piping
City	City of Lynnwood
County	Snohomish County
CPU	Comprehensive Plan Update
DAS	Densified Activated Sludge
DI	Ductile Iron
DMR	Daily Monitoring Report
DOH	Washington State Department of Health
DWF	Dry Weather Flow, or Domestic Flow. An estimation of wastewater flow with little to no I/I contribution.

Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
ERU	Equivalent Residential Unit
EWUC	Everett Water Utility Committee
Facility Plan	City of Lynnwood WWTP Facility Plan. Prepared by RH2 Engineering, Inc.
FOG	Fats, Oils, and Grease
Force Main	A pipe that transports wastewater under pressure delivered by a wastewater pump.
FRP	Fiberglass Reinforced Plastic
ft	Feet
FTE	Full-Time Employee
GFC	General Facilities Charge
GIS	Geographic Information System
GMA	Growth Management Act
GO	General Obligation
gpad	gallons per acre day
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
HDPE	High Density Polyethylene
HP	Horsepower
IFAS	Integrated Fixed Film Activated Sludge
ILA	Interlocal Agreement
Infiltration	Groundwater that enters a wastewater collection system through fractured or defective pipes, leaking pipe joints, leaking manholes, and other defects.
Inflow	Stormwater runoff that directly enters a wastewater collection system from roof, street, and other drains, perforated or leaking manhole covers, and other sources. Water from foundation drains is also considered inflow.
I/I	Inflow and Infiltration. Combined total of infiltration and inflow without distinction between the two.
IWD	Industrial Wastewater Discharge
kW	Kilowatt
LF	Linear Feet

LFC	Local Facilities Charge
LHV	Lower Heating Value
L&I	Labor and Industries
LID	Local Utility District
LMC	Lynnwood Municipal Code
LOMC	Lynnwood Operations and Maintenance Center
LOS	Level of Service. The City's LOS criteria states that maximum wastewater levels must remain 5-feet below ground level
LS	Lift Station
LUD	Local Utility District
LUV	Land Use Vision
MABR	Membrane Aerated Biofilm Reactor
MG	Million Gallons
MGD	Million Gallons per Day
mg/L	milligram per liter
MH	Manhole
MLSS	Mixed Liquor Suspended Solids
MMF	Maximum Month Flow. The average flow of the maximum month.
MMDF	Maximum Month Design Flow. The average flow of the maximum month the City's WWTP.
MPPS	Main Plant Pump Station
MWL	Municipal Water Supply – Efficiency Requirements Act Chapter 5, commonly known as the "Municipal Water Law." It was adopted in 2003 and includes requirements for water and wastewater master planning.
MIKE Urban	Danish Hydraulic Institute Software. This is the software used for the hydraulic and hydrologic model simulations.
MU	Mike Urban
NPDES	National Pollution Discharge Elimination System. As authorized by the Clean Water Act, the NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches.
NRCS	Natural Resources Conservation Service

O&M	Operations and Maintenance
OFM	Office of Financial Management
Orange Book	Ecology's *Criteria for Sewage Works Design*
OSHA	Occupational Safety and Health Administration
OSS	On-Site Sewage
PDF	Peak Day Flow. The maximum total daily flow through the system.
PHF	Peak Hour Flow. The peak sustained flow rate occurring during a one-hour period.
PHS	Priority Habitat Species
PIC	Person-In-Charge
Plan	Sewer Comprehensive Plan
POTW	Publicly Owned Treatment Works
ppcd	Per Capita per Day
PSNGP	Puget Sound Nutrient General Permit. This permit focuses on controlling nutrients (particularly nitrogen) and works in conjunction with existing WWTP's individual discharge permits, applying to the 58 WWTPs that discharge into marine and estuarine waters of Washington
PSRC	Puget Sound Regional Council
PUD	Public Utility District
PVC	Polyvinyl Chloride
RAS	Return Activated Sludge
RCE	Residential Customer Equivalent
RCW	Revised Code of Washington
RH2	RH2 Engineering, Inc
SAEP	Small Area Estimates Program
SCADA	Supervisory Control and Data Acquisition
SCP	Sewer Comprehensive Plan
SDR	Standard Dimension Ratio, a measurement that rates the working pressure capacity of a pipe
SEPA	State Environmental Policy Act. A law of the State of Washington that requires identification of environmental impacts for proposed projects and actions. General Wastewater Plans are subject to review under this law.

Sewer	A pipe or conduit, generally closed but normally not flowing full, for carrying wastewater.
Service Area	The area currently served by wastewater collection system
SF	Square Feet
SOC	Species of Concern
SRT	Solids Retention Time
SSI	Sewage Sludge Incinerator
SSMH	Sanitary Sewer Manhole
SSO	Sanitary Sewer Overflow
TDH	Total Dynamic Head
TIN	Total Inorganic Nitrogen. This is the sum of nitrate, nitrite, and ammonia in effluent discharged from the WWTP
TKN	Total Kjeldahl Nitrogen. This is the sum of ammonia and organic nitrogen
TMDL	Total Maximum Daily Load establishes the highest amount of a pollutant (numerical value) a surface water body can receive and still meet the state water quality standards
TOC	Toxic Organic Compounds
TPH	Toxic/Poisonous, Petroleum Laden
TSS	Total Suspended Solids
TWAS	Thickened Waste Activated Sludge
UGA	Urban Growth Area
ULID	Utility Local Improvement District
UPD	Urban Planned Developments. These are land developments within the UGA involving a public review process with the intent of mutual benefit to public and private interests.
UV	Ultraviolet
VFD	Variable Frequency Drive
WAC	Washington Administrative Code
WAS	Waste Activated Sludge
WDFW	Washington Department of Fish and Wildlife
WISHA	Washington Industrial Safety and Health Act
WSDOT	Washington State Department of Transportation
WWTP	Wastewater Treatment Plant

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Executive Summary

BACKGROUND AND PURPOSE (CHAPTER 1)

The City of Lynnwood (City) owns and operates wastewater collection facilities including gravity sewers, sewer force mains, lift stations and a Wastewater Treatment Plant (WWTP).

The City's 2023 Sewer Comprehensive Plan Update (Plan) was prepared as an update to the November 2012 Wastewater Comprehensive Plan. The purpose of this updated Plan is to: update projected population and flow estimates for the City's wastewater service area based on current and future growth; analyze the City's existing sanitary sewer conveyance system and WWTP to identify necessary conveyance and facility upgrades; analyze operations and maintenance (O&M) personnel, practices, and staffing levels; summarize and schedule a targeted list of future capital improvements; and review the City's finances to ensure adequate funding is available for the necessary system-wide improvements.

REGULATIONS, POLICIES AND DESIGN CRITERIA (CHAPTER 2)

Several local, state, and federal regulatory requirements guide the planning, operation, design, and construction of wastewater collection systems, and these must be considered as part of this planning process. This Plan is prepared for the City to fulfill the requirements of Chapter 173-240-050 of the Washington Administrative Code (WAC), Chapter 90.48 of the Revised Code of Washington (RCW), and RCW 36.70A (Growth Management Act). Regulatory requirements, City wastewater policy and design standards are summarized in **Chapter 2**.

SERVICE AREA CHARACTERISTICS (CHAPTER 3)

The City's WWTP serves most of the population within City limits and the northern area of the City of Edmonds. The City's WWTP collects and treats wastewater from a sewer service area of approximately 5,892 acres. Wastewater within this service area is generally conveyed west to the WWTP, located in a City annexed area adjacent to Puget Sound. The City has agreements with adjacent utilities (Edmonds, Mountlake Terrace and Alderwood Water and Wastewater District) to serve the remaining urban growth area (UGA).

Lynnwood is located on terrain characterized by gently rolling hills and valleys. Scriber Lake, Scriber Creek, Hall's Lake, and Lund's Gulch Creek are the dominant freshwater features in the Lynnwood City boundary. Critical areas, such as wetlands and landslide hazards, are summarized and mapped in **Chapter 3**. **Chapter 3** also includes summary of compliance with the Water Quality Management Plan and an overview of City potable water systems.

POPULATION, FLOW, AND MODEL LOADING PARAMETERS (CHAPTER 4)

Population and employment forecasting are used to estimate future wastewater flow. The existing and future residential and employment population data were collected from the Office of Financial Management (OFM) and the Puget Sound Regional Council (PSRC). Projections were provided for the four geographies representing the entire area served by the City's sanitary sewer system and WWTP.

Residential population projections were modified based on input by the City's Planning Department to reflect the heavier concentration of new development and redevelopment slated for the Alderwood Mall and City Center areas. A 74.3% increase in residential population is anticipated within the City's sanitary sewer service area between 2019 and 2050.

Employment population projections were also provided for the four geographies within the City's sanitary sewer service area, with the highest density of future employment population growth concentrated within the City's predominant commercial centers in the City Center, Alderwood Mall Area, and the SR-99 Corridor. A 70.3% increase in employment population is anticipated within the City's sanitary sewer service area between 2019 and 2050.

Future flow to the City's WWTP was estimated based on historical flows and forecasted population and employment increases.

EXISTING WASTEWATER FACILITIES (CHAPTER 5)

The City owns and operates approximately 104 miles of gravity sewer pipe, six miles of lift station force mains, seven lift stations, and a WWTP. Wastewater is generally conveyed west to the WWTP located in the northwestern corner of the City's service area. Sewer system mapping is provided in **Chapter 5** figures and **Appendix G Sewer System Map**.

Gravity sewer pipe materials vary by year of installation. Generally, older installations used concrete pipe material and newer installations used high density polyethylene (HDPE), polyvinyl chloride (PVC), ductile iron (DI) or fiberglass reinforced plastic (FRP). Approximately 75% of gravity sewer pipe in the City's system is concrete pipe.

The existing wastewater collection and conveyance system includes seven lift stations. There are two wet well/dry well stations, three vacuum-primed packaged stations, and two submersible stations. Tabulated and narrative summaries of each lift station are provided in **Section 5.3**.

The WWTP is located at 17000 76th Ave W, Edmonds, WA 98026. The WWTP, originally constructed in 1962, solely used primary treatment. The WWTP was upgraded with secondary treatment in 1989. Treated wastewater is discharged to Puget Sound in accordance with the requirements of National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit No. WA0024031 issued February 8, 2019; effective March 1, 2019; and expiring February 29, 2024.

CONVEYANCE SYSTEM ANALYSIS (CHAPTER 6)

The City's existing Sanitary Sewer Collection System Model, originally developed for the 2012 Plan using the MIKE Urban (MU) software platform, was updated as part of this planning effort. The model represents a truncated version of the City's system, including only trunk and interceptor gravity mains mostly over 8-inches, pump stations, and accompanying force mains.

Dry weather flow was calculated based on water meter data and input to the model on a per parcel basis. Inflow and infiltration (I/I) was calculated using the six instream flow meters installed as part of this planning effort, in addition to the flow data obtained from existing lift station flow meters. Wet weather calibration was initially performed based on the recorded January 2nd and 3rd, 2022 storm, estimated as a 5-year, 24-hour rainfall event. A universal scaling factor was applied to transform the calibrated storm into a 20-year, 24-hour rainfall event used to analyze system deficiencies predicted in the model.

The City's level of service criteria of allowing sewer flows to surcharge under peak hour conditions for the 20-year, 24-hour flow event to within five (5) feet of the ground level was used to identify capacity deficiencies within the existing system. The model is used to estimate current and future capacity deficiencies.

A high-level I/I analysis was performed as part of this planning effort. Model results, input from the City, and previous I/I studies were used to inform this I/I analysis. In general, I/I is predicted to be higher in the central part of the City's system, which is an older part of the system that is located near freshwater features such as Scriber Lake and Scriber Creek. A multi-pronged I/I action plan is included within this Plan that focuses on near-term I/I reductions in the central part of the City.

Lastly, the conveyance system analysis presented in **Chapter 6** provides discussion of diversion alternatives, collection alternatives, and reclaimed water considerations. It is not expected that the City will pursue diversion alternatives or reclaimed water in the near-term.

WWTP PROGRAM (CHAPTER 7)

The City owns and operates a WWTP that treats and disinfects wastewater prior to its discharge into the Puget Sound. The existing WWTP site is constrained by parcel size and lack of nearby developable land. No substantial improvements to the WWTP capacity have been made in over 30 years. To meet the demands of growth, an increase of WWTP capacity will be necessary. Moreover, In December 2021, Ecology issued the Puget Sound Nutrient General Permit (PSNGP), which applies to all domestic WWTPs discharging to Puget Sound. While the final limits and compliance timeline have not been developed at this time, the impact of these potential regulatory requirements are considered in WWTP planning presented in this Plan.

Significant upgrades are needed at the City's WWTP. The City's WWTP Facility Plan (Facility Plan), prepared by RH2 Engineering, Inc., identifies needed improvements at the WWTP and includes recommendations for increasing the capacity and performance of the treatment facilities on the existing site to meet anticipated growth and nitrogen removal requirements. Wastewater treatment and disposal alternatives are also considered in **Chapter 7** to meet the requirements of WAC 173-240-050. Three alternatives are provided to satisfy the required treatment capacity and nitrogen removal capability. The first alternative is redevelopment of the existing WWTP site; the second alternative is development of an entirely new WWTP site within Lynnwood City limits; and the third alternative would be a connection to a larger regional wastewater collection and treatment system. Based on a review of the alternatives, it is recommended the City proceed with Alternative 1 and improve the existing WWTP onsite per the recommendations in the Facility Plan. The WWTP Upgrades are planned as a three-phased approach with an estimated total cost approximately $200 million.

OPERATIONS AND MAINTENANCE (CHAPTER 8)

Chapter 8 provides review and evaluation of normal, emergency, and preventative operations of the City's wastewater collection system, including a staffing analysis. Operations and maintenance of the City's WWTP is evaluated in the **Appendix A Facility Plan**.

The City's sewer system personnel are under the direction of the Deputy Director of Maintenance and Operations. Additional City operations staff is classified by Supervisor, Foreman, Pump Station Operator, Utility Lead, Maintenance Worker II and Maintenance Worker I positions. Staffing responsibilities, staff certifications, safety procedures, emergency response procedures, and preventative maintenance tasks and frequency are outlined in **Chapter 8**.

City operations staff are not able to, based on current staffing levels, provide the desired level of preventative maintenance as outlined in the City's **Appendix J Operations and Maintenance Manual**. Staff is limited to normal and emergency operations. A staffing analysis was performed and City staffing levels were reviewed against staffing levels for utilities of similar size and for providing optimum level of service. The staffing analysis indicates the City is understaffed, and approximately 5.1 additional full-time staff equivalents would be needed to achieve optimum operation and maintenance of the sewer system.

CAPITAL IMPROVEMENT PROGRAM (CHAPTER 9)

Implementation of the Capital Improvement Program (CIP) projects for the conveyance and treatment systems will be determined based on a number of factors, including an increase in sewer flows and/or necessary rehabilitation of aging infrastructure. Timing of projects may also depend on coordination with other utility projects, such as transportation system, water system, or stormwater system improvements.

There are eleven gravity or force main CIP projects identified for the City's sanitary sewer conveyance system; eight CIP projects for upgrades or improvements to the gravity system, lift stations, and force mains; and five CIP projects identified for the City's WWTP. Prioritization of these projects is within the 6-year planning horizon from 2023 thru 2028.

The City originally installed sanitary sewer in the 1960s. Components of the wastewater conveyance system are approaching or have exceeded 50-years old. This Plan recognizes the need to replace or rehabilitate aging gravity sewer pipe. An annual 'Sewer Replacement and/or Rehabilitation Program', starting in 2026, is identified for long-term replacement of aging gravity sewer pipe.

In additional to the conveyance and treatment related CIP, this Plan identifies three additional recommendations for the City's wastewater program, including upgrading their GIS database, implementing a regular flow monitoring program, and developing an interlocal agreement with the Alderwood Water and Wastewater District (AWWD).

FINANCIAL PROGRAM (CHAPTER 10)

The estimated cost of the twenty-seven CIP projects over the 20-year planning period identified in this Plan equals approximately $308 million. All of these projects are included in the budgeting process and the City has sufficient resources to fund the planned CIP. Several of the planned CIP projects will be completed beyond the near-term projects. Implementation of many of these projects will depend on the rate of growth in specific areas.

PLAN APPROVAL AND ADOPTION

Note: This is a summary of the expected process. This section will be updated based on actual future events, including additional dates/timelines. This document is the FINAL DRAFT which will be reviewed by City planning commission and neighboring utilities.

After preparation and review by City and Consultant staff, a Final Draft of the Plan was reviewed by the City's Planning Commission in January 2023. Concurrent to Planning Commission review, the City distributed a copy of the Plan to neighboring wastewater utilities (Alderwood Water and Wastewater District, City of Edmonds, and City of Mountlake Terrace) for review and comment. Applicable comments were incorporated to a Final Draft Approval Plan. The Final Draft Approval

Plan was then routed to Department of Ecology (Ecology) for review and approval. As part of the submittal to Ecology, the **Appendix A WWTP Facility Plan** was also submitted for concurrent approval. Final Ecology approval was provided after Ecology comments were addressed and incorporated. Lynnwood Council adopted the Plan shortly thereafter.

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Chapter 1 Introduction

1.1 BACKGROUND AND AUTHORIZATION

The City of Lynnwood (City) is in south Snohomish County between the cities of Seattle and Everett. It is generally bordered by City of Edmonds to the west; Mountlake Terrace to the South; and unincorporated Snohomish County to the north and east. The City is also bordered by Interstate Highway 5 to the east. A vicinity map is presented in **Figure 1-1**.

The City's wastewater collection facilities include gravity sewers, sewer force mains, and lift stations that convey wastewater to the City's Wastewater Treatment Plant (WWTP). The WWTP consists of a headworks with influent screening and grit removal, primary clarifiers, aeration basins, secondary clarifiers, gravity thickening, solids dewatering, incineration and ash handling, and chlorine disinfection. Treated wastewater is discharged to the Puget Sound in accordance with the requirements of National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit No. WA0024031 issued February 8, 2019; effective March 1, 2019; and expiring February 29, 2024 (see **Appendix F**). Biosolids from the wastewater treatment process are currently incinerated on-site with a fluidized bed incinerator, although the City is in the process of starting to haul biosolids off-site for disposal for a limited period during design and construction of the updated biosolids handling facility.

BHC Consultants, LLC (BHC) was authorized by the City of Lynnwood in September 2021 to prepare this Sewer Comprehensive Plan (SCP or Plan). The previous Wastewater Comprehensive Plan Update was completed in 2012. This Plan has been prepared in accordance with Washington Administrative Code (WAC) 173-240, which provides guidelines for the preparation of General Sewer Plans.

1.2 OWNERSHIP AND MANAGEMENT

The City of Lynnwood is a municipal corporation that owns, operates and manages wastewater conveyance and treatment. The City uses a Mayor-Council form of government. The Mayor oversees the management of the Public Works Department through the Director of Public Works. The collection system and WWTP is managed by the Public Works Department. A list of City officials at the time of SCP publication is included in **Table 1-1** below:

Table 1-1
City Officials Involved in SCP

Name	Title
Bill Franz	Director of Public Works
Jared Bond	Deputy Director – Operations and Maintenance
David Mach	City Engineer
Ehsan Shirkhani	Project Manager
Kris Olsen	Public Works Supervisor

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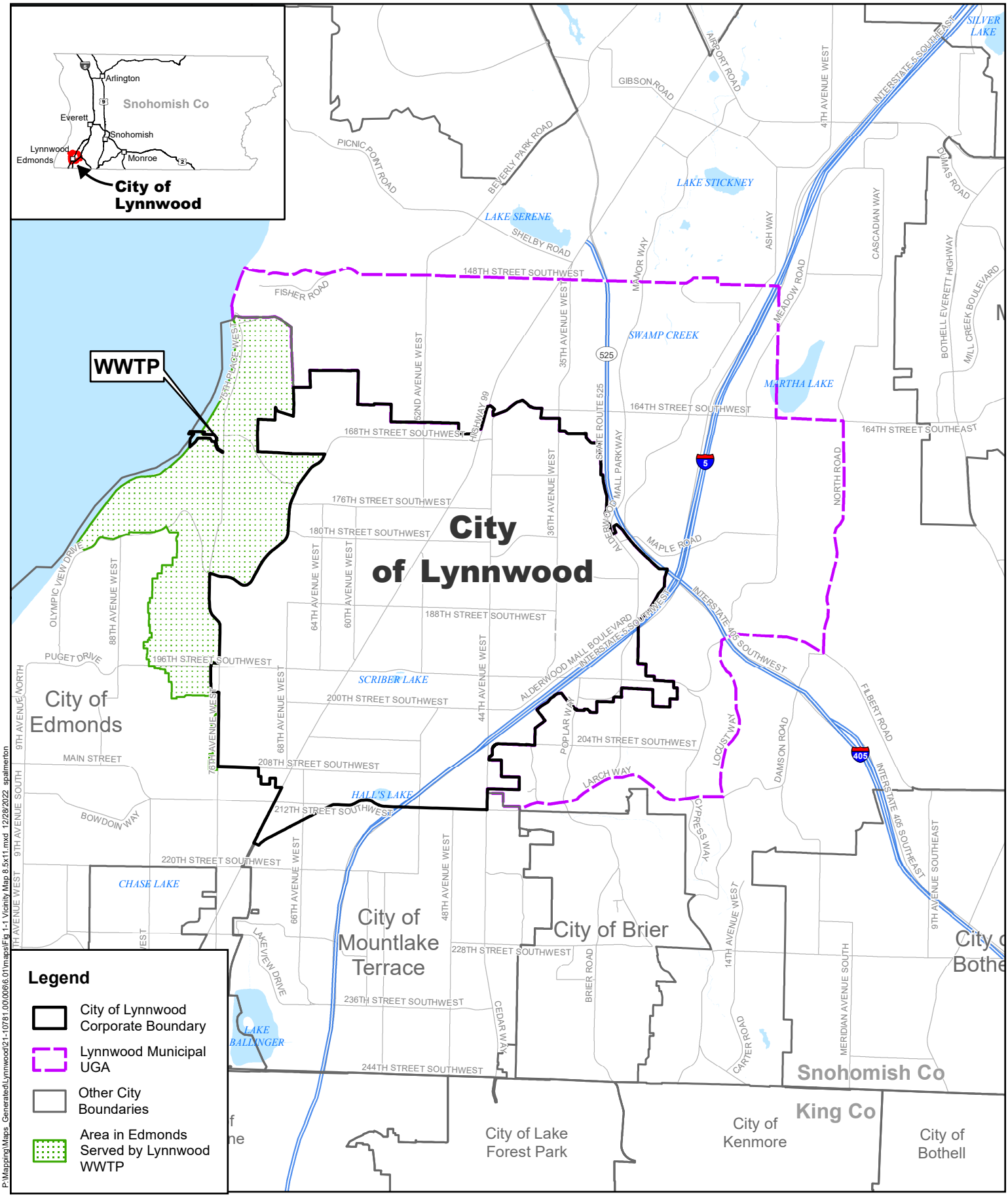

P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\006\6.01\maps\Fig 1-1 Vicinity Map 8.5x11.mxd 12/28/2022 spalmerton

This map is a geographic representation based on information available. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

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LYNNWOOD WASHINGTON

Vicinity Map

Sewer Comprehensive Plan
City of Lynnwood, Washington
January 2023

Figure **1-1**

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1.3 PURPOSE AND SCOPE

Changes in development, sewer system infrastructure and planning have occurred in the City since the previous Wastewater Comprehensive Plan Update in 2012. Development and growth within the City's sewer system boundary is expected to continue in upcoming years. The purpose of the SCP is to evaluate the City's sewer system and determine if the sewer utility is adequately serving the current and future needs of the community, as well as meeting applicable regulatory requirements. Specific goals of the SCP include:

- Evaluate existing wastewater collection and treatment requirements and project future wastewater system flows.
- Identify wastewater system improvements necessary to resolve existing system deficiencies and accommodate future needs of the system.
- Provide alternatives for collection, treatment, and disposal.
- Identify and plan for system improvements at the WWTP in conjunction with the WWTP Facility Plan (prepared under separate contract).
- Analyze existing and future Operations and Maintenance (O&M) personnel and practices. Update O&M Program.
- Prepare a Capital Improvement Plan (CIP) with scheduled implementation that balances community assets and goals.
- In conjunction with 2022 Utility Rate Study, prepare a Financial Program which addresses operational and capital costs; and assesses sewer rates and connection fees.
- Meet regulatory requirements further discussed in **Chapter 2**.

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Chapter 2 Regulations, Policies, and Design Criteria

2.1 REGULATORY REQUIREMENTS

Several local, state, and federal regulatory requirements guide the planning, operation, design, and construction of wastewater collection systems, and these must be considered as part of this planning process. This Plan is prepared for the City to fulfill the requirements of Chapter 173-240-050 of the Washington Administrative Code (WAC), Chapter 90.48 of the Revised Code of Washington (RCW), and RCW 36.70A (Growth Management Act).

2.1.1 Department of Ecology

WAC 173-240-050 requirements and their corresponding locations with the Plan are outlined below in **Table 2-1**.

Table 2-1
Comprehensive Sewer Plan Requirements per WAC 173-240-050

WAC Paragraph	Description of Requirement	Location in Document
3a	Purpose and need for proposed plan	**Section 1.3**
3b	Discussion of who will own, operate, and maintain system	**Section 1.2**
3c	Existing and proposed service boundaries	**Figure 3-1**
3d	Layout map showing boundaries of municipality and sewer service area, including vicinity map	**Figure 1-1; Figure 3-1**
3d	Map of existing and proposed sewer infrastructure, including size, slope, capacity, direction of flow and service area boundaries	**Figure 5-1; Figure 9-1, Appendix I**
3d	Map of topography and elevations	**Figure 3-2**
3d	Map of existing and proposed pump stations	**Figure 5-1; Figure 9-1**
3d	Map of streams, lakes and other bodies of waters	**Figure 3-3**
3d	Map of water systems, including wells or other locations of water supply, water storage reservoirs, water treatment plant and water transmission facilities	**Figure 3-4**
3e	Population forecasting and methodology	**Chapter 4**
3f	Existing domestic and/or industrial wastewater facilities within 20 miles	**Figure 5-4**
3g	Discussion of infiltration and inflow and how actions in the plan will alleviate these problems in the future	**Section 6.5**

WAC Paragraph	Description of Requirement	Location in Document
3h	Treatment systems and adequacy of such treatment	**Section 5.4; Appendix A; Chapter 7**
3i	Identify industrial wastewater sources	**Section 5.5**
3j	Discussion of the location of all existing private and public wells, or other sources of water supply and how they are related to wastewater treatment facilities	**Section 3.5**
3k	Discussion of collection, treatment and disposal alternatives	**Section 6.6; Section 7.4**
3l	Define construction cost and O&M costs	**Chapter 8; Chapter 9**
3m	Compliance with adopted water quality management plan	**Section 3.4.4**
3n	SEPA compliance	**Appendix H**

2.1.2 Water Conservation

Water conservation is required by Washington State Department of Health through the Water Use Efficiency Rule (WAC 246-290-100 and 246-290-810). Less water use through conservation can reduce wastewater flows, which can result in delays or the reduced need for wastewater infrastructure improvements. The City is a member of the Everett Water Utility Committee (EWUC) and therefore shares in their system-wide conservation goal, which is to reduce demand by 1.4 MGD by the end of 2029. The City has several measures in place to support this goal, such as replacing old water meters with magnetic read meters, distributing water efficiency kits, a water billing structure that promotes conservation, estimating non-metered water use such as hydrant flushing, and a leak detection and repair program. Following the completion of the Advanced Metering Infrastructure project in 2021, the City has improved their ability to track water saved and their progress towards the EWUC conservation goals. Consideration of water conservation measures (RCW 90.48.495) are discussed more thoroughly in the City's Water System Plan.

2.1.3 Reclaimed Water

Consideration of reclaimed water (RCW 90.48.112) is discussed in Section 6.7.

2.1.4 Growth Management Act

Under the requirements of the state Growth Management Act, the City must commit to serving the wastewater needs of the planned growth that will occur within Lynnwood's urban boundary during the next six years. Snohomish County has defined the urban growth area (UGA) for the County as a whole in accordance with state law together with employment and population projections provided by the State Office of Financial Management.

The UGA assigned to the City of Lynnwood (City) is shown on **Figure 1-1**. The City has no immediate plans to annex any parcels outside of the current City limits. This Plan includes an evaluation of the existing wastewater system and identification of additional facilities needed to accommodate the planned growth to comply with the state regulations.

2.2 POLICIES

2.2.1 Overview and Goals

The City manages and operates their system in accordance with state, local and federal regulations and in accordance with Title 14 of the Lynnwood Municipal Code (LMC). The Title's primary purpose is the protection of public health and safety by controlling the quality of wastewater discharged to the wastewater collection and wastewater treatment system. LMC 14.04.005 further establishes the following objectives:

A. Protect the health, safety and welfare of the Publicly Owned Treatment Works (POTW) and its personnel and the general public;

B. Avoid or abate public nuisances;

C. Make provisions for the collection and treatment of all wastewater generated by domestic and nondomestic sources under the jurisdiction of the city;

D. Protect the City's wastewater collection and treatment system from pollutants which may interfere with the operation of the system or contaminate the sludges or other waste products generated as a result of operating the system;

E. Prevent pollutants from entering the wastewater treatment and collection system which could pass through the system, inadequately treated, into the receiving waters;

F. Generate sufficient revenues to operate, maintain, repair, improve and construct the wastewater collection and treatment system.

The Lynnwood Comprehensive Plan, adopted June 2015, also identifies the following sanitary sewer goals and policies:

A. Policy CF-1.6 Provide review for all development considering the land use plan.

B. Policy CF-1.7 Utilize contemporary materials and construction techniques.

C. Policy CF-1.8 Review and update the City's Wastewater Comprehensive Plan approximately every five years, depending on changes in best available science and the regulatory climate.

D. Policy CF-1.9 Plan and initiate the necessary analysis and public review to identify wastewater system financial needs and implement results of those efforts.

E. Policy CF-2.6 Provide financial support annually for the Pre-Treatment Program.

F. Policy CF-2.7 Clean sewers on a frequency determined by historical need.

G. Policy CF-2.8 Remedy one infiltration/inflow concern each year.

H. Policy CF-2.9 Prevent any large and control any small wastewater overflows each year.

I. Policy CF-2.10 Monitor air and water quality on a daily basis.

J. Policy CF-2.11 Maintain the equipment preventative maintenance schedule.

K. Policy CF-2.12 Limit odor complaints as practicable.

L. Policy CF-3.3 Maintain air and water quality to standards required by regular authority.

M. Policy CF-3.4 Coordinate contractual relationships with adjacent agencies for services.

2.2.2 On-site Sewage Systems

The LMC includes the following as related to management and conversion of on-site sewage, or septic, systems:

- 14.12.030: Except as hereinafter provided, it is unlawful to construct or maintain any privy, privy vault, septic tank, cesspool, or other facility intended or used for the disposal of sewage. (Ord. 147 § 3.03, 1963)
- 14.12.042: Every residence, apartment house, motel, hotel, factory, store, commercial establishment, or other building in which plumbing fixtures have been or are to be placed shall be required to connect with the municipal sanitary sewerage system within 90 days of written notice from the City whenever the Snohomish County Board of Health determines that a failing on-site wastewater system threatens public health or, for any public sewer installed after March 1, 2007, within 90 days after written notice that sewer service is available to said building; and provided, that any such building or part of building, or any exterior drainage facility, is within 200 feet of a public sewer. (Ord. 2665 § 2, 2007; Ord. 1706 § 14.90.910, 1989; Ord. 127 § 4, 1962)

2.2.3 Inflow and Infiltration

The LMC includes the following as related to inflow and infiltration management and reduction:

- 14.12.050: No person shall discharge or cause to be discharged any storm water, surface water, ground water, roof runoff, subsurface drainage, cooling water or untreated industrial process waters into any sanitary sewer. (Ord. 781 § 8, 1975)

2.2.4 Pretreatment

Prohibited discharges are described in LMC Section 14.60 and include discharges that are corrosive, high temperature, flow obstructing, toxic/poisonous, petroleum laden (TPH), high strength (solids, BOD, TSS), high in fats, oils and grease (FOG), contain toxic organic compounds (TOCs), or emit hydrogen sulfide.

Pretreatment systems may be required to reduce, eliminate, or alter the nature of a pollutant's properties prior to discharging to the City's wastewater collection system. Pretreatment systems primarily include oil, grease, and sand interceptors/traps. FOG pretreatment requirements are discussed in LMC 14.60.358. Grease removal systems shall be provided for all commercial wastewater customers that have food handling and preparation service, or otherwise generate FOG.

Pretreatment systems may also include treatment systems designed specifically for the removal of metals, solvents, and high strength Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) wastes or for pH adjustment. Such users may require an Industrial Wastewater Discharge Permit, as discussed in LMC 14.60.503. Industrial wastewater discharge users are discussed in **Section 5.5**.

2.2.5 Grinder Pumps

The LMC does not appear to contain information about installation, ownership and management of individual grinder pumping systems. Operationally, grinder pumps are limited to single family residences and single commercial buildings which are physically unable to connect to the sanitary sewer system by gravity. Individual grinder pumps and sewers located on private property are the

property owner's responsibility to construct, maintain and repair. The sewer lateral and main located in the public right-of-way are the responsibility of the City.

2.3 DESIGN CRITERIA

While the City has discretion in setting performance and design criteria and standards for its wastewater system, the criteria must meet or exceed the minimum standards for public sewers as established by the Washington State Department of Ecology (Ecology) in Chapters 90.48, 90.52, and 90.54 of the RCW. The criteria focus on planning, design parameters, and other details that have been developed to establish consistency and to ensure that adequate levels of service are provided throughout the system.

City wastewater system improvements are designed and constructed in accordance with the following:

- City of Lynnwood Sewer Standard Notes and Details, provided in **Appendix C** or available online at link below:
  - https://www.lynnwoodwa.gov/Services/Document-Library/Standard-Plans-Index
- City of Lynnwood Development Standards for Sewer Installation, also provided in **Appendix C**
- Washington Department of Ecology's *Criteria for Sewage Works Design (Orange Book)*
- Washington State Department of Health (DOH) requirements
- U.S. Environmental Protection Agency (EPA) requirements
- Current edition of the Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction.

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Chapter 3 Service Area Characteristics

3.1 BACKGROUND AND HISTORY

The City of Lynnwood is located in southwest Snohomish County. The City began as a small community of farms, forestlands, and businesses, and was incorporated in 1959. The modern city grew from the Alderwood Manor area, which was founded in 1917 near the spot where 196th Street and Interstate 5 converge today.

Primary wastewater treatment was first provided in the 1960s. The majority of the conveyance system was constructed in the 1960s and 1970s as concrete pipe.

3.2 SEWER SERVICE AREA

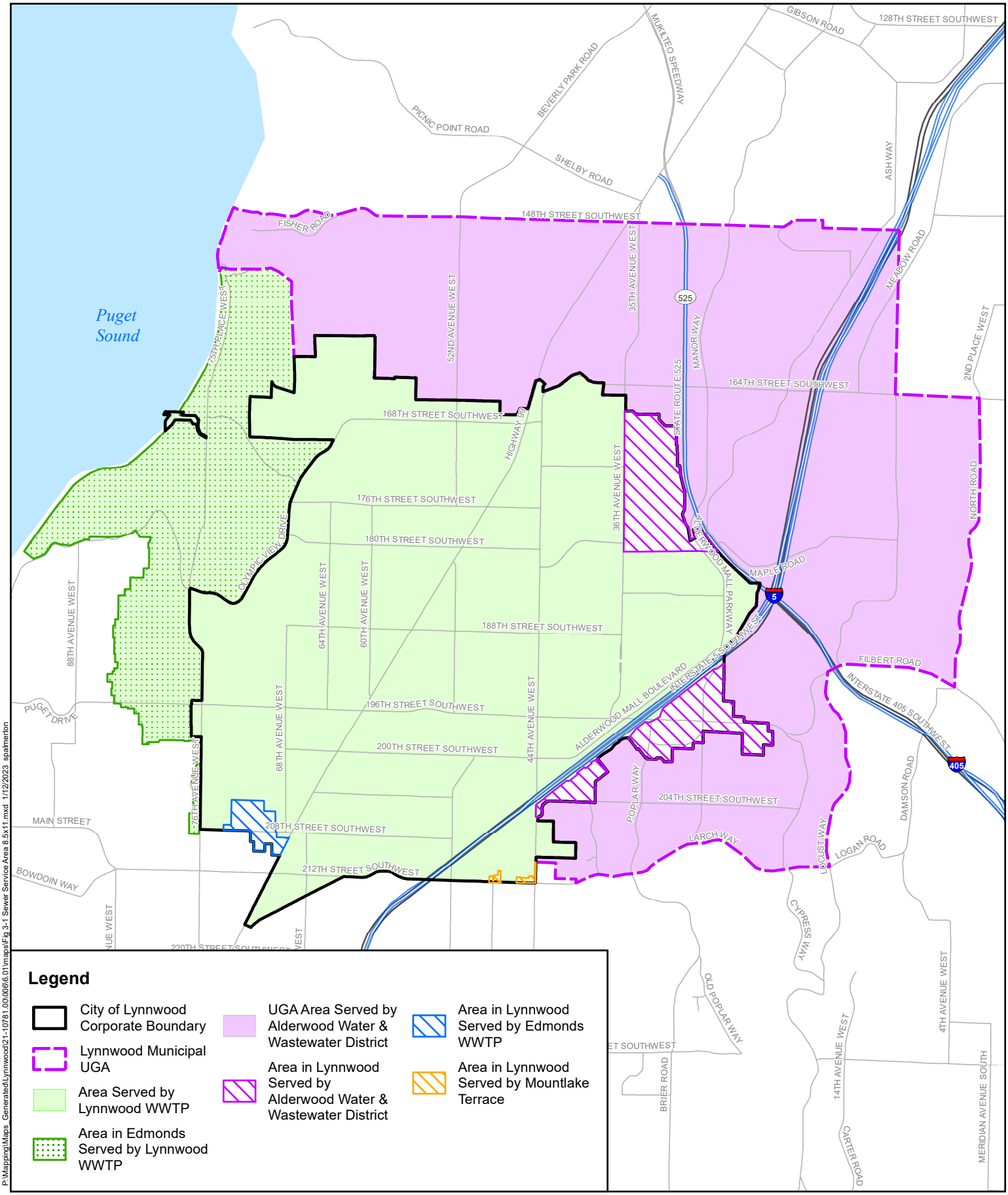
The City owns, operates, and maintains the majority of the sewer utility within City limits. Alderwood Water and Wastewater District (AWWD) is the sanitary sewer service provider in the urban growth area (UGA) outside of the City's corporate boundary. The northwestern extent of the area served by AWWD (primarily west of SR-525) is conveyed west to AWWD's Picnic Point WWTP. The northeastern and southern extent of the area served by AWWD and the area served by Mountlake Terrace are conveyed south and ultimately treated by King County Wastewater Treatment Division. The City also receives and treats flow from a portion of the City of Edmonds in the northwest section of the City. Edmonds owns and operates the collection system in these areas until the connection to the 76th Avenue West sewer trunk. Lastly, Lynnwood owns and operates pipe in the southwest corner of their City limits that is conveyed to and treated by City of Edmonds.

Table 3-1 below summarizes the utility service areas. A map showing sewer service areas within City limits and UGA is provided in **Figure 3-1**; a system-wide sewer map is provided in **Appendix G**.

Table 3-1
Sewer Service Areas

Sewer Service Provider	Service Area in Acres
Lynnwood Collection Area Served by Lynnwood WWTP	4,650
Area in Edmonds Served by Lynnwood WWTP	1,242
Total Area Served by Lynnwood WWTP	**5,892**
Area in Lynnwood Served by Edmonds WWTP	43
Area in Lynnwood Served by AWWD	360
Area in Lynnwood Served by Mountlake Terrace	5
Area in Lynnwood UGA Served by AWWD	5,014
Total Area in Lynnwood Served by Others	**5,422**

There are no current plans to change service area boundaries or alter relationships with adjacent sewer providers. There are Interlocal Agreements (ILAs) in place between the City of Lynnwood and Cities of Edmonds and Mountlake Terrace. There is no current ILA between AWWD and the City; this agreement is being worked on currently. Existing ILAs are located in **Appendix B**.



P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\006\6.01\maps\Fig 3-1 Sewer Service Area 8.5x11.mxd 1/12/2023 spalmerton

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LYNNWOOD WASHINGTON

Sewer Service Area

Sewer Comprehensive Plan
City of Lynnwood, Washington
January 2023

Figure
3-1

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3.3 TOPOGRAPHY, CLIMATE AND SOILS

Lynnwood is located on terrain characterized by gently rolling hills and valleys. The topography within the City is gently sloping with a maximum elevation of approximately 600 feet at 164th Street SW and 36th Avenue West, and a minimum elevation within the City of 240 feet at 180th Street SW and 76th Avenue West, though the small separate parcel for the WWTP is at sea level. A map of Topography and Elevations is provided in **Figure 3-2**.

Lynnwood is located in the Puget Lowlands, which generally are characterized by glacial soils. Basic soils information for the Lynnwood area is summarized in the NRCS Soil Survey of Snohomish County, Washington.

Lynnwood, like much of the Puget Sound area, has moderate temperature and precipitation. Precipitation in Lynnwood can range from 25 to 50 inches annually. Average annual precipitation is about 39 inches with December usually being the wettest month with about 5.9 inches of precipitation.

Lynnwood has above average precipitation for the Puget Sound area because it is located near the Puget Sound convergence zone. Northwest winds in the upper atmosphere become split by the Olympic Mountains, then re-converge over Puget Sound, causing updrafts. These updrafts can lead to convection and produce rain showers or more active weather.

3.4 WATER BODIES AND SENSITIVE AREAS

3.4.1 Lakes and Streams

Lakes, streams, and shorelines are classified as sensitive areas due to the variety of plants and animals that they support. Lynnwood is located within, or partially within, at least six watersheds: Swamp Creek, Scriber Creek, Hall Creek, Lund's Gulch Creek, Peririnville Creek and Stilthouse Creek. Critical Areas, lakes, streams, and shorelines are mapped on **Figure 3-3**.

The City's waterbody classification system is defined in LMC Chapter 17.10, as established by WAC 222-16-030, and include Type S, Type F, Type Np, and Type Ns waterbodies.

Type S waterbodies include any waters that are defined as "shorelines of the state". The standard buffer widths for Type S waterbodies are defined in LMC Chapter 17.20 (Shoreline Master Program), or default to a 150-foot buffer if not specifically defined in LMC Chapter 17.20. The City's Puget Sound shoreline and adjacent shorelands are classified as Type S waterbodies. This area is noncontiguous with the rest of City limits, bordered on three sides by the City of Edmonds, and is the location of the City's WWTP.

Type F waterbodies are defined as "all waters that are known to be used by fish or contain fish habitat". This includes Scriber Creek, Swamp Creek, Hall Creek, and Lund's Gulch Creek. The standard buffer width required for Type F waterbodies is 100 feet.

Type Np waterbodies are defined as "perennial waters that do not contain fish or fish habitat". The standard buffer width required for Type Np waterbodies is 60 feet.

Type Ns waterbodies are defined as "intermittent waters that do not contain fish or fish habitat and have intermittent flows". The standard buffer width required for Type Ns waterbodies is 35 feet.

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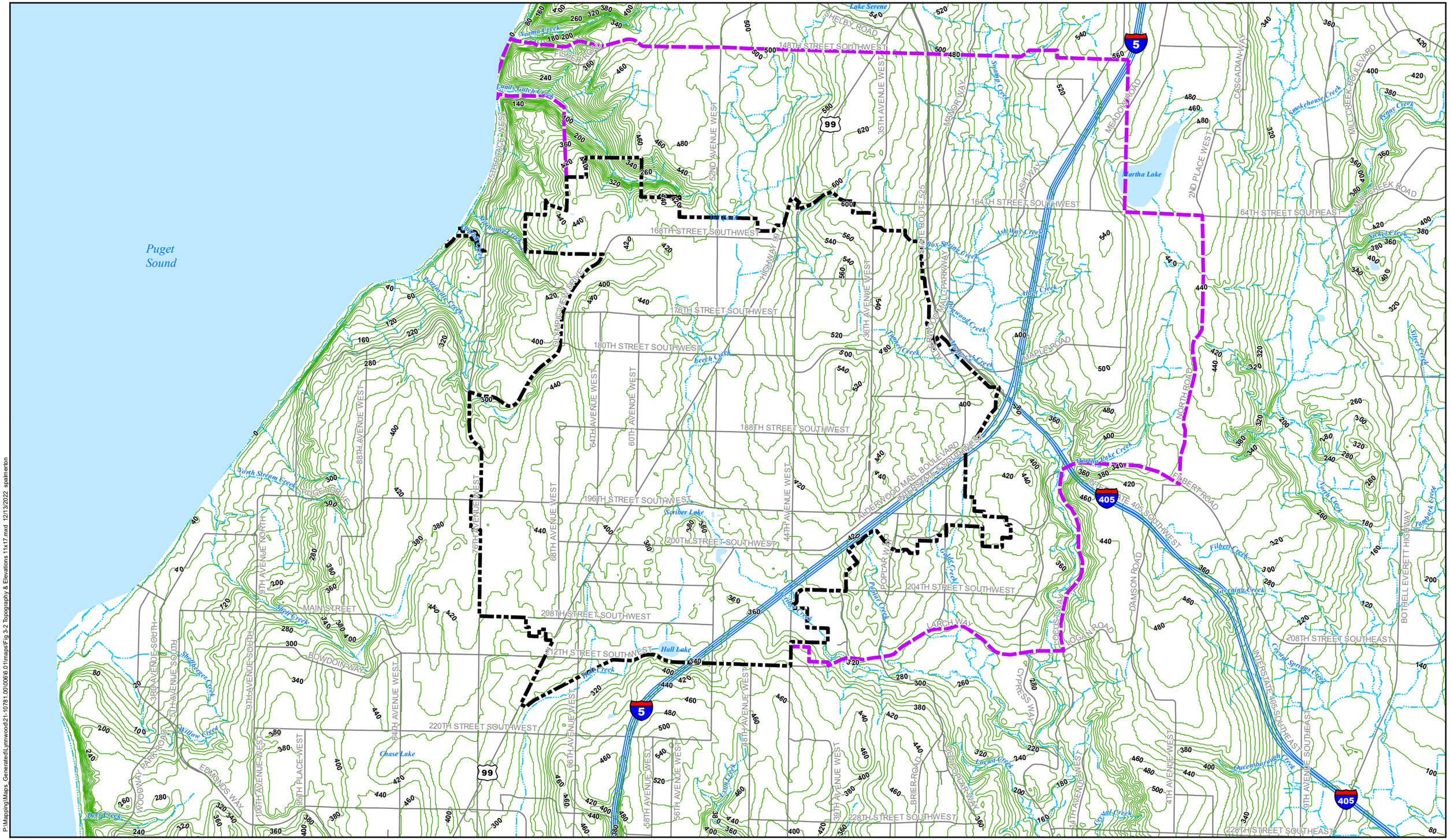

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GIS Base Data: Snohomish County
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City of Lynnwood
Municipal UGA
Water Bodies
Water Courses
20ft Contours

LYNNWOOD WASHINGTON

Topography & Elevations
Sewer Comprehensive Plan
City of Lynnwood, Washington
January 2023

Figure
3-2

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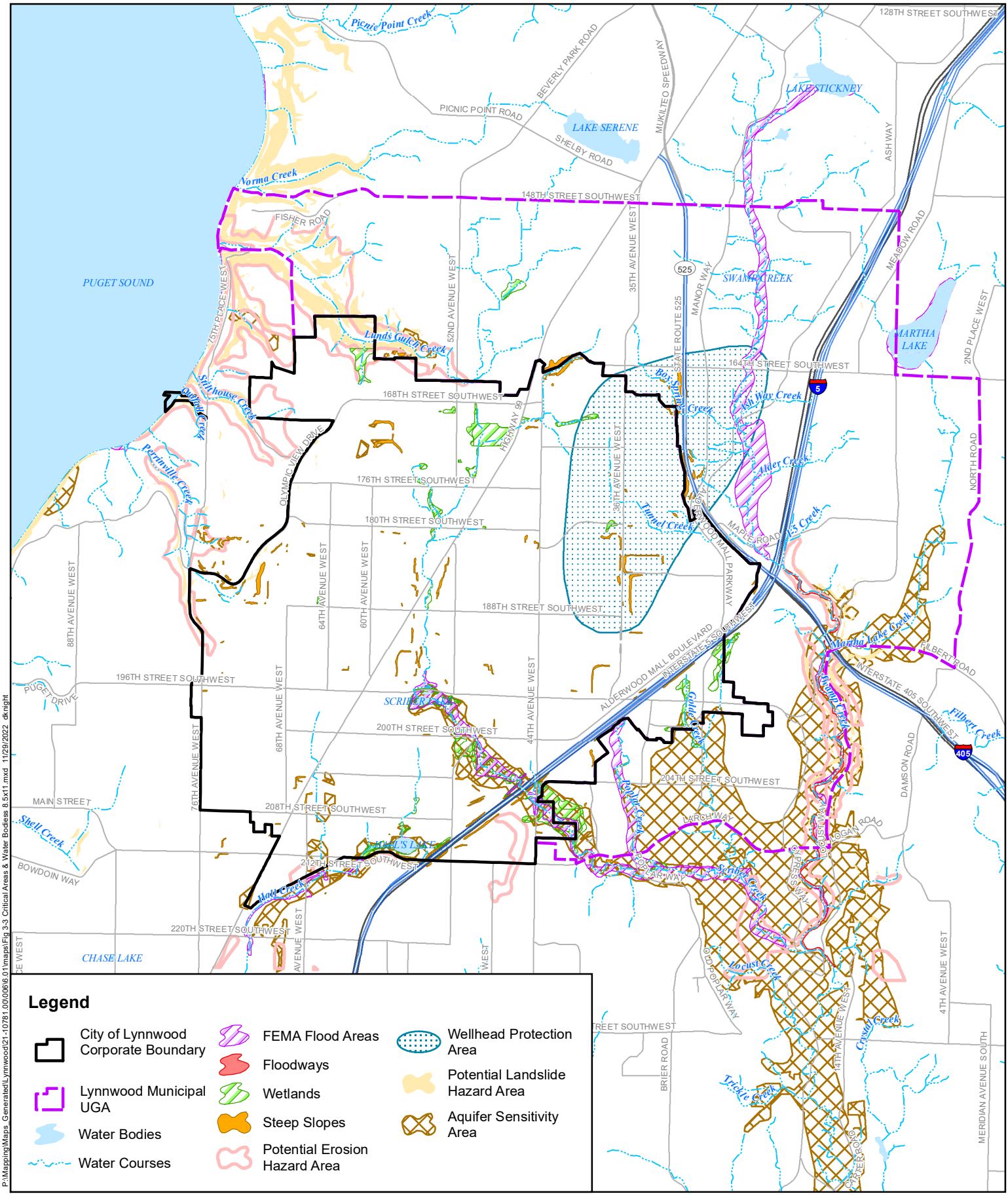

P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\0616.01\maps\Fig 3-3 Critical Areas & Water Bodies 8.5x11.mxd 11/29/2022 dknight

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LYNNWOOD WASHINGTON

Critical Areas & Water Bodies

Sewer Comprehensive Plan
City of Lynnwood, Washington
January 2023

Figure **3-3**

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3.4.2 Species Habitat

Sensitive fish and wildlife habitat is defined as areas which meet the definition of a "Fish and Wildlife Habitat Critical Area" pursuant to WAC 365-190-080(5) and is essential for maintaining specifically listed species in suitable habitats. Any proposed activity within 300 feet of these areas, including construction related to wastewater collection systems, requires that a habitat assessment be prepared. The Lynnwood Parks and Recreation Department has been working to acquire lands surrounding the area just south of Haine's Point to create a habitat corridor.

The City also has a Critical Areas Ordinance which requires sensitive areas to be protected and preserved when adjacent development occurs. Per the City of Lynnwood Comprehensive Plan (adopted June 2015) Lynnwood provides (or is likely to provide) habitat for the following species listed as priority habitat species (PHS) and species of concern (SOC) by the Washington Department of Fish and Wildlife (WDFW): great blue heron, wood duck, pileated woodpecker, Columbian black-tailed deer, and bald eagle. Other species that may occur in the Lynnwood area that are listed as Candidate or Threatened species include the following: little willow flycatcher, northern red-legged frog, and spotted frog.

3.4.3 Critical Areas

Critical areas within the sewer service area are identified in mapping provided by the City and are shown in **Figure 3-3**. These include areas classified as flood hazards, landslide hazards, wetlands, water bodies, and fish and wildlife habitat.

3.4.4 Compliance with Adopted Water Quality Management Plan

Scriber Lake, Scriber Creek, Hall's Lake and Lund's Gulch Creek are the dominant freshwater features in the Lynnwood City boundary. Lunds Gulch Creek and Scriber Creek are the two areas that have Category 5 listings on Department of Ecology 303(d) list (see Water Quality Atlas). Both creeks show up with a Category 5 rating for 'bioassessment' parameter indicating a high biotic integrity. Swamp Creek is also located in City UGA but outside of the current and planned wastewater collection area. Per the City's Surface Water Management 2020 Comprehensive Plan, the City is subject to the Swamp Creek Total Maximum Daily Load (TMDL) (Ecology 2006) for fecal coliform bacteria. The City performs monthly sampling at four different locations in Swamp Creek.

The City has mapped remaining on-site sewage (OSS), or septic, systems within the City as part of this Plan (see **Appendix G**). Lynnwood Municipal Code prohibits the construction of new OSS systems and requires connection of failing OSS systems if sanitary sewer is nearby. Although there are no apparent water quality issues created from current OSS systems, failing systems that threaten to impair surface waters are considered by Lynnwood to be a priority for removal. Lynnwood will continue to work with Snohomish County to address failing and proposed OSS systems on a case-by-case basis.

Although considerations related to Inflow and Infiltration (I/I) can influence stream temperature by affecting the amount of groundwater available to cool streams and increase the possibility of sewer overflows, I/I is not considered a major surface water quality concern.

Ecology initiated the Puget Sound Nutrient Reduction Project in spring of 2017 to address the problem of human sources of nutrients contributing to the low and decreasing dissolved oxygen levels throughout Puget Sound. The Puget Sound Nutrient General Permit became effective on January 1, 2022. Requirements for nutrient removal and an evaluation of upgrades to Lynnwood's WWTP to meet pending discharge limitations is further discussed in the WWTP Facility Plan (see **Appendix A**).

3.5 WATER SYSTEMS

The City of Lynnwood provides water service to most of the residents of the City. A water system map of City-owned facilities is provided in **Figure 3-4**.

3.5.1 Supply

The City does not own their water source and consequently does not hold any water rights. The City of Lynnwood purchases its water supply from AWWD under a 1978 Water Supply Agreement, which states that the AWWD will supply the necessary peak day water supply to the City of Lynnwood. In turn, the AWWD purchases its water supply from the City of Everett. The City of Everett's water source is the Sultan River waterworks complex, located approximately 20 miles east of the City of Everett. The City of Everett waterworks complex includes the Lake Spada Reservoir, the Chaplain Reservoir, and the Everett Filtration Plant.

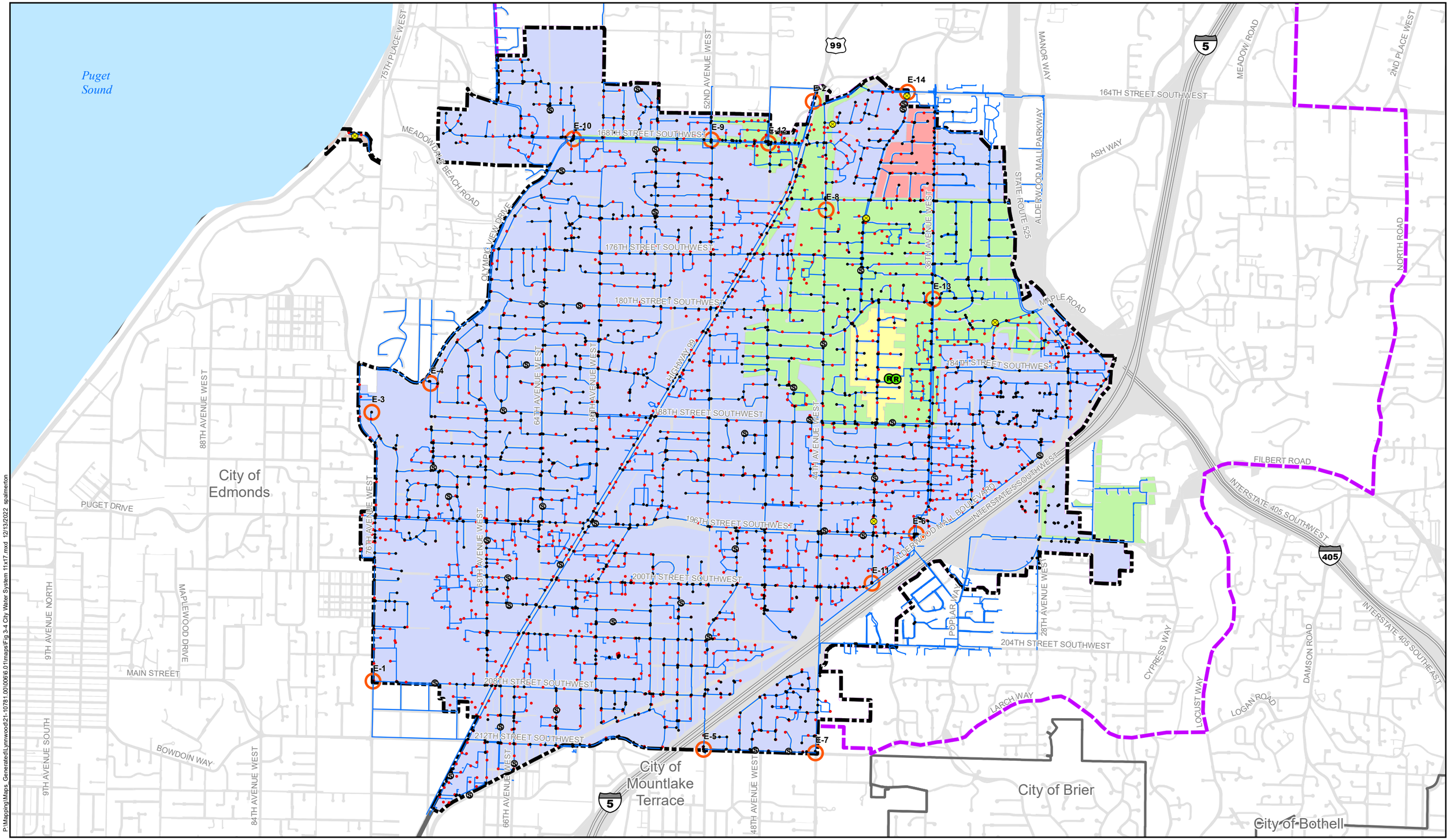
The Chaplain Reservoir was formed in 1929 by the construction of an earth-fill dam. In 1942, the elevation of the dam was raised and the current storage capacity of the Chaplain Reservoir is approximately 4.5 billion gallons. The Lake Spada Reservoir is located upstream of the Chaplain Reservoir. The Lake Spada Reservoir was formed by construction of the George Culmback Dam. The Culmback Dam was a joint project between the City of Everett and Snohomish County Public Utility District (PUD) No. 1. The dam was designed to supply both a source of drinking water and hydroelectric power. The current storage capacity of the Lake Spada Reservoir is 50 billion gallons.

The City of Everett's 20-MG Reservoir No. 3 feeds the AWWD Pump Stations No. 1 and No. 2. The combined capacity of the AWWD Pump Stations No. 1 and No. 2 is 50 million gallons per day (MGD). These pump stations supply the AWWD's 20-MG reservoir and two 28-MG reservoirs located just west of 35th Avenue West and north and south of 156th Street SW. All three reservoirs are owned by the AWWD and have an overflow elevation of 635 feet. These three reservoirs serve the City of Lynnwood 635 Zone through the master meter located south of 164th Street SW and Spruce Way.

Water is then conveyed through a 24-inch-diameter water main to approximately 173rd Place SW at Spruce Way. A pressure-reducing valve supplies the two Lynnwood reservoirs, which have a combined capacity of 5.77 MG, and serve the 573 Zone. A booster pump station adjacent to the reservoirs provides service to Lynnwood's 680 Zone. The AWWD 724 Booster Pump Station fills the AWWD 2.0-MG standpipe and is supplied from the AWWD's 28-MG Reservoir No. 1. The AWWD 724 Booster Pump Station has three booster pumps, each with capacities of 1,500 gpm. The AWWD's High Tank No. 1 (2.0 MG) and High Tank No. 2 (3.07 MG) directly serve 724 Zone in the City of Lynnwood.

3.5.2 Wells

The City of Lynnwood does not own or operate any source water wells. AWWD operates and maintains a water well at the City's water tank facility, near intersections of 185th St SW and 40th Ave W. AWWD also operates and maintains a water well outside of the northeast City limits along 164th Street SW. The wellhead protection areas for these wells extends into the northeast portion of the City's sanitary sewer service area as shown in **Figure 3-3**.



P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\0066.01\maps\Fig 3-4 City Water System 11x17.mxd 12/13/2022 spalmerton

Water System: City of Lynnwood.
GIS Base Data: Snohomish County
This map is a geographic representation based on information available. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

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Water System
- Reservoir
- Sample Station
- PRV
- Intertie Locations

Water System
- Hydrants
- Valves
- Water Lines

Pressure Zones
- 573
- 635
- 680
- 724
- WWTP

Base Layers
- City of Lynnwood Corporate Boundary
- Lynnwood Municipal UGA
- Other City Boundaries

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LYNNWOOD WASHINGTON

City Water System
Sewer Comprehensive Plan
City of Lynnwood, Washington
January 2023

Figure
3-4

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Chapter 4 Population, Flow, and Model Loading Parameters

4.1 INTRODUCTION

This Chapter discusses population projections, employment projections, flow parameters and loading parameters within the City's sanitary service area. The population and employment projections utilize forecast results of a previous technical memorandum prepared and provided as **Appendix D** of the Wastewater Treatment Plant (WWTP) Facility Plan. Review of 2020 census data and Snohomish County Ordinance No. 22-003 concluded that more recent planning information does not significantly impact the projections provided as part of the WWTP Facility Plan. A change to previous projections is unwarranted and, therefore, the population and employment projections provided to the City in 2020 are utilized as part of this Plan.

Population and employment estimates are provided for the following years: 2019 (baseline), 2026 (6-year), 2030 (10-year), 2040 (20-year) and 2050 (30-year). Historical flows and flow peaking factors are estimated for dry weather day, average day, average day of max month, peak day, and peak hour flow categories.

Population and employment data were collected from the Office of Financial Management (OFM) and Puget Sound Regional Council (PSRC). To establish the boundaries where data was collected, a GIS shapefile was submitted to OFM and PSRC containing four geographies labeled as shown in **Figure 4-1**. Note that Lynnwood sewer service area encapsulated by geographies A, C, and D is not identical to the City of Lynnwood boundary, as some portions within City limits are served by other sewer providers.

- A: Service area provided within the City of Lynnwood (excluding City Center and Alderwood Mall)
- B: Service area provided within the City of Edmonds
- C: Service provided to the Alderwood Mall Area
- D: Service provided to Lynnwood City Center

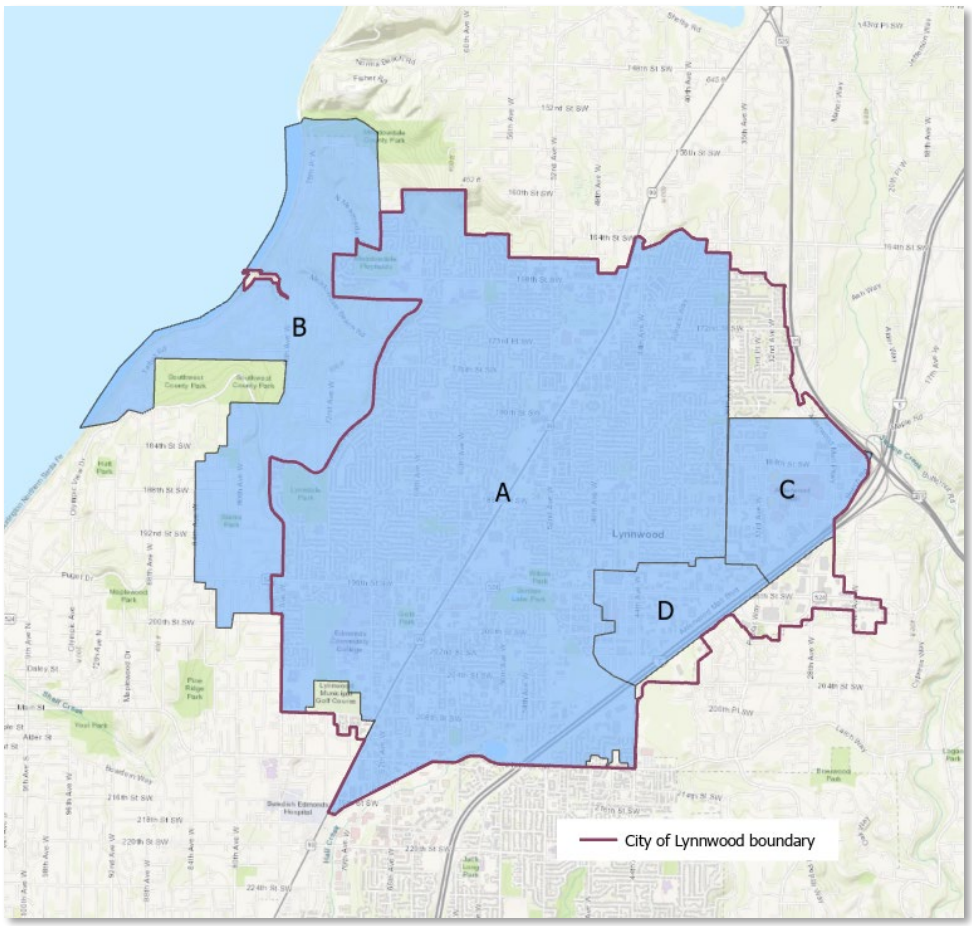

Figure 4-1
Geographies Used to Compile Population and Employment Estimates

Combined, these four geographies represent the area served by the City's sanitary sewer system and WWTP. Lynnwood treats wastewater from geography B in Edmonds but does not own or operate the wastewater conveyance system. The Alderwood Mall Area and Lynnwood City Center were separated for analysis due to their higher development potential compared to the City as a whole. Both

areas are commercial centers with the Lynnwood City Center being the focal point for a wide range of current and forthcoming projects "intended to significantly upgrade the City's transportation network, add new public spaces and parks, build housing, improve cultural attractions, create a pedestrian-friendly environment, and enhance livability."[1]

4.2 BASELINE ESTIMATES

4.2.1 Population Baseline

The residential population baseline year was 2019. The OFM Small Area Estimates Program (SAEP) prepares custom population estimates upon request. OFM provided a 2019 population estimate for the requested geographies, recorded in **Table 4-1**. This estimate provides the population baseline against which forecasted growth can be compared.

Table 4-1
Baseline Population Estimates

Geography	2019 Population Estimate
Service area provided within the City of Lynnwood [A]	34,528
Service area provided within the City of Edmonds [B]	6,455
Alderwood Mall Area [C]	743
Lynnwood City Center [D]	981
Total Service Area [A+B+C+D]	**42,707**

The total City service area baseline population estimate is 42,707.

4.2.2 Employment Baseline

The employment baseline year was 2019. Employment population projections were collected from 2019 Covered Employment data provided by PSRC and are summarized in **Table 4-2**.

Table 4-2
Baseline Employment Estimates

Geography	2019 Employment Estimate
Service area provided within the City of Lynnwood [A]	15,825 employees
Service area provided within the City of Edmonds [B]	767 employees
Alderwood Mall Area [C]	8,316 employees
Lynnwood City Center [D]	4,325 employees
Total Service Area [A+B+C+D]	**29,233 employees**

[1] City of Lynnwood: City Center, https://www.lynnwoodwa.gov/Government/Departments/Economic-Development/City-Center.

The total City service area baseline employment is 29,233 employees. The total employment number captures employees covered by the Washington Unemployment Insurance Act (Act) as well as those who are self-employed. Because the Alderwood Mall Area and Lynnwood City Center are major commercial areas, they contain employment estimates that greatly exceed their population, as recorded in **Table 4-2**.

4.3 FORECAST DATASETS

4.3.1 Population Forecasts

Population forecasts were estimated for 2019, 2026, 2030, 2040, and 2050. Residential population and employment projections for 2020, 2025, 2030, 2035, and 2040 were obtained from PSRC to forecast population. PSRC provided a population estimate for each requested geography using the Land Use Vision (LUV) regional model. According to PSRC's Growth Projection Users Guide, "The Land Use Vision (LUV) is a policy-directed growth projection out to 2040 for jurisdictions and other geographies. It represents the urban-focused growth pattern the region is planning for under VISION 2040 and local comprehensive plans and supports PSRC's long-range planning analyses and modeling. The current Land Use Vision was released in October 2017 and utilizes the 2015 macroeconomic forecast."

The population of residents living in group quarters[2] was estimated using spatial data provided by PSRC. The group quarters population was added to the household population to generate total population. Residential population and employment forecasts were estimated for each forecast year by calculating a straight-line interpolation between baseline data and the projection years provided by PSRC. The LUV, while the most current forecasting tool available at PSRC, may return improbable forecasts for small geographies. For example, LUV-modeled employment forecasts showed unlikely declines in employment in the City of Edmonds service area. Adjustments were made to the projections based on professional judgement and local knowledge to rectify this discrepancy. The results of the population forecast analysis are summarized in **Table 4-3**.

Table 4-3
Initial Population Forecast Compiled by PSRC

Geography	2019	2026	2030	2040	2050
Service area provided within the City of Lynnwood [A]	34,528	39,606	43,549	53,330	61,770
Service area provided within the City of Edmonds [B]	6,455	7,010	7,139	7,423	8,040
Alderwood Mall Area [C]	743	1,489	1,530	2,143	2,535
Lynnwood City Center [D]	981	1,591	1,733	1,875	2,086
Total Service Area [A+B+C+D]	**42,707**	**49,696**	**53,951**	**64,771**	**74,431**

[2] A Census category that includes hospitals, nursing facilities, college dormitories, and other places where people stay or live in a group living arrangement.

Following conversations with City of Lynnwood Planners, PSRC's projected population in Geographies C and D was adjusted to align with future planned development, which is considerably higher than what was initially forecasted in **Table 4-3**. For example, while the LUV model returned a 2040 population of around 2,000 people in the Alderwood Mall area (Geography C), City planning efforts generally assume a future population target that may be much higher. According to current City permitting data, over 800 residential units are currently under construction in this area. Northline Village, a proposed redevelopment of Lynnwood Square connected to the Link extension in Geography D, could add as many as 3,000 people to the area alone.

The most plausible explanation for this inconsistency is that PSRC's LUV model did not fully integrate planned infrastructure developments. The current version of the LUV model was largely developed between 2016 and 2017, meaning that some newer developments would not have been factored in. This is the most likely reason for the diminished forecasts, because the zoning and land use inputs applied to the LUV model appear to be otherwise appropriate for high-density areas.

Accordingly, discussion with the City supported transferring some of the population projected for Geography A into Geographies C and D. This approach ensures that the total forecasted growth remains consistent with the LUV model's outcome, but the relative distribution of the population within Lynnwood better corresponds with expectations for development. PSRC's Vision 2050 includes a goal for regional growth centers and areas within walking distance of high-capacity transit to take on 65% of the region's population growth (MPP-RGS-8). Given this, it was deemed justifiable to transfer 65% of population growth within Lynnwood city boundaries to the Alderwood Mall and City Center areas (Geographies C and D, respectively). With this modification, final adjusted population projections are given in **Table 4-4** below.

Table 4-4
Final Adjusted Population Forecast

Geography	2019	2026	2030	2040	2050
Service area provided within the City of Lynnwood [A]	34,528	36,780	38,224	41,912	45,077
Service area provided within the City of Edmonds [B]	6,455	7,010	7,139	7,423	8,040
Alderwood Mall Area [C]	743	2,834	4,175	7,599	10,538
Lynnwood City Center [D]	981	3,072	4,413	7,837	10,776
Total Service Area [A+B+C+D]	**42,707**	**49,696**	**53,951**	**64,771**	**74,431**

4.3.2 Employment Forecasts

More so than population growth, employment projections generated by the model do appear to be consistent with anticipated development. The results of the employment forecast analysis are summarized in **Table 4-5**, and provide the basis for flow estimates.

Table 4-5
Employment Forecast

Geography	2019	2026	2030	2040	2050
Service area provided within the City of Lynnwood [A]	15,825	17,748	18,816	23,907	26,828
Service area provided within the City of Edmonds [B]	767	780	792	805	816
Alderwood Mall Area [C]	8,316	9,157	10,599	12,908	14,377
Lynnwood City Center [D]	4,325	4,632	5,062	7,622	7,861
Total service area [A+B+C+D]	**29,233**	**32,317**	**35,269**	**45,242**	**49,882**

As with population growth, the Lynnwood service area (Geography A) accounts for the largest share of total growth over time. However, there is less divergence among the four regions in these forecasts, indicating that jobs may be spread more evenly across the service area than residential population. As commercial centers, the Alderwood Mall Area and the Lynnwood City Center (Geographies C and D, respectively) are forecasted to increase in employment totals over time. As with population, it is likely that the rate of employment growth is projected to increase after the year 2030 due to forthcoming infrastructure development and associated increases in density to accommodate a growing population. The City of Edmonds service area is projected to grow at a much smaller rate, increasing in employment capacity only by approximately fifty jobs through the 2050 planning horizon.

Unlike population growth, the employment growth will be more evenly distributed among Geographies A, B, and C. The City of Lynnwood service area (Geography A) is projected to account for approximately 50% of total employment, giving this geography the largest share. This is followed by the Lynnwood City Center (Geography D), the Alderwood Mall Area (Geography C), and the City of Edmonds service area (Geography B).

4.4 FLOW PARAMETERS

4.4.1 Flow Definitions

The following flow definitions are used in the analysis:

- **Dry Weather Flow (DWF)** – This flow condition is defined as the average daily flow during dry periods, also referred to as domestic flow. The intent of presenting this data is to capture the base domestic flow conditions which represent flow from only households and businesses. Some baseline Inflow and Infiltration (I/I) may be present in DWF.
- **Average Annual Flow (AAF)** – This flow condition captures all daily flows during the year. AAF is also referred to as average daily flow.
- **Maximum Month Flow (MMF)** – This flow condition is defined as the average flow of the maximum month. Since National Pollution Discharge Elimination System (NPDES) general permits are written with monthly discharge limitations, the MMF flows are of particular interest for WWTP planning and design.

- **Peak Day Flow (PDF)** – This flow condition is the maximum total daily flow through the system. The analysis below assesses PDF from 2017 to 2019 recorded WWTP flows.
- **Peak Hour Flow (PHF)** – This flow condition is defined as the peak sustained flow rate occurring during a one-hour period. It is typically the condition used to size the collection and interceptor sewers, lift stations, piping, flow meters, and certain physical WWTP processes.

4.4.2 Historic WWTP Flows and Peaking Factors

Flows at the WWTP, from 2017 to 2019, are summarized in **Table 4-6**. Also shown in **Table 4-6** are 2017 to 2019 peaking factors and a comparison to the previous Wastewater Comprehensive Plan Update (CPU). Average day flow is used as the baseline for peaking factors.

Table 4-6
Recorded WWTP Flows

	2017	2018	2019	$Avg_{2017-2019}$	2017-2019 Peaking Factor[3]	CPU Peaking Factor[4]
Dry Weather Flow[2,6] (MGD)	3.55	n/a[5]	n/a[5]	3.55	0.82	n/a
Average Day Flow[1] (MGD)	4.60	4.32	4.04	4.32	1.00	1.00
Max Month Flow[1] (MGD)	6.24	6.14	5.01	5.80	1.34	1.28
Peak Day Flow[2] (MGD)	11.95	9.82	16.53	12.77	2.95	3.03
Peak Hour Flow[2] (MGD)	20.46	13.2	20.13	20.30[7]	4.15	4.28

Notes:
1) Source: City of Lynnwood Department of Ecology Discharge Monitoring Reports.
2) Source: City of Lynnwood Meter at WWTP effluent. Peak flows appear to be sustained over multiple hours so flows through effluent meter are assumed the same as those at WWTP influent.
3) Peaking factors calculated from 2017 to 2019 average WWTP flows.
4) Peaking factors used in CPU, November 2012.
5) 2018 and 2019 data – when analyzed for DWF – does not corroborate with DMRs. 2018 and 2019 data not used for this analysis.
6) Dry Weather Flow is an average of daily DMRs in July and August.
7) 2018 is excluded from average PHF.

The difference between recent and previous planning peaking factors is minimal and do not warrant the need to change values for future planning efforts.

4.4.3 Flow Per Capita

Water meter records were used to analyze flows on a parcel-by-parcel level. Winter meter records were used with the assumption that irrigation usage – where not explicitly metered – is negligible during winter months. This process is further explained in **Chapter 6** and **Appendix D**.

On average, a single-family household uses approximately 145 gallons per day (gpd) during winter months. It is assumed that 145 gpd is also the average dry weather or domestic discharge for a single-family household. The average persons per household in Lynnwood is 2.59 persons per household[3]. Dividing 145 gpd per household by 2.59 persons per household equates to approximately 56 gpd dry weather or domestic wastewater discharge per Lynnwood resident. Calculated by remaining flow divided by baseline employment, employees, on average, discharge 40 gallons of wastewater per day per employee.

There is almost certainly some fluctuation in residential usage geographically across Lynnwood's service area. For example, more than 2.59 persons on average could reside in the larger households in the more suburban areas (west and northwest) of Lynnwood. Fluctuations by geography are hard to estimate and deemed minimal, however. 145 gpd per household or 56 gpd per resident is used City-wide for future planning efforts. Similar to residents, employment wastewater discharge could vary by geography and type of industry (e.g., there are differences in wastewater discharge between restaurants and retail). Differences in employee usage by future development is hard to estimate, however, and the 40 gpd per employee is used as the assumption for future sewer planning efforts. A summary of wastewater discharge in flow per capita is shown in **Table 4-7** below:

Table 4-7
Dry Weather Flow Per Capita

	Flow Per Capita
Residents	56 gpd per resident
Employees	40 gpd per employee

It should be noted that the flow per capita values in **Table 4-7** are higher than the estimates used in previous planning efforts, including values used in the 2012 Wastewater Comprehensive Plan. Possible causes could include more City residents working from home during recent years due to COVID-19 and subsequently increased residential water usage. For non-residential, the business' that stayed open could be higher water users.

4.4.4 Development Proposals

The City provided a summary of known developments in various stages of the application process[4]. The summary is abbreviated in **Table 4-8** below and excludes the development applications without proposed unit counts, office square footage or commercial square footage. It is assumed that the development proposals without detailed development data will not significantly impact the sanitary system and are already accounted for in overall forecasting efforts.

[3] Census.gov/quickfacts/lynnwoodcitywashington
[4] Entitlement Tracking Spreadsheet, 2-16-2022

Table 4-8
Large Development Proposals

Proposed Use	Residential Unit Count	Office SF	Commercial SF
Legacy Alderwood Hotel	0	0	85,500
Lynnwood Place - Bldgs 5 & 6	0	0	9,596
Holman Automotive Group | Porsche of North Seattle	0	0	38,150
UPS Distribution Center	0	0	52,350
Shake Shack	0	0	3,300
Alexan Gas Station Expansion	0	0	622
Chick-Fil-A (Hwy 99 and 196th)	0	0	5,182
Ahmad Commercial	0	0	7,372
Harris Ford Properties	0	0	4,300
Luxor Motors Car Wash	0	0	1,296
Alfy's Conversion	0	0	1,585
Cosmos	328	3,500	0
Alexan Alderwood Retail	0	0	63,711
Avalon at Alderwood	328	0	63,700
Ember | Lynnwood 40th	361	0	9,200
Alexan Alderwood Apartments	328	0	0
Lynnwood Place II - The Woods at Alderwood - Multi-Family	500	0	30,000
Northline Village	1370	522,000	257,500
196th St Townhomes	26	0	0
Novo on 52nd	242	0	0
Perrinville Townhomes	42	0	0
Alexander61	13	0	0
Lee's Apartments	24	0	0
The Estates at Pinebrook	40	0	0
Kinect @ Lynnwood	239	0	0

The abbreviated development proposals are shown graphically on **Figure 4-2**. The development proposals are used to inform more detailed loading inputs for the 2044 hydraulic model.

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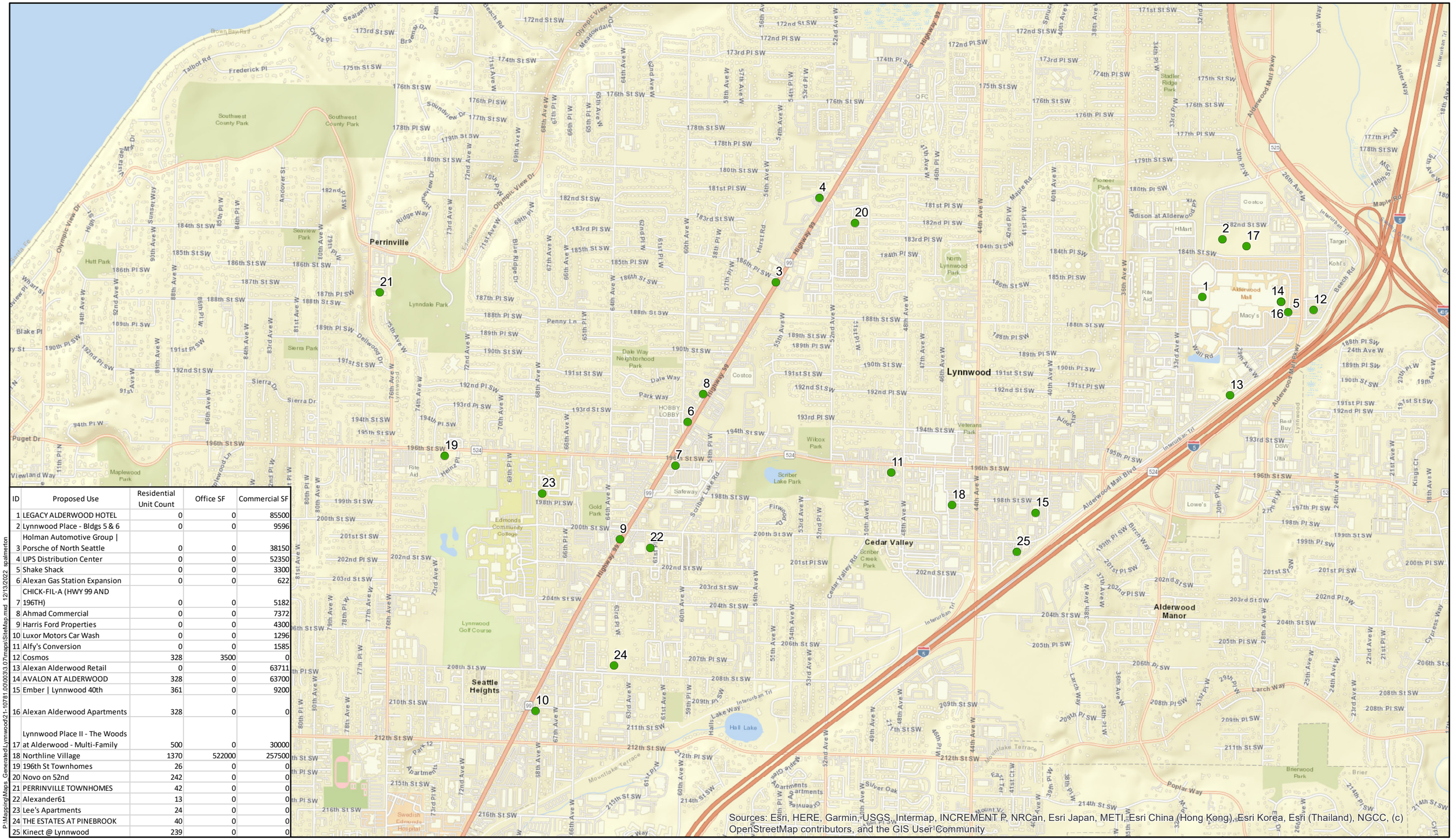

ID	Proposed Use	Residential Unit Count	Office SF	Commercial SF
1	LEGACY ALDERWOOD HOTEL	0	0	85500
2	Lynnwood Place - Bldgs 5 & 6	0	0	9596
3	Holman Automotive Group | Porsche of North Seattle	0	0	38150
4	UPS Distribution Center	0	0	52350
5	Shake Shack	0	0	3300
6	Alexan Gas Station Expansion	0	0	622
7	CHICK-FIL-A (HWY 99 AND 196TH)	0	0	5182
8	Ahmad Commercial	0	0	7372
9	Harris Ford Properties	0	0	4300
10	Luxor Motors Car Wash	0	0	1296
11	Alfy's Conversion	0	0	1585
12	Cosmos	328	3500	0
13	Alexan Alderwood Retail	0	0	63711
14	AVALON AT ALDERWOOD	328	0	63700
15	Ember | Lynnwood 40th	361	0	9200
16	Alexan Alderwood Apartments	328	0	0
17	Lynnwood Place II - The Woods at Alderwood - Multi-Family	500	0	30000
18	Northline Village	1370	522000	257500
19	196th St Townhomes	26	0	0
20	Novo on 52nd	242	0	0
21	PERRINVILLE TOWNHOMES	42	0	0
22	Alexander61	13	0	0
23	Lee's Apartments	24	0	0
24	THE ESTATES AT PINEBROOK	40	0	0
25	Kinect @ Lynnwood	239	0	0

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Development Proposals
Sewer Comprehensive Plan
City of Lynnwood, Washington
January 2023

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4.4.5 Flow Projections

The flow per capita values were multiplied by the future population and employment projections for the 2026, 2030, 2040, and 2050 planning horizons. The DWF projections for future years for individual geographies (A thru D) and at the WWTP (Total) are shown in **Table 4-9** below.

Table 4-9
Dry Weather Flow Projections

Geography	2026 DWF (MGD)	2030 DWF (MGD)	2040 DWF (MGD)	2050 DWF (MGD)
Service area provided within the City of Lynnwood [A]	2.77	2.89	3.30	3.60
Service area provided within the City of Edmonds [B]	0.42	0.43	0.45	0.48
Service area provided to the Alderwood Mall Area [C]	0.52	0.66	0.94	1.17
Service area provided to Lynnwood City Center [D]	0.36	0.45	0.74	0.92
Total [A+B+C+D]	**4.08**	**4.43**	**5.44**	**6.16**

The flow estimates in **Table 4-9** are based on the assumption that all customers will be connected to the sanitary sewer system and removed from on-site sewage (septic) systems by 2026. Parks and open spaces are assumed to remain indefinitely.

Baseline I/I, by flow category, was calculated by subtracting the **Table 4-6** baseline DWF average from the **Table 4-6** baseline ADF average, by flow category. For example, the baseline average day flow I/I is estimated at 0.77 mgd which is 4.32 (baseline average day flow) minus 3.55 (baseline DWF). I/I is projected to increase by 7% per decade to 2026, 2030, 2040 and 2050 projection years. 7% per decade is an industry standard as identified from a 2001 King County I/I Study and July 2014 Updated Planning Assumptions for Wastewater Flow Forecasting. City staff reviewed and agreed to the 7% per decade as an appropriate value for I/I forecasting. The baseline and projected I/I, by flow category, is presented in **Table 4-10** below.

Table 4-10
I/I Projections by Flow Category

	Baseline	2026	2030	2040	2050
Average Day Flow (MGD)	0.77	0.80	0.82	0.88	0.94
Max Month Flow (MGD)	2.25	2.34	2.41	2.58	2.76
Peak Day Effluent Flow (MGD)	9.22	9.61	9.87	10.56	11.29
Peak Hour Effluent Flow (MGD)	16.75	17.45	17.92	19.17	20.51

Adding the I/I projections in **Table 4-10** to the total DWF projections in **Table 4-9** gives the total flow projected at the WWTP in different projection years. Flow projections at the WWTP are provided in **Table 4-11.**

Table 4-11
Flow Projections at WWTP

	2026	2030	2040	2050
Average Day Flow (MGD)	4.88	5.26	6.32	7.11
Max Month Flow (MGD)	6.42	6.84	8.01	8.92
Peak Day Effluent Flow (MGD)	13.68	14.30	15.99	17.46
Peak Hour Effluent Flow (MGD)	21.52	22.35	24.61	26.68

Note the flow projections provided in **Table 4-9** through **Table 4-11** are based on updated per capita rates and I/I projection methods similar to those used for the collection system model (See **Chapter 6** and **Appendix D**). Although the same population and employment forecasts are used in the WWTP Facility Plan, the values presented in **Chapter 4** and the WWTP Facility Plan Appendix are not equivalent. The numbers are similar, however, and do not warrant updates to the WWTP Facility Plan. Any numbers used as WWTP design criteria should be revisited and agreed to by the City during preliminary design.

4.5 LOADING PARAMETERS

Table G2-2 of the Department of Ecology Criteria for Sewage Works Design (Orange Book) lists a design basis of 0.2 pounds per day per capita for Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS). Sections 4.1.2 of the WWTP Facility Plan summarizes historical loadings, from 2015 through 2020, at Lynnwood's WWTP. The WWTP Facility Plan analysis indicates historical average annual BOD loadings of 0.21 pounds per day per capita and TSS loadings of 0.18 pounds per day per capita. Section 4.3 and **Table 4-8** of the WWTP Facility Plan also describes per capita loadings under various flow events. The loading parameters described in the WWTP Facility Plan can be used for future planning efforts. The WWTP Facility Plan is included as **Appendix A** of this Comprehensive Sewer Plan Update.

Chapter 5 Existing Wastewater Facilities

5.1 BACKGROUND

The City owns and operates approximately 104 miles of gravity sewer pipe, 6 miles of lift station force mains, 7 lift stations, and a Wastewater Treatment Plant (WWTP). Wastewater is generally conveyed west to the WWTP located in the northwestern corner of the City's service area. Wastewater is treated and disinfected at the WWTP prior to discharge into Puget Sound. **Figure 5-1** shows the location of major gravity sewer trunks, force main piping, lift stations and the WWTP. **Appendix I** provides a tabular output of sewer pipe size, slope, and capacity. A more complete system and basin map is provided in **Appendix G**.

For planning and analysis purposes, the City organizes the system into smaller basins. Basins are defined as having one common outlet to which all wastewater in the basin flows. There are 18 basins identified in the service area in addition to the Area in Edmonds served by Lynnwood WWTP. A basin map is presented in **Figure 5-2**. A flow schematic for the sewer system in presented in **Figure 5-3**.

5.2 EXISTING GRAVITY AND FORCE MAIN PIPING

A map of the sewer system, including all major sewer trunks, lift stations, and force main piping is shown in **Figure 5-1**. An inventory listing of gravity sewer and force main piping is provided in **Table 5-1** through **Table 5-3**. Piping is inventoried based on ArcMap/GIS query commands.

Table 5-1
Existing Gravity Sewers by Size

Pipe Diameter (inches)	Length (feet)
8	460,865
10	22,954
12	13,228
15	7,534
18	22,085
21	5,389
24	9,823
28	4,686
30	471
36	4,194
Total Gravity Sewers	**551,229 (104 miles)**

Notes:
1) Information obtained from ArcMap/GIS query of Lynnwood Sewer Lines GIS shapefile layer.
2) Sewer Pipe 6-inches and below – including side sewers – is not included in the summary table above.

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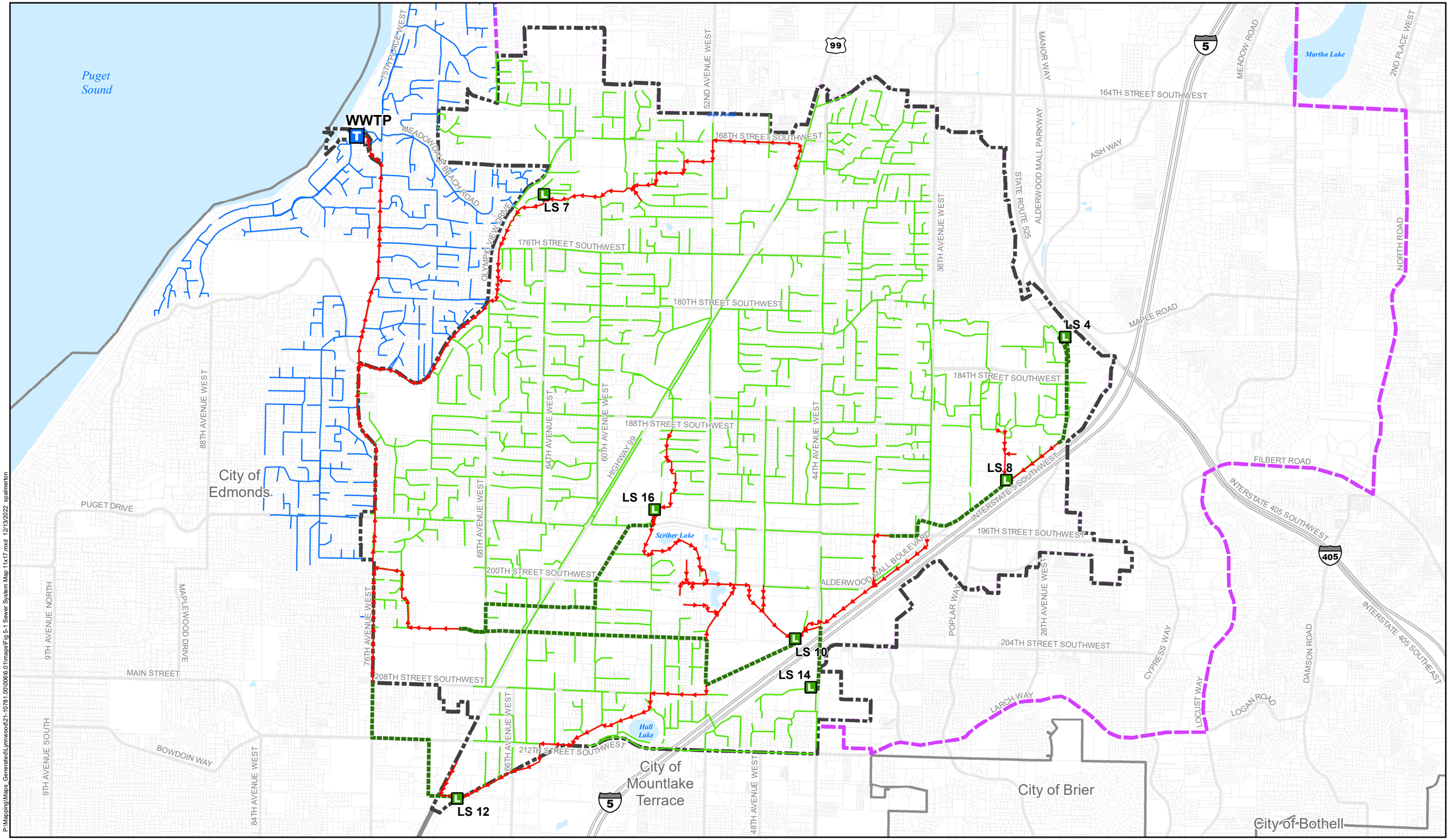

P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\006\6.01\maps\Fig 5-1 Sewer System Map 11x17.mxd 12/13/2022 spalmerton

Sewer System: City of Lynnwood.
GIS Base Data: Snohomish County
This map is a geographic representation based on information available. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

Feet
0 1,500 3,000

N

WWTP
Lift Station
Force Main
Sewer Pipes
Edmonds Sewer Pipes Served by Lynnwood WWTP
Major Sewer Trunks
Major Force Mains
City of Lynnwood Corporate Boundary
Lynnwood Municipal UGA
Other City Boundaries

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LYNNWOOD WASHINGTON

Sewer System Map
Sewer Comprehensive Plan
City of Lynnwood, Washington
January 2023

Figure
5-1

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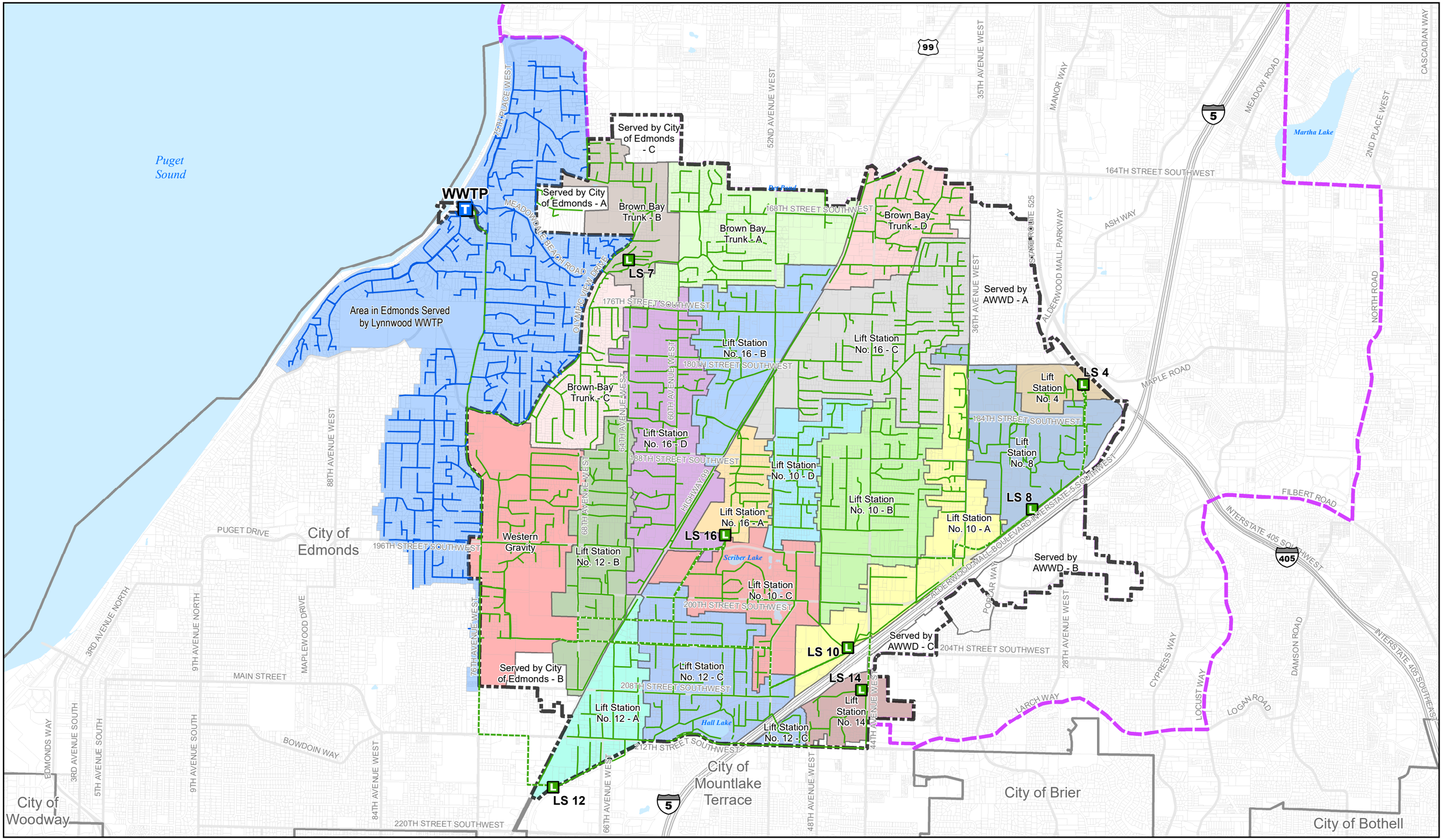

Sewer System: City of Lynnwood.
GIS Base Data: Snohomish County
This map is a geographic representation based on information available. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

0 1,500 3,000 Feet

N

Legend

- WWTP
- Lift Station
- Force Main
- Sewer Pipes
- Edmonds Sewer Pipes Served by Lynnwood WWTP
- City of Lynnwood Corporate Boundary
- Lynnwood Municipal UGA
- Other City Boundaries

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LYNNWOOD WASHINGTON

Sewer Basin Map
Sewer Comprehensive Plan
City of Lynnwood, Washington
January 2023

Figure
5-2

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P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\0616.01\maps\Fig 5-2 Sewer Basin Map 11x17.mxd 12/13/2022 spalmerton

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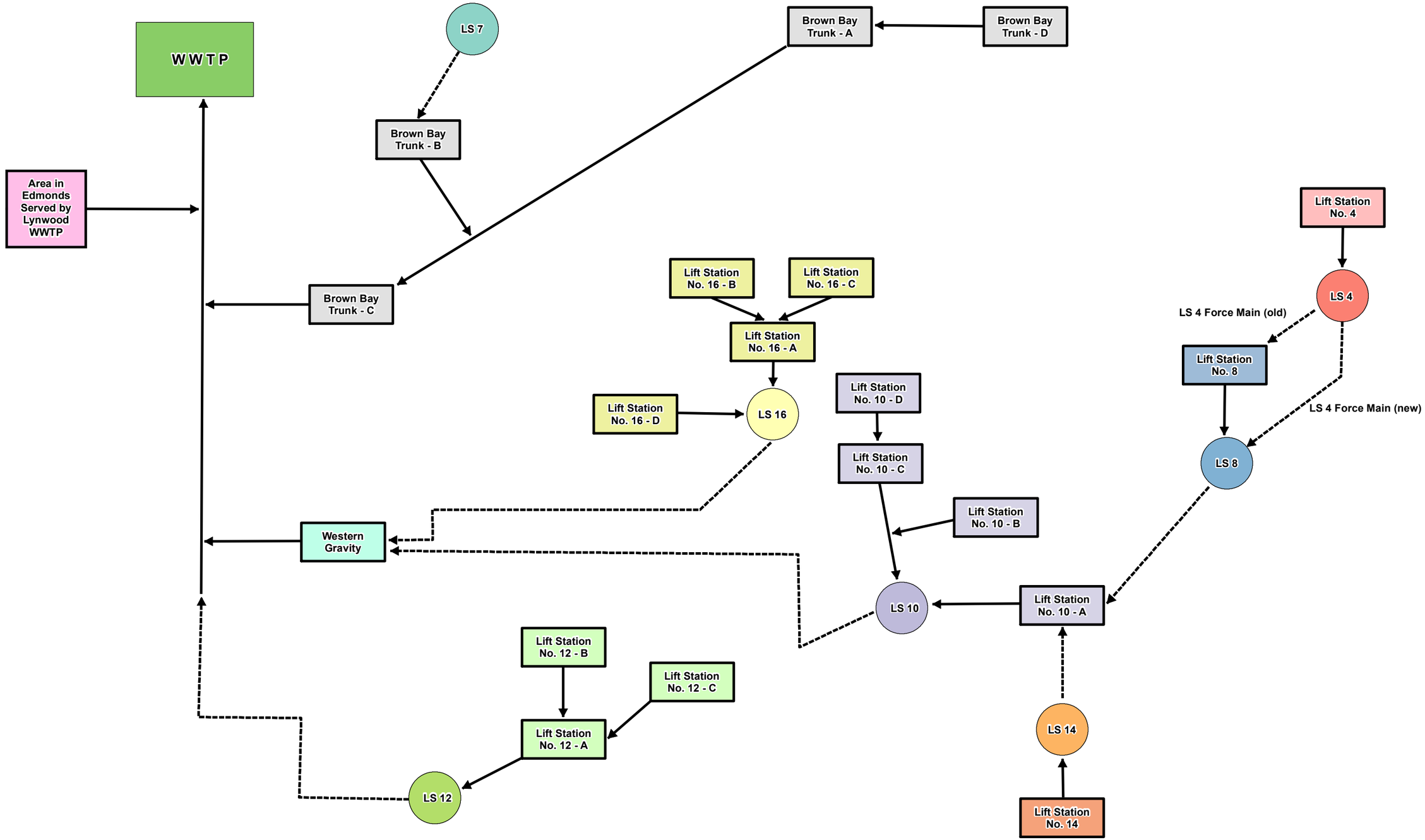

P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\006\6.16\maps\Fig 5-3 Sewer System Flow Schematic - 11x17.mxd 12/29/2022 dknight

bhc CONSULTANTS

Sewer System & Basins: City of Lynnwood

Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

Legend

- Gravity Main
- Lift Station
- Sewer Main
- Sewer Basin

N

LYNNWOOD WASHINGTON

Sewer System Flow Schematic
Sewer Comprehensive Plan
City of Lynnwood, WA
January 2023

Figure
5-3

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Table 5-2
Existing Gravity Sewers by Pipe Material

Pipe Material	Length (feet)
Concrete	412,812
Ductile Iron	471
HDPE	4,934
PVC	132,732
FRP	280
Total Gravity Sewers	**551,229 (104 miles)**

Notes:
1) Information obtained from ArcMap/GIS query of Lynnwood Sewer Lines GIS shapefile layer.
2) The pipe material for sewer pipe 6-inches and below – including side sewers – is not tabulated in the summary table above.

Table 5-3
Existing Force Mains

Pipe Diameter (inches)	Length (feet)
6	1,834
8	2,739
14	3,584
16	7,166
18	4,822
24	9,511
Total Force Mains	**29,656 (5.6 miles)**

Notes:
1) Information obtained from ArcMap/GIS query of Lynnwood Sewer Lines GIS shapefile layer.
2) LS 8 Force Main includes an 18-inch HDPE SDR 11 with approximate inside diameter of 14.5-inches. This section of force main is summed as 14-inch pipe diameter.

5.3 EXISTING LIFT STATIONS

The existing wastewater collection and conveyance system includes seven lift stations. There are two wet well/dry well stations, three vacuum-primed packaged stations, and two submersible stations. A list of the City's lift stations, with details about the lift station pumps, motors, on-site power generation, and capacities, is summarized in **Table 5-4**. Lift station firm capacity is based on the largest pump out of service. Written summaries and pictures for each station are provided in the sections that follow.

All stations are monitored via the City's Supervisory Control and Data Acquisition (SCADA) system to provide remote monitoring by City operations staff, including pump status, alarms, flow rate, and other site-specific information. Information is transmitted via a fiber optic network that the City owns and operates.

Table 5-4
Existing Lift Stations

Lift Station	Location	Year Built/ Remodeled	Station Type	Pump Manufacturer	Pump Model	Number of Pumps	Single Pump Capacity (gpm)	Firm Capacity (gpm)	Design Head (ft)	Motor Horsepower (HP)	Generator (kW)	Force Main Diameter/ Length
4[1]	18150 26th Avenue West	1987	Package Suction Lift	Smith and Loveless	6556609	2	200 (New) 300(Old)[2]	200 300	81 (New) 75 (Old)	10*	40	8" DI / 2,750 LF (New) 6" CI / 630 LF (Old)
7	17131 Meadowdale Drive	1978	Package Suction Lift	Smith and Loveless	1978	2	125	125	30	3	Yes	6" / 160 LF
8	3015 Alderwood Mall Boulevard	2021	Submersible	Hidrostal with Prerostal Basin	F4K-S	4	1,650	3,900	140	65*	300	14" / 3,900 LF
10	20329 46th Avenue West	1993	Wet well/ Dry well	Fairbanks Morse	5-C5446	4	2,100[3]	5,000[1]	150	125+	350	24" DI / 9,490 LF
12	7000 216th Avenue West	1993	Wet well/ Dry well	Fairbanks Morse	4-C5444	4	1,000[4]	2,000	125	75	250	18" / 4,740 LF
14	20899 44th Avenue West	1990	Package Suction Lift	Smith and Loveless	4B2B	2	210[5]	210	37	3	Yes	6" / 1,680 LF
16	19426 56th Avenue West	2016	Submersible	Hidrostal with Prerostal Basin	H5K-S	2	2,500	2,500	185	170*	450	16" HDPE / 6,670 LF

Notes:
1) Lift Station 4 can pump through one of two force mains. Current/2022 operations are through old 6" force main, which discharges to nearby gravity system in Alderwood Mall. New 8" force main is routed south along Alderwood Mall Parkway then southeast along Alderwood Mall Boulevard. Lift Station 4 is expected to be upgraded in 2024 and will pump through the new 8'' force main.
2) Based on pump average during drawdown test performed in April 2022, through 6" force main.
3) Based on pump average during drawdown test performed on January 2020.
4) Based on pump average during drawdown test performed on March 2014.
5) Based on pump average during drawdown test performed on February 2016.

*Motor has variable frequency drive (VFD).
+Motor has soft starter.

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5.3.1 Lift Station 4

Lift Station 4 is located at 18150 26th Avenue West. The lift station (shown in **Photo 1**) is equipped with a vacuum-primed Smith and Loveless packaged pump system that has reached the end of its useful life. The design capacity for the Lift Station is 300 gallons per minute (gpm) at 72 feet total dynamic head (TDH) through the 6-inch DI force main.

Photo 1: Lift Station 4

To accommodate growth around the Alderwood Mall area, the station's force main was upsized to an 8-inch ductile iron pipe in 2017. Pump impellers were also replaced in 2020 to provide adequate TDH for the longer force main. The 8-inch force main alignment diverts flow away from the mall and toward Alderwood Mall Boulevard.

Due to the age of the facility, the pump condition has deteriorated and pump performance is no longer adequate to provide capacity in the 8-inch force main. The City reverted to using the 6-inch force main due to its lower TDH requirement, and plans to construct a new lift station at a nearby site which will provide adequate TDH for the 8-inch force main. The firm capacity requirement of the lift station may require evaluation as additional development has taken place and is planned to continue within the Lift Station 4 basin.

The lift station has a 40-kilowatt (kW) diesel emergency generator for backup power. A new telemetry and control panel was installed in 2021.

The facility is located within a utility easement on the northern adjacent property. City crews access the facility from the north via a narrow driveway from Ash Way between the northern commercial property and the retaining wall for a hotel to the south. Access is challenging and a vactor truck cannot drive on the access road. A gravity pipeline easement between Alderwood Mall Parkway and the lift station theoretically can facilitate access, but grade and traffic control requirements present significant challenges.

The site is surrounded by chain-link fencing. Permanent lighting and a security camera have been installed as vandalism and theft are problematic at this facility.

5.3.2 Lift Station 7

Lift Station 7 is located at 17131 Meadowdale Drive. The lift station (shown in **Photo 2**) is equipped with a vacuum-primed Smith and Loveless packaged pump, vertically and horizontally offset from the nominal 4-foot-diameter concrete wet well that is located outside the facility fence line. The capacity for the lift station is 125 gpm at 30 feet TDH. The motor size is 3 HP. The station is serviced by single phase power.

Photo 2: Lift Station 7

City records state the force main is 6-inch diameter. There are no available records of pipeline material. The facility does not have a flow meter.

The lift station has a small portable diesel emergency generator for backup power that requires manual connection during emergencies. The control panel is aging and is reaching the end of its useful life. Spare parts for maintenance are challenging to procure.

5.3.3 Lift Station 8

Lift Station 8 is located at 3015 Alderwood Mall Boulevard and was constructed in 2021. The lift station is equipped with two crystalline-waterproofed concrete wet wells, each of which has two submersible Hidrostal pumps equipped with pre-rotation basins. An upstream manhole has stainless steel slide gates for flow diversion when desired. Each pump has a capacity of 1,000 gpm, and the capacity for the lift station is 3,000 gpm at 140 feet TDH. The motor size is 65 HP and is controlled by VFDs. A magnetic flow meter is installed on the force main.

The Lift Station 8 force main was upgraded from 8-inch AC to 14-inch ductile iron (DI) in 2017. The 8-inch AC force main is abandoned in place and can still be used for emergency or additional capacity if necessary.

The lift station is equipped with a passive odor control system and has a 300-kW diesel emergency generator for backup power.

Site access is controlled via hydraulically operated bollards and 10-foot fencing surrounds the facility equipment. A roof shelter structure is installed over the electrical and control panels.

5.3.4 Lift Station 10

Lift Station 10 is located at 20329 46th Avenue West on a City-owned parcel underneath the Interstate-5 overpass to the Lynnwood Transit Center Park & Ride. The lift station (shown in **Photo 3**) was originally constructed in the 1990s and is the largest station in the City, conveying flows from the Lift Station 4, Lift Station 8, and Lift Station 14 basins.

Photo 3: Left, Lift Station 10 Exterior; Right, Dry Well Piping

The lift station has 4 Fairbanks Morse pumps, each capable of pumping 2,100 gpm at 150 TDH with a 125 HP motor. Existing pumps are ageing, and signs of cavitation are evident. The lift station capacity has been demonstrated to be 5,000 gpm, although theoretical capacity is calculated to be 6,300 gpm. This discrepancy is believed to be due to buildup within the force main which is 9,490 linear feet (LF) of 24-inch DI force main. The station's original 12-inch force main is plumbed to convey flows to Lift Station 12. This force main is not typically in use.

The lift station consists of a dual wet well and a dry well with the control building above the structure. A diversion box at the wet well entrance has stainless steel slide gates to isolate wet well bays, although operators report that trash buildup prevents full isolation. Trash buildup within the wet wells poses a maintenance challenge. Wet well access is limited to a single access hatch above the diversion box, and the wet well depth prevents successful vactoring. After significant concrete deterioration was identified, the wet well was rehabilitated in 2015 with crystalline cementitious grout. Wet well access, ventilation piping, and the wet well catwalk also were upgraded.

The facility does not have a flow meter.

The lift station has an activated carbon odor control system that is in use and a liquid oxygen system that is not in use.

There is a 350-kW diesel emergency generator for backup power. Electrical capacity is limited by the existing 800 Amp service entrance.

The existing control panel and automatic transfer switch (ATS) are reaching the end of their useful life. City staff indicate replacement of the control panel is a high priority item given difficulty sourcing replacement parts for antiquated equipment.

5.3.5 Lift Station 12

Lift Station 12 is located at 7000 216th Street SW. The Lift station (shown in **Photo 4**) is a wet well/dry well configuration with four Fairbanks Morse pumps. Each pump is capable of pumping 1,000 gpm at 125 TDH. The station capacity is 2,000 gpm. The pump motors are 75 HP with soft starters. Two of the motors are believed to have been replaced with immersible motors.

Photo 4: Left, Lift Station 12 Exterior; Right, Dry Well Piping

The Lift Station 12 force main is 18 inches and approximately 4,740 LF. The force main material is unknown. In addition, the Lift Station has an overflow system that can convey sewer to the King County Metro trunkline during a high flow event. A Parshall flume allows for flow metering of this overflow discharge. There is no flow metering for typical force main discharge flows.

Check valves continually pose challenges due to degradation from abrasive media in the waste stream.

The lift station has a 250-kW diesel emergency generator for backup power. There is a passive odor control system that is typically not put in operation. No significant odor issues have been reported.

5.3.6 Lift Station 14

Lift Station 14 is located at 20899 44th Avenue West. The lift station (shown in **Photo 5**) has a duplex vacuum-primed Smith and Loveless package. The station capacity was measured to be 210 gpm during a February 2016 drawdown test. Nameplate capacity is 300 gpm at 37 feet TDH. The motor size is 5 HP.

Photo 5: Lift Station 14

The existing lift station is located within a floodplain, leading to significant infiltration during flooding events as the access hatch is not watertight. The wet well is founded on poor soils and documented settling poses a risk to the force main pipe connection. There is no force main isolation valve or flow meter.

The Lift Station 14 force main diameter is not confirmed but is believed to be 6-inch based on pipe sizing in the wet well. The force main material could be DI or AC pipe.

The lift station has a diesel emergency generator for backup power. A telemetry panel was installed in 2021. The existing control panel has been modified within the existing enclosure.

5.3.7 Lift Station 16

Lift Station 16 is located at 19426 56th Avenue West. The lift station (shown in **Photo 6**) was constructed in 2016 and designed to intercept a portion of the Lift Station 10 basin flows. Valving in the gravity system can be opened to redirect flow to Lift Station 10 if necessary.

Photo 6: Lift Station 16

There are two submersible Hidrostal pumps, each capable of pumping 2,500 gpm at 185 TDH. The motor size is 170 HP and operated on VFDs. Pumps are removed via a hoist on a monorail integral to the lift station building. The facility has a flow meter.

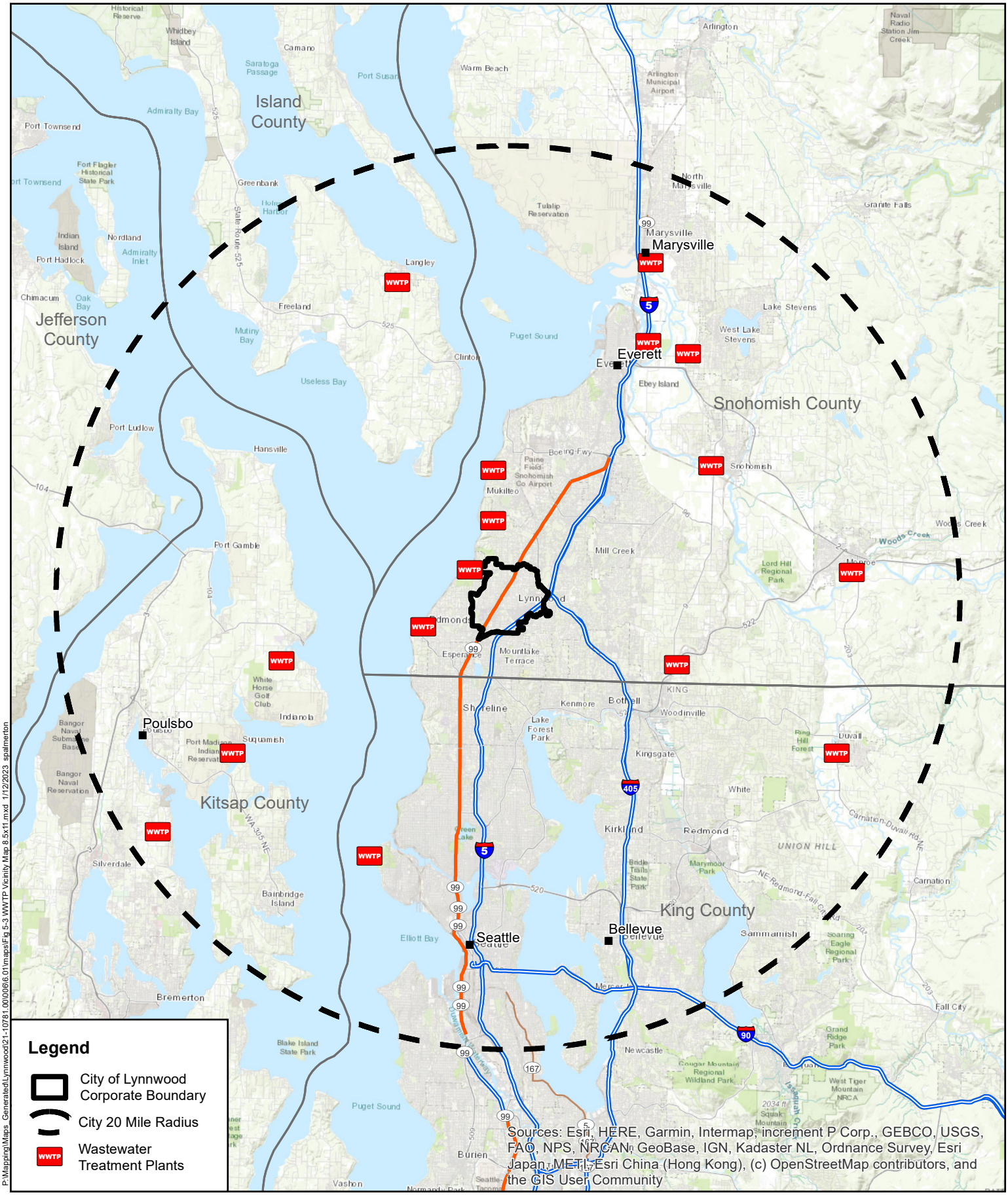
The 6,670 LF 16-inch high-density polyethylene (HDPE) Lift Station 16 force main was constructed at the same time as the lift station. The forcemain discharges at the same location as the Lift Station 10 forcemain, near Edmonds College.

The lift station has an active odor control system and a 450-kW diesel emergency generator for backup power.

5.4 WASTEWATER TREATMENT PLANT

5.4.1 WWTP History

The City is responsible for wastewater collection, treatment, and disposal within its service boundaries. Domestic and commercial wastewater is treated at the City's WWTP, which the City owns and operates. The treatment facilities are intended to protect the public health and the beneficial uses of water in the area. **Figure 5-4** shows wastewater facilities within a 20-mile radius of the City.



P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\006\6.01\maps\Fig 5-3 WWTP Vicinity Map 8.5x11.mxd 1/12/2023 spalmerton

This map is a geographic representation based on information available. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

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0 2.5 5 Miles

N

LYNNWOOD WASHINGTON

WWTP Vicinity Map

Sewer Comprehensive Plan
City of Lynnwood, Washington
January 2023

Figure
5-4

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The original WWTP, installed in 1962, solely used primary treatment, which consisted of a sewer grinder and bar screen, circular primary clarifier, outfall to Browns Bay, sludge thickener, incinerator, operation building, and an office building. Much of the infrastructure is currently still in use. The first major expansion to the WWTP (Sewage Treatment Plant Expansion) was completed in 1984. These improvements added influent and effluent flow measurement, headworks screening and grit removal, three rectangular primary clarifiers, rehabilitation of the circular primary clarifier, a chlorine addition and contact system for disinfection, a diffuser at the plant outfall, a drain lift station, rehabilitation of the sludge thickening and incineration systems, standby generator, and office building and laboratory.

The second major expansion of the WWTP (Wastewater Treatment Facility Project) was completed in 1989. This project added secondary treatment processes. However, given the constraints of the site and location of primary treatment infrastructure, the secondary treatment system was located at an elevation higher than the primary treatment system. Thus, the construction of the secondary treatment system (three aeration basins, aeration blowers, four secondary clarifiers) was accompanied by the addition of a Main Plant Pump Station (MPPS), which pumps primary effluent uphill to the secondary treatment system, where processes once again flow via gravity. These improvements also included upgrades to the chlorine contact and solids incineration system, as well as adding waste activated sludge (WAS) thickening, dewatering, and scum handling systems. All subsequent WWTP improvements projects have served to improve or replace existing infrastructure and equipment, without significantly altering the treatment process.

5.4.2 Overview

The existing WWTP as currently configured is permitted for a maximum month design flow (MMDF) of 7.4 million gallons per day (MGD) with a 5-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) maximum month design capacities of 15,120 lbs./day, each. Treated wastewater is discharged to the Puget Sound in accordance with the requirements of National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit No. WA0024031 issued February 8, 2019; effective March 1, 2019; and expiring February 29, 2024. The WWTP NPDES Permit is provided in **Appendix F**.

The WWTP is a secondary treatment plant using an activated sludge process for the liquid stream and a sewage sludge incinerator (SSI) for solids handling. The major components in the plant include the headworks (with mechanical bar screen, grit removal equipment, influent and effluent flow metering); primary clarifiers (three rectangular tanks); three aeration basins, three secondary clarifiers, and chlorine contact basins. The waste sludge from the activated sludge process is thickened in the thickened waste activated sludge (TWAS) pre-concentration tank and combined with the primary sludge downstream of the sludge blending tank. The combined primary and TWAS is dewatered in a screw press with the dewatered sludge pumped to the fluidized bed SSI. The inert ash produced by the SSI is disposed of in a landfill. Various system processes and their components are documented further in following sections. The WWTP site plan is provided in **Figure 5-5** on the following page. The following sections describe each WWTP unit process from the influent manhole to the discharge outfall.

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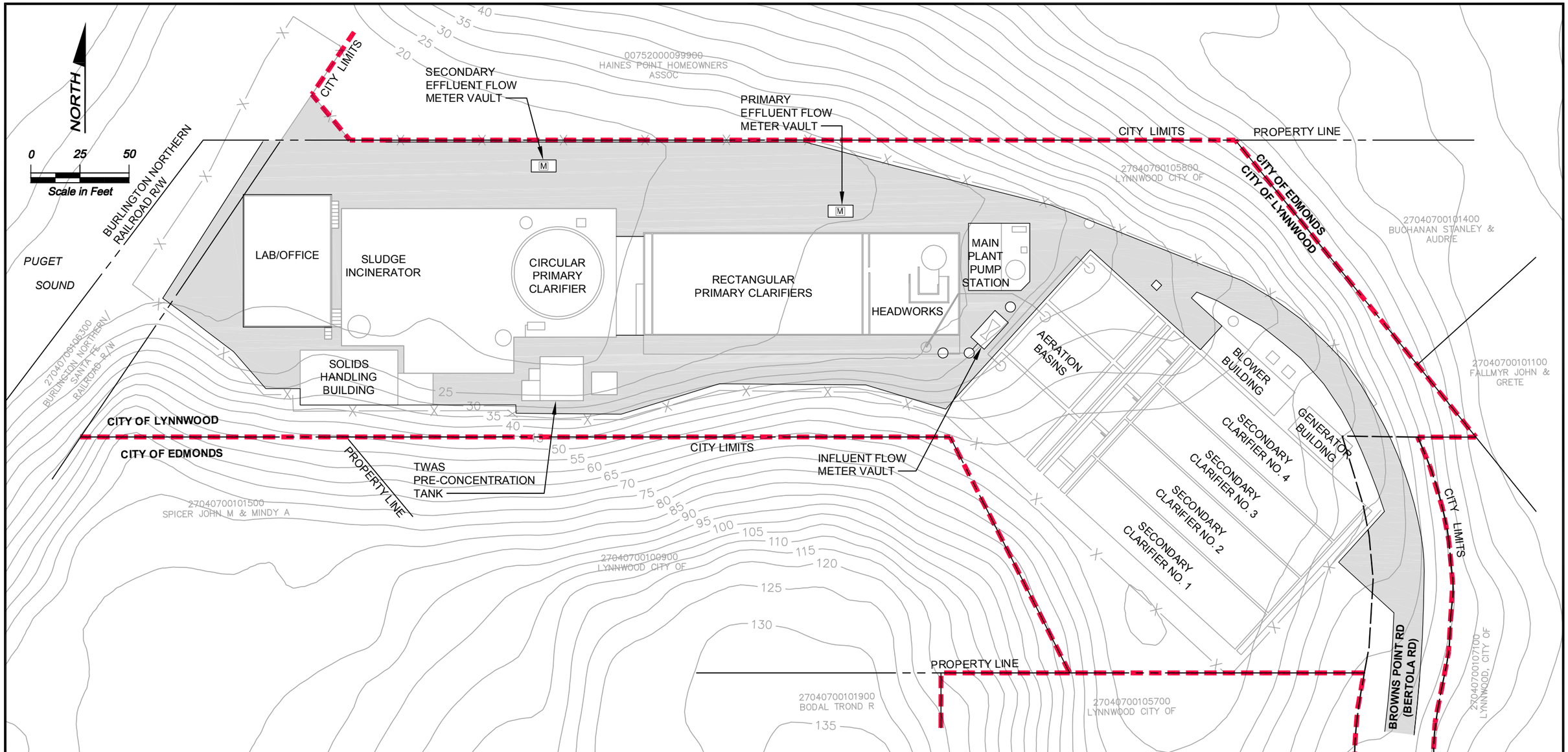

LEGEND

SITE BOUNDARY

Map Source:

This drawing was created from a variety of record drawing and site visit information.

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LYNNWOOD WASHINGTON

WWTP Site Plan
City of Lynnwood
Sewer Comprehensive Plan
December 2022

Figure
5-4

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Path: S:\Cad\Lynnwood\21-10781 Sewer Comp Plan\d Filename: P21-10781_Fig 5-4 Plot date: Nov 18, 2022-12:10:12pm CAD User: solsoe.
Xref Filename: | X21-10781_Ex Surf |

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5.4.3 Headworks

Two trunk sewers convey wastewater to the WWTP. The 24-inch influent line from the City enters the facility along the north side of the aeration basins, while the 12-inch influent line from the City of Edmonds enters the facility along the south side of the WWTP. The two sewers are combined at manhole 2B immediately upstream of the influent Parshall flume (24-inch flume with a 21.4 MGD capacity), after which it enters the headworks. All influent splits into two channels in the headworks: a primary screening channel and a backup channel which are each isolated with manual slide gates. The primary channel houses an automatic mechanical bar screen and discharges to the grit removal system. The grit removal system consists of a circular concrete grit chamber. Settled grit slurry is extracted from the chamber and discharged to an adjacent grit classifier by an integrated air lift system. Grit and screenings are removed, washed, compacted, and then disposed of in a dumpster.

The headworks are collocated with the three rectangular primary clarifiers in Building No. 1. This building mechanical bar screen, screenings washer/compactor, grit removal, and grit dewatering screw conveyor. The odor control system serving the aeration basins and secondary clarifiers includes a scrubber located adjacent to the MPPS. Odor control for the headworks and the rectangular primary clarifiers is provided by a second separate odor control system located outside Building No. 2. Building No .1 also includes the headworks electrical room.

5.4.4 Primary Clarifiers

Screened and degritted wastewater from the headworks flows by gravity to the primary clarifiers. The single channel from the headworks splits into two channels with manual slide gates: one to the three rectangular clarifiers and the other to the circular primary clarifier. The primary clarifiers remove settleable solids (and the associated BOD) by slowing the flow in the long tanks. The flow velocity dissipates here, allowing solids to settle out of suspension and scum to rise to the surface. All primary sludge and scum is collected for separate processing. The rectangular primary clarifiers are each 105 feet long by 16 feet wide and have a side water depth of 16 feet. The surface area of each rectangular clarifier is 1,680 SF, for a total of 5,040 SF. The circular primary clarifier has a diameter of 45 feet and a side water depth of 12 ½ feet. The total surface area of the circular clarifier is 1,590 SF, which is about 24 percent of the total primary clarifier surface area.

The effluent discharges from the clarifiers and flows by gravity to the MPPS. Design loading for primary clarifiers is primarily based on the surface overflow rate (flow rate divided by the settling area; or on the vertical upward flow velocity which opposes downward vertical settling velocity). The primary clarifiers flow consists of about 95 percent plant influent and 5 percent return flows from the thickeners and screw press. The typical design parameter for a primary clarifier is between 800 to 1,200 gallons per day per square foot for average annual flows.

5.4.5 Main Plant Pumping Station

Given the hydraulics of the WWTP and how the site was developed per **Section 5.4.1**, the MPPS is located near Building No. 1. Effluent from the primary clarifiers combines in the Bypass Overflow Structure to flow to the MPPS. Flows above approximately 14 MGD bypass secondary treatment. Primary effluent typically flows to the MPPS. A flow meter within a vault measures primary effluent flow. Combined primary effluent/return activated sludge (RAS) is pumped from the MPPS to the aeration basins. The MPPS consists of four 100-hp dry-pit, non-clog centrifugal pumps with a capacity of 4,600 GPM each at a TDH of 48 feet.

5.4.6 Aeration Basins

There are three 309,000-gallon aeration basins for the secondary biological treatment process. Each basin is equipped with four cells. The first two cells (No. 1 & 2) are anoxic selectors where non-filamentous bacteria predominate over filamentous bacteria. Non-filamentous bacteria can then settle and compact properly in the secondary clarifiers. The second two cells (No. 3 & 4) are larger and aerobic (dissolved oxygen ≥ 1.0 mg/L.) for carbonaceous oxidation. Air is blown through submerged piping and through air diffusers to mix and provide oxygen to the activated sludge. One Neuros Turbo Blower and two 200-HP multistage centrifugal aeration blowers, supply air to all three basins. The solids retention time (SRT – or sludge age expressed in days) in the aeration basins is the average time that the solids remain in the basin, which is computed as the total mass divided by the amount grown per day. The aeration basins are operated within the normal range for conventional activated sludge plants of 3 to 5 days. The aeration basins are being operated to prevent nitrification, which can begin at an SRT of about 8 days in warmer weather or at about 12 days in winter. The aerated mixed liquor has the suspended solids concentration controlled to maximize plant performance through seasonal variations in the wastewater and climate. The mixed liquor suspended solids (MLSS) concentration averages about 2,000 mg/L in winter and 2,500 mg/L in summer. The MLSS concentration is limited by the solids settling ability in the subsequent secondary clarifiers.

5.4.7 Secondary Clarifiers

The aeration basin effluent flows by gravity to one of the four rectangular secondary clarifiers. Each clarifier is 120 feet long by 24 feet wide with a side water depth of 14 feet. Activated sludge settles and collects along the bottom where it is either returned to the aeration basins or wasted to the incinerator. The effluent leaves via the clarifier effluent weirs and continues by gravity to the chlorine contact tanks.

5.4.8 Solids Handling

Primary sludge is pumped from the primary clarifiers to the mixing manhole and then pumped to the sludge blending tank. Scum from the primary clarifier flows to a scum collection basin. Scum is then processed by the grease concentrator before being added to the reversing screw conveyor that is directly upstream of the incineration process.

A portion of the biosolids from the activated sludge process is wasted to prevent the buildup of excessive solids in the system. This WAS is wasted off the RAS lines, prior to the MPPS, through the aid of a WAS pump station. The WAS flows to the pump station located between the aeration basins and the secondary clarifiers, below the walkways, where it is pumped to the pre-concentration (TWAS) tank for thickening before being pumped downstream of the sludge blending tank. The WAS 45,000-gallon pre-concentration tank has a settling area of 400 SF and a design underflow solids concentration of about 1.5 percent total solids. The thickened WAS flows to a holding tank. From the holding tank the thickened sludge is ground before two progressive cavity pumps with a capacity of 65 gpm and 5 feet TDH move the WAS to join the thickened primary sludge. WAS, on the average, enters the tank at 0.75 percent and leaves thickened to 1.9 percent total solids.

Thickened primary and WAS flows are combined and mixed in an in-line static mixer before being fed to the 285-gallon screw press mix tank where polymer is added to condition the sludge. The sludge is then dewatered in the screw press, which can continuously operate unattended. The screw press can process approximately 6 dry tons per day and produce a dewatered sludge of 22-24%. Dewatered sludge is discharged to a distribution conveyor that can deliver the sludge to either of two progressive cavity pumps which deliver the dewatered sludge to two feed locations of the SSI.

The solids handling system produces a number of return streams that are recycled to the plant influent. These include scum decant, pre-concentration tank overflow, filtrate from the screw press, and waste streams from the incinerator gas scrubber and ash handling processes. The operating efficiency of the solids handling process will be reflected in the quality of these return streams, as well as their volume.

5.4.9 Sewage Sludge Incineration

Dewatered sludge from the screw press is pumped using two progressive cavity pumps to two locations in the SSI. The City's history with incineration began in 1962 when it installed the first municipal fluidized bed SSI in North America, a 4-foot diameter unit (WEF MOP 30). In 1989, the original SSI was replaced with the current 9.5-foot diameter, 860 pounds per hour design capacity system. The design capacity was never reached in practice and a subsequent upgrade in 1994 was implemented to increase the capacity to 750 - 800 pounds per hour. Per the Wastewater Comprehensive Plan Update (BHC Consultants, 2012), the facility operators believe the SSI's sustained capacity was 688 pounds per hour, or approximately 86% of its original design capacity. In 2020, Chavond Berry Engineering Corp (CBE) performed a review to determine SSI capacity, which was estimated at 620 pounds per hour. The analysis was based on City-provided data on SSI operation and monthly dewatered sludge data from 2019 and 2020. From the data provided, an SSI feed solids percentage of 21% was selected, with an 84% volatile fraction, and 10,000 BTU per pound lower heating value (LHV). CBE performed a heat balance assuming a low exhaust temperature of 1,500 °F, and 140% excess air, in line with actual SSI operations in 2019 and 2020. The excess air percentage was higher than typical and indicated that the SSI had a sludge burning capacity of 620 pounds per hour. However, the SSI has not been able to exceed a sludge burning capacity of 450 to 500 pounds per hour due to the capacity of the existing progressive cavity pumps.

5.4.10 Sewage Sludge Incinerator Ash Handling

The SSI produces gases and ash that exit the top of the incinerator and pass through two heat exchangers. The primary heat exchanger pre-heats the incinerator fluidizing air and the secondary exchanger re-heats the exhaust stack. The gas and ash then passes through a wet Venturi cyclone scrubber for particulate removal, followed by a four- tray wet scrubber where the finer particulate is removed, and the gas is cooled by passing it counter-current to a large quantity of water. The scrubbed gas is re-heated (to prevent a visible steam plume) and released through a stack to the atmosphere. The captured ash, in the form of a slurry, is thickened in a 10-foot diameter gravity thickener with polymer addition. The thickened ash is then dewatered in a 3 SF vacuum filter. Current operations produce, on average, approximately 6 cubic yards of ash a week for disposal offsite.

5.4.11 Disinfection

The secondary clarifier effluent is disinfected with gaseous chlorine, which is delivered to the plant in one-ton gas cylinders. The gas is stored on site in six one-ton cylinders hooked up to two banks that share a common header that feeds the system, with only one bank used at a time. The chlorine gas is converted to a chlorine solution using chlorinators, and is then mixed with the secondary clarifier effluent in a flash mix compartment where the chlorine is rapidly mixed with the effluent. There is a 30-inch diameter ultrasonic flow meter in the pipe between the secondary clarifiers and the chlorine contact tank. This meter is used to control the chlorine dose rate and record the effluent flow. The chlorine contact tank is divided into two halves. Each tank half is 56 feet long x 24 feet wide x 20 feet water depth. The total volume is 326,000 gallons, which provides a current detention time of 77 minutes at maximum month flow. A minimum contact time of about 60 minutes at average daily flow rates is required to achieve the necessary fecal coliform kills. The effluent from the chlorine

contact tank is de-chlorinated, using an ORP-probe controlled sodium bisulfite feed, before being discharged to the 36-inch diameter outfall.

5.4.12 Outfall

Treated effluent is discharged through a 36-inch diameter 240-foot-long x 130-foot-deep diffuser that disperses the flow through 98 3-inch ports into Browns Bay of Puget Sound. The outfall extends approximately 1,000-feet into the Puget Sound and is approximately 100 to 120 feet deep.

5.5 INDUSTRIAL WASTEWATER USERS

Industrial waste is a generic term for any waste material generated by a commercial, industrial, or other non-residential activity. The City of Lynnwood has a federally mandated Industrial Pretreatment program (40 CFR Part 403). LMC 14.60 sets forth the requirements for compliance with applicable state and federal laws. Pretreatment policies are also described in **Section 2.2.4** of this Plan.

Per Ecology Fact Sheet for NPDES Permit WA0024031 (effective March 1, 2019), Ecology delegated authority to the City for permitting, monitoring and enforcement over industrial users discharging to their treatment system. All dischargers of industrial wastewater to the sewer system who are required to have an industrial wastewater discharge permit shall submit an application to the City Department of Public Works per LMC 2.44.040. The City reviews applications, determines appropriate requirements and/or restrictions, then issues the Industrial Wastewater Discharge Permit. The City monitors the applicant for compliance with the permit and applicable codes. Ecology is informed annually of the issuance of these permits and provided with documentation on the industrial discharge.

There is currently one active Industrial Wastewater Discharge Permit in City of Lynnwood: The Sound Transit Facility at 20833 44th Avenue West has an Industrial Wastewater Discharge Permit (IWD-021766-2019) for discharge to the City's sanitary sewer system.

Chapter 6 Conveyance System Evaluation

6.1 BACKGROUND

This chapter will focus on analysis of the conveyance system – gravity piping, force main piping and lift stations – to meet current and future needs. **Chapter 5** provides a summary of the City of Lynnwood's (City's) existing wastewater facilities. **Chapter 7** and the Wastewater Treatment Plant (WWTP) Facility Plan in **Appendix A** provide a more detailed analysis of the WWTP.

Significant changes in experienced and projected growth have occurred since the City's last sewer plan update in 2012. Primarily, Office of Financial Management (OFM) increased allocations to the City by approximately 10,000 persons around 2014. The City is responsible for planning infrastructure for future growth allocated by OFM. Additionally, a Sound Transit Light Rail Station is currently in construction near I-5 and 46th Ave N which will promote surrounding growth in City Center.

Several tools are used to analyze the conveyance system including a hydraulic sanitary sewer collection system model, previous Inflow and Infiltration (I/I) studies, institutional operator knowledge and assumptions on useful design life.

6.2 COLLECTION SYSTEM MODEL

An update to the City's Sanitary Sewer Collection System Model was performed as part of this planning effort. A summary of the modeling efforts is provided below. More detail on model inputs and parameters can be found in the **Appendix D** Hydraulic Model Report.

The City's conveyance system was analyzed using a truncated model, simulating only trunk and interceptor gravity mains mostly over 8-inches in diameter, pump stations, and associated force mains. 8-inch diameter gravity mains, where impactful on system conveyance capacity, are also included. The 8-inch diameter gravity mains in neighborhoods were largely not modeled as an 8-inch pipe have capacity to convey localized neighborhood flows. All pump stations and force mains are simulated with the exception of Lift Station (LS) 7 and Lift Station 14, which were instead each represented by a singular flow input in the model. This allows for an accurate representation of the most critical components of the City's conveyance system and the simultaneous analysis of both gravity and pressure pipelines.

6.2.1 Model Software

The Lynnwood model was developed using the MIKE Urban (MU) software platform, which uses the MOUSE hydraulic engine for hydraulic analysis calculations. The model operates within the ArcGIS (GIS) platform and is specifically designed for modeling urban sanitary and combined sewer systems. Model inputs, including physical infrastructure updates, domestic loading, I/I loading, diurnal or cyclical variations and future loading methodology and inputs are discussed further in the **Appendix D** Hydraulic Model Report.

6.2.2 Flow Records

Available historical flow records were used in the model calibration. The City has flow meters installed at Lift Stations 8, 16 and at the WWTP. The City also has a long-standing meter in gravity system manhole (MH) 6-181 located near 196th St SW and 68th Ave W, downstream of the LS-10 and LS-16 discharge manhole. In addition, six area-velocity meters were deployed in the City's system from October 2021 to May 2022. These meters are further described in **Appendix D** Hydraulic Model Report and are shown graphically on the system-wide map in **Appendix G**. Lastly, the City provided lift station run-times at LS-12, although accurate flow data is harder to extract from LS run-times.

Flow records were used to inform and calibrate a baseline 2021-22 sewer model.

6.2.3 Design Storm and Surcharging

The City uses the following level of service (LOS) criteria for future sanitary sewer collection system sizing:

1. By a 20-year flow recurrence event with wastewater levels in manholes within 5-feet of ground surface. Capacity upgrades may be required when the highest wastewater level is less than 5-feet from ground or manhole elevation to the maximum wastewater level, during a 20-year flow event. The 20-year flow recurrence is consistent with other City utility plans and other local agency criteria (e.g., King County).

The sanitary sewer collection model provides a simulated 20-year flow recurrence. Using scaling factors in the MU's 'boundary items', a 5-year flow recurrence event can also be simulated. This is discussed in further detail in the **Appendix D** Hydraulic Model Report.

6.2.4 Model Scenarios

Flow records in 2021-22 wet weather season were used for the baseline calibration; known developments and population and employment forecasting were used to simulate a '2044' scenario; and additional scaling was applied to estimate a 2080 scenario. Each model scenario can be simulated for either a dry weather flow (DWF), 5-year wet weather flow (WWF) recurrence event or 20-year WWF recurrence event (City's level of service criteria). A list of available model scenarios is provided below:

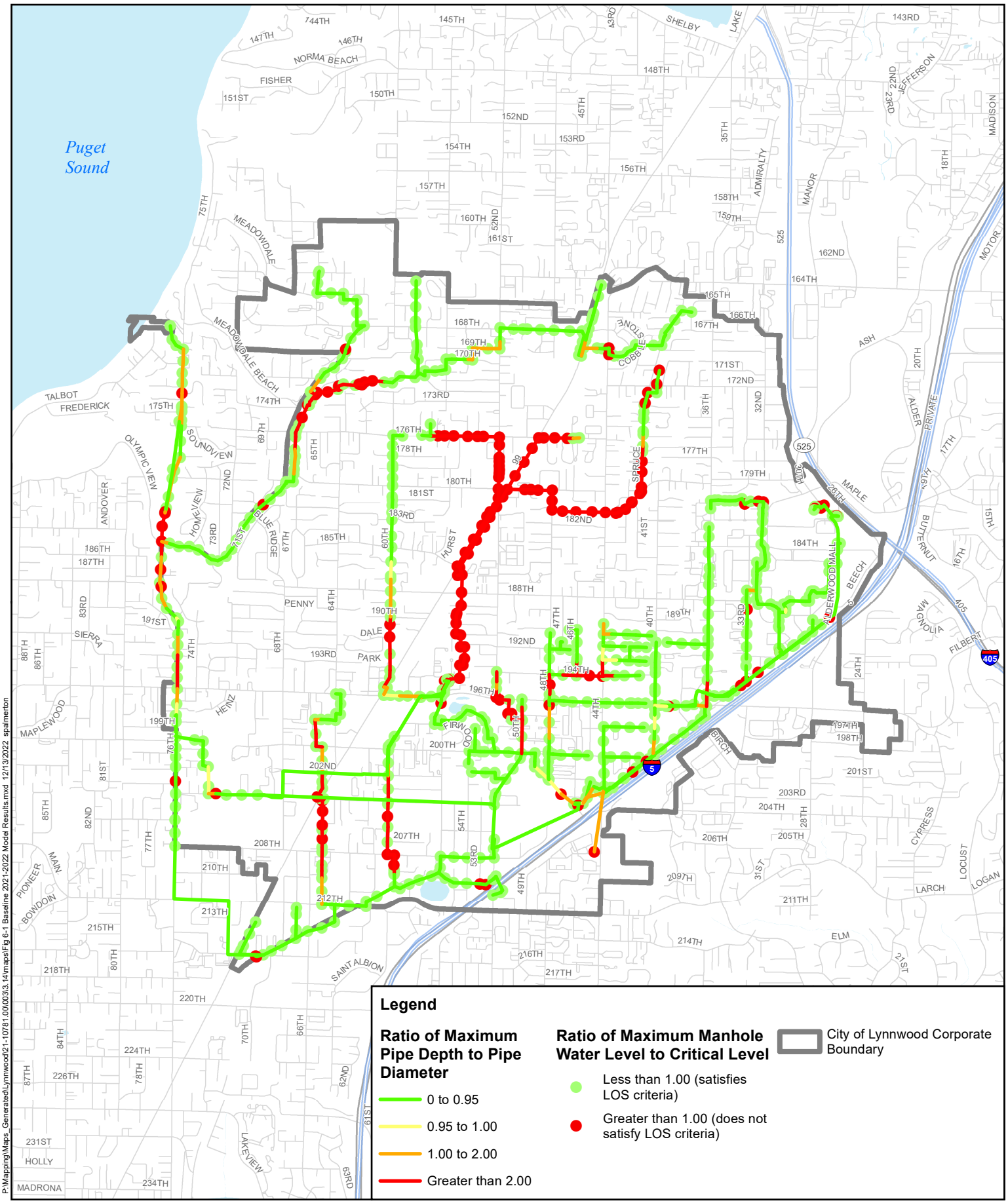
1. Baseline 2021-22: DWF, 5-year WWF, 20-year WWF
2. 2044: DWF, 5-year WWF, 20-year WWF
3. Buildout: DWF, 5-year WWF, 20-year WWF

In general, the baseline scenario can be used to assess and evaluate current problem areas within the system; the 2044 scenario can be used to evaluate near-term future problems, including lift station sizing for design; and the 2080 model can be used for long-term gravity conveyance system sizing.

6.2.5 Model Results

Model results shown herein reflect the 20-year flow recurrence simulation. **Figure 6-1** and **Figure 6-2** show maximum wastewater levels during a 20-year event.

For piping, maximum wastewater levels during a 20-year flow event are displayed relative to the gravity pipe size (d/D). Larger d/D values represent a more significant capacity problem during peak flow events.



P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\003\3.14\maps\Fig 6-1 Baseline 2021-2022 Model Results.mxd 12/13/2022 spalmerton

This map is a geographic representation based on information available. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

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LYNNWOOD WASHINGTON

Baseline 2021-2022 Model Results

Sewer Comprehensive Plan
City of Lynnwood
January 2023

Figure **6-1**

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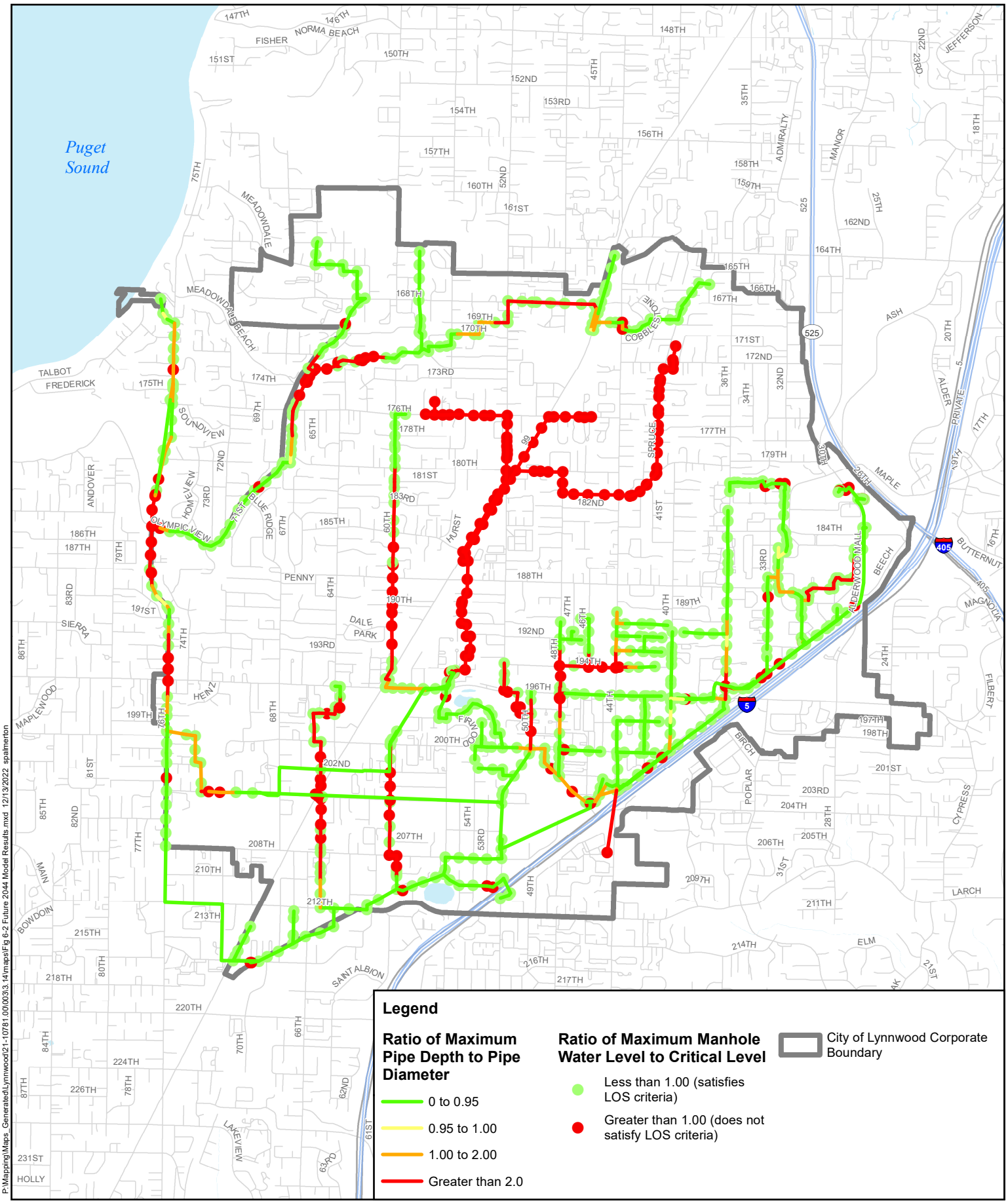

P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\003\3.14\maps\Fig 6-2 Future 2044 Model Results.mxd 12/13/2022 spalmerton

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LYNNWOOD WASHINGTON

Future 2044 Model Results

Sewer Comprehensive Plan
City of Lynnwood
January 2023

Figure **6-2**

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The City's LOS criteria states that maximum wastewater levels must remain 5-feet below ground level. The MU modeling software contains a manhole parameter called the critical level, which is a user-defined parameter and can be set to any elevation. It defaults to the manhole's ground elevation when a critical level is not specified. The critical level parameter is especially useful because it can be used to identify manholes that do not satisfy the City's LOS criteria. Each modeled manhole was assigned a critical level elevation 5-ft below the manhole's ground level elevation. Manholes that do not satisfy the City's LOS criteria during a model simulation can be identified by plotting the maximum manhole wastewater level normalized by (or divided by) the manhole critical level. If the maximum manhole wastewater level normalized by the manhole critical level is less than one, it satisfies the City's LOS criteria. If it is greater than one, it does not satisfy the City's LOS criteria. These results are also plotted in **Figure 6-1** and **Figure 6-2** for the 20-year flow event for the baseline and 2044 model simulations.

6.3 GRAVITY SYSTEM ANALYSIS

Conveyance upgrades are generally necessary for one of two reasons – capacity problems or obsolescence. Capacity problems occur when the system is not large enough to convey flow during peak sewer flow events. Obsolescence occurs when a sewer asset is degrading or failed and is at the end of its useful life. In the past, City sanitary sewer plans have focused on existing and future capacity-related problems. This plan, in addition to capacity, places a renewed focus on replacing or rehabilitating old sewer pipe in the City's system.

6.3.1 Capacity

Baseline model results indicate existing capacity problems are present upstream of LS-16 along the Scriber Creek Sewer Main; upstream of LS-16 along 60th Ave W sewer main; upstream of LS-10 along 50th Ave W/Wight Property/52nd Ave W sewer mains; upstream of LS-12 along the 60th Ave W/59th Pl sewer main; upstream of LS-12 along the 65th Ave W sewer main; along 194th Street SW between 48th Ave W and 44th Ave W; upstream of the WWTP near the high density polyethylene (HDPE) relief sewer along 76th Ave W; and along Olympic View Drive, near LS-7.

As expected, the 2044 model results show more pronounced capacity problems within the same areas identified for the baseline model scenario. In addition to the baseline model capacity problem areas, the 2044 model results indicate future capacity problems along 204th Street between 68th Ave W and 73rd Ave W.

Table 6-1 provides additional information for each capacity problem area, including location specifics, if the capacity problem area is recommended for inclusion in the 6-year Capital Improvement Program (CIP), and if an additional study is recommended for the capacity problem area.

Table 6-1
Conveyance Capacity Problem Summary

Capacity Problem	Location	MH to MH	6-year Capital Improvement Project?	Additional Study Recommended?
Baseline/Existing				
1	Upstream of LS-16 along Scriber Creek sewer main	LS 16 to MH 4-185	Yes	Yes
2	Upstream of LS-16 along 60th Ave W sewer main	MH 4-63 to MH 4-45	Yes	No
3	50th Ave W/Wright Property/52nd Ave W sewer mains	MH 5-125 to MH 5-121	Yes	Yes
4	Upstream of LS-12 along the 60th Ave W/59th Pl sewer main	MH 2-59 to MH 2-48	Yes	Yes
5	Upstream of LS-12 along the 64th Ave W sewer main	MH 1-64 to MH 1-28	Yes	Yes
6	Along 194th Street SW between 48th Ave W and 44th Ave W	MH 5-38 to MH SS01-04	Yes	No
7	Upstream of the WWTP and the HDPE relief sewer along 76th Ave W	MH 6-4 to MH 8-18A	No	No
8	Along Olympic View Drive, near LS-7	MH 7-116 to MH 7-102	No	No
2044				
9	Along 204th between 68th and 73rd	MH 6-161 to MH 6-158	No	No

6.3.2 Obsolescence

As outlined in **Table 5-2**, approximately 413,000 linear feet of the City's 551,000 total linear feet of gravity sewer is concrete pipe. The concrete sewer pipe was generally installed in the 1960's and 1970's. Design life of concrete pipe can vary significantly (50- to 100-years) depending on how well it is maintained, whether or not it is lined and the type of sewage it conveys. Old concrete pipe is likely to experience corrosion, disjointing or root intrusion and high I/I. Some of this concrete pipe may be at or approaching its useful life.

To replace or rehabilitate all concrete pipe in the next 50 years, the City would need to, on average, replace or rehabilitate approximately 8,300 linear feet per year. In addition to reduced maintenance, replacing or rehabilitating gravity sewer infrastructure will help address I/I. A 'Sewer Replacement and/or Rehabilitation' program to address aging gravity sewer infrastructure is presented in **Chapter 9** – Project C-10. The program requires annual funding for pipe replacement and rehabilitation. The City has flexibility to identify which pipes will be replaced or rehabilitated based on closed-circuit television (CCTV) reports, sewer failures and/or possible synergies with other projects.

Based on review of recent project costs, approximately $3 million (2022 dollars) is needed annually to replace or rehabilitate 8,300 feet of pipe per year. This assumes 5,000 linear feet of cured-in-place-piping (CIPP) at an average project construction cost of $200 per linear foot; and 3,300 linear feet of replacement at an average project cost of $500 per linear foot. Approximately 15% is added for engineering and administration costs.

6.4 LIFT STATION ANALYSIS

The City owns and operates seven lift stations. **Section 5.3** provides a summary of the existing lift stations.

6.4.1 Capacity

Existing capacity, last year of improvements, force main diameter, force main length and 2044 peak flows or capacity required for each lift station is shown in **Table 6-2** below. New lift stations should be designed with a firm capacity equal or greater to the 2044 peak flows/above. Force main sizing may be evaluated based on Department of Ecology's recommended velocities of 2 to 8 feet per second. If design flows are approaching or exceed 8 fps, an increase to the force main size should be considered.

Table 6-2
Lift Station Capacity Summary

Lift Station	Existing Capacity[1] (gpm)	Year Built/ Remodeled	Force Main Diameter/ Length	Baseline/Existing Peak Flows/Capacity Required	2044 Peak Flows/Capacity Required
4	300	1987	8" DI / 2,750 LF (New) 6" CI / 630 LF (Old)	130 gpm	270 gpm
7	125	1978	6" / 160 LF	N/A	N/A
8	3,900	2021	14" / 3,900 LF	1,600 gpm	2,200 gpm
10	5,000	1993	24" DI / 9,490 LF	4,900 gpm	5,900 gpm
12	2,000	1993	18" / 4,740 LF	2,400 gpm	2,700 gpm
14	210	1990	6" / 1,680 LF	N/A	N/A
16	2,500	2016	16" HDPE / 6,670 LF	3,550 gpm	3,650 gpm

Notes:
1) Existing capacity shown is firm capacity with largest pump out of service.
2) Lift Station 4 is expected to be upgraded in 2024 and will pump through the new 8'' force main.
3) Lift Station 14 is expected to be upgraded in 2024.

Model results indicate that Lift Station 10, 12 and 16 are currently undersized or reaching firm capacity limitations. Upgrades to Lift Station 10 are currently planned. Lift Station 12 Improvements are also recommended. The City has not experienced capacity problems at LS-16 to-date during recent storm events. Several conveyance projects are planned in the Lift Station 16 basin, which may reduce I/I and extend capacity of the current pumps. Further, there is some question to the accuracy of Meter 5 which was used to calibrate flows from LS-16-A, LS-16-B and LS-16-C basins. The City will observe how I/I is improved through various conveyance projects and conduct further study before upgrading capacity at LS-16.

6.4.2 Obsolescence

Lift station mechanical, electrical and controls equipment generally last approximately 30-years. Lift Station 16 is a new station constructed in 2016; Lift Station 8 was fully upgraded in 2021; Lift Stations 4 and 14 are expected to be upgraded in 2024 and 2025. Lift Stations 7, 10 and 12 are approaching or have exceeded the 30-year mechanical and electrical/controls equipment life expectancies.

6.5 INFLOW AND INFILTRATION

Two primary sources are used to analyze I/I:

1. The March 2011 Infiltration and Inflow Study.
2. The updated sanitary sewer collection system model, including the flow monitoring outputs that informed the model calibration.

6.5.1 I/I Areas of Concern as Identified in 2011 Study

As part of the 2011 Study, site investigations such as smoke testing, manhole inspections, and CCTV inspections were performed to identify specific I/I point sources. These site investigations provide insight to specific areas where I/I problems exist in the City's sanitary sewer collection system. The 2011 I/I Study is included as **Appendix K** of this Sewer Comprehensive Plan Update.

I/I Areas of Concern from the 2011 Study are illustrated by the orange highlights in **Figure 6-3**. For the most part, the I/I areas of concern identified in the study and **Figure 6-3** exist in the LS-10-D and LS-16-A basins in the center part of the City's sanitary sewer system. These are older areas of the City that are likely to have concrete infrastructure subject to root intrusion, pipe bellies, corrosion, higher manhole infiltration, etc. These sewers may also contain private storm connections such as connected roof drains and/or sump pumps.

The City will commit internal public works staff to addressing and fixing the specific pipe sections as identified in this study. If fixes are outside of public works purview, projects can be assigned to the Sewer Replacement and/or Repair program for the additional design and construction expertise required.

6.5.2 I/I Areas of Concern as Identified from Model

The model was calibrated to recent flow monitoring information and results validated by City Engineering and Operations and Maintenance (O&M) staff. Model and flow monitoring results indicate generally where I/I is problematic but the specific point sources of I/I are not directly identified.

As described in **Section 6.2** above and Table 3-3 of **Appendix D** Hydraulic Model Report, the City deployed six flow instream flow meters from October 2021 to May 2022. Flow Meter 1 (MH 8-6) was relocated to MH 4-185 on March 22, 2022. The largest storm during the flow-monitoring period, by 24-hour precipitation, occurred from 11am January 2, 2022 to 11am January 3, 2022. The January 2nd-3rd storm has an estimated 5-year, 24-hour precipitation recurrence interval. Also of interest is the November 12, 2021 rainfall event. On November 12, 2021 at around noon, there was a 1-hour rainfall of approximately 0.43-inches. This represents a higher short-term intensity event. Higher meter flows directly following precipitation could represent areas with high inflow. **Table 6-3** provides a summary of estimated I/I produced by the storms (in gallons per acre day) for the two events.

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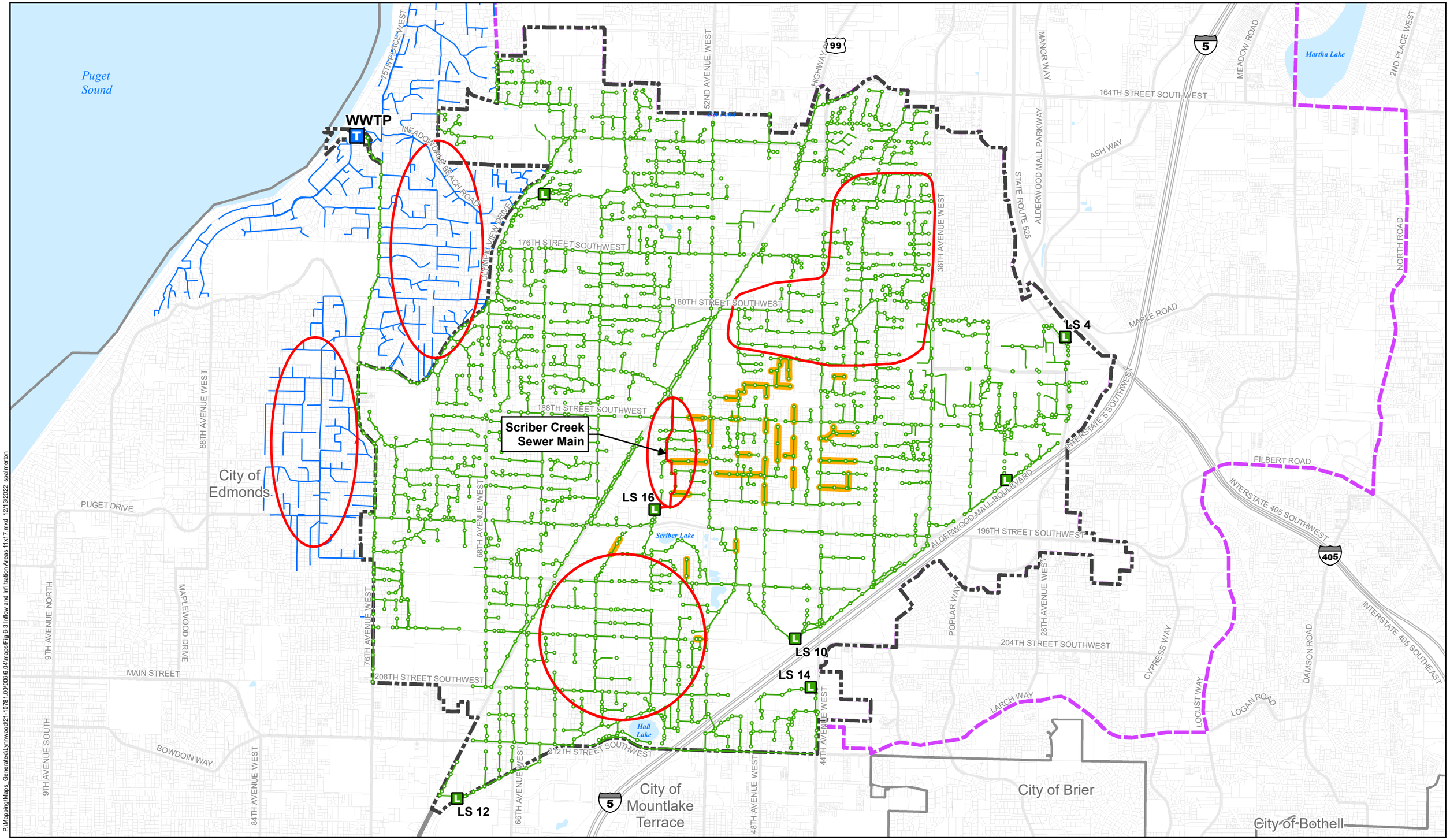

P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\006\6.04\maps\Fig 6-3 Inflow and Infiltration Areas 11x17.mxd 12/13/2022 spalmerton

Sewer System: City of Lynnwood.
GIS Base Data: Snohomish County
This map is a geographic representation based on information available. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

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- WWTP
- Lift Station
- Manholes
- Sewer Pipes
- Edmonds Sewer Pipes
- I/I Areas of Concern as Identified in 2011 I/I Study
- Suspected high I/I Areas requiring further investigation and/or study
- City of Lynnwood Corporate Boundary
- Lynnwood Municipal UGA
- Other City Boundaries

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Inflow and Infiltration Areas
Sewer Comprehensive Plan
City of Lynnwood, Washington
January 2023

Figure
6-3

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Table 6-3
I/I Analysis for Wet Weather Events

Meter Basin	Jan 2-3, 2022 Storm		Nov 12-13, 2021 Storm	
	Avg 24-hr I/I (gpad)	Peak I/I (gpad)	Avg 24-hr I/I (gpad)	Peak I/I (gpad)
1	1,044	1,372	419	880
2	197	763	268	762
3	1,025	2,762	937	2,763
4	957	1,751	418	1,269
5	1,383	3,563	427	2,452
6	1,740	2,323	904	1,954

Table 6-3 above indicates relatively high I/I rates (peaks approaching or exceeding 3,000 gallons per acre day) in the Meter 3, 5 and 6 basins. These meters pick up flow in the north-central part of the City's Sanitary System. **Figure 6-4** is provided below for easy reference on the location of these meters. The City will focus near-term I/I reduction efforts on this area of the system.

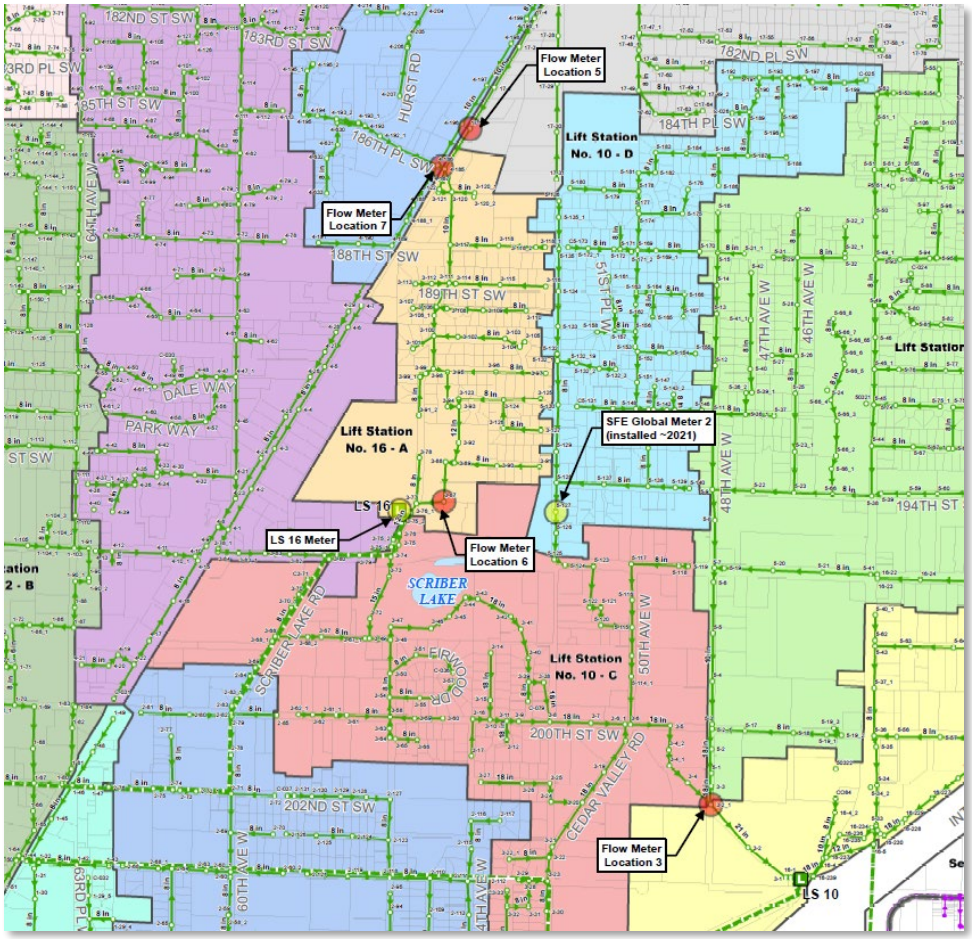

Figure 6-4
Meters 3, 5, and 6 Locations

Meter 3 is located downstream of older City residential neighborhoods, where which Local Improvement Districts (LIDs) were formed to fund sewer installation in the mid-to-late 1960's. The 2011 I/I Study corroborates the high I/I identified in more recent flow monitoring efforts for Meter 3 basin. Specific areas of concern are noted in **Figure 6-3** for the areas upstream of 52nd Ave W and 48th Ave W sewer mains, or in Lift Station 10-D and Lift Station 10-B basins, respectively.

Meter 6 is located adjacent and downstream of the Scriber Creek Sewer Main. The City has not been able to CCTV the Scriber Creek Sewer Main due to continuous high flows, nor was it CCTV'd as part of the 2011 I/I Study. Field observations of Scriber Creek Sewer Main indicate the presence of concrete pipe and block and mortar manholes. Replacement and/or rehabilitation of the Scriber Creek Sewer Main, from LS-16 to sanitary sewer manhole (SSMH) 4-185 near Highway 99, should be prioritized for I/I reduction.

Meter 5 is located in SSMH 17-1 on the east main along Highway 99. The meter is located at the outlet of the Lift Station 16-C basin. It is unclear when sewer installation occurred in this basin and what type of material was used. Further, some question arose during this planning process on the accuracy of the Meter 5 results. The City will monitor and study this area in future years to further assess possible I/I and to validate the accuracy of Meter 5.

Other I/I areas of concern that are not directly apparent from flow monitoring results are:

1. *LS-12 I/I*: Sewer infrastructure was installed in this area via LID funding in the 1960s. No flow meters were installed in LS-12 as part of the recent monitoring. However, all pumps in LS-12 have operated simultaneously in the past, indicating high I/I during wet weather events. This is an area of concern, and the City should focus upcoming sewer CCTV and manhole inspections within the LS-12 basin.
2. *Edmonds I/I*: The City of Edmonds owns and operates their own sewer collection system. A portion of Edmond's collection system, generally between City of Lynnwood limits and the City's WWTP, discharges to the 76th Ave Sewer Trunk and is treated at the WWTP. No flow meters were installed to specifically record flow from City of Edmonds. However, a meter was placed upstream of the WWTP and there is a meter on the pump station at the WWTP. Meters were also placed at the outlet of the Brown's Bay Sewer Trunk and shortly downstream of the LS-10 and LS-16 discharge manhole. Through mass-balance, it is estimated that the City of Edmonds collection system that flows to Lynnwood is attributable to high I/I. Since the Edmonds area is largely residential, it is likely that I/I is generated from illicit stormwater connections to the sanitary sewer system (e.g. roof downspout connections, sump pump discharge, etc.), or from aging sewer mains. Coordination and partnering between City of Lynnwood and City of Edmonds is required to address I/I in this area.

6.5.3 I/I Actions

Although I/I degradation is still assumed for future model simulations and corresponding gravity conveyance sizing, the City has set the specific goals to prevent future I/I in their system through the following:

1. City Public Works O&M staff will take measures to address the specific I/I Areas of Concern as Identified in the 2011 I/I Study (see **Figure 6-3**).

2. O&M staff will resume proactive sewer main and manhole inspections as described in **Section 8.4.1**. Repairs, if necessary, will be conducted by O&M staff or assigned as a future capital replacement and/or rehabilitation project.
3. The City will inspect new sewers and educate existing customers to prevent storm water discharges from private property, in compliance with LMC 14.12.050.
4. The City will utilize the Sewer Replacement and/or Rehabilitation program budget to improve I/I by upgrading existing sewer infrastructure.
5. Identification of additional capital improvement projects which will, at least in part, address the surcharging issues from I/I. Such projects currently include the Scriber Creek Corridor Sewer Improvements, 60th Ave W Pipe Upsize, and the 52nd Ave W Reroute. These projects are predicted to reduce surcharging issues but do not fully address the underlying cause of I/I.
6. Provide additional study and/or monitoring for the area upstream of Meter 5, in LS-16-C basin.

6.5.4 Performance Monitoring

It would be ideal and preferred by the City to measure how successful future projects (as identified in **Section 6.5.3**) are in reducing I/I. However, the City must consider the cost of measures to monitor performance and the corresponding value of such measures. For example, no storm or flow event affects the sanitary system in the same way. One storm may have high short-term intensity while another is prolonged; storms could occur during different times of the day, with differing domestic sewer flow contributions; and storms could produce different peak flows through larger facilities such as LS-10, LS-16 and the WWTP. Nonetheless, the most practical way to measure results of specific I/I actions is through flow monitoring. The City could purchase the equipment and training for instream flow monitoring to measure performance of the I/I actions. Alternatively, flow monitoring could be sub-contracted to a third-party flow monitoring company. The City will further evaluate the cost-effectiveness of flow monitoring following adoption of this Plan.

6.6 COLLECTION ALTERNATIVES

Diversion and collection system alternatives are provided below for future consideration and for compliance with Washington Administrative Code 173-240-050 3k. **Chapter 7** and the WWTP Facility Plan provide discussion for WWTP and disposal alternatives.

6.6.1 Diversion Alternatives

The City's WWTP is projected to have adequate capacity within the current planning horizon to treat all flows generated within the City's current sanitary sewer service area. However, flow diversions would reduce both flow and loadings at the WWTP. The following diversion alternatives are provided for future consideration:

1. *Diversion of LS-12*: Lift Station 12 is located across I-5 from Mountlake Terrace. An overflow is installed at the lift station which would convey flows through Mountlake Terrace and for ultimate treatment by King County. There are no plans to pursue this diversion near-term but a diversion to King County through Mountlake Terrace is an option for future conveyance should capacity problems arise. This diversion would need to be further discussed and agreed to by the City, Mountlake Terrace and King County Wastewater Treatment Division.

2. *Diversion of LS-4*: The King County Swamp Creek Trunk flows south just east of Lynnwood near S-525 and I-405. Lift Station 4 is approximately 500 feet west of the Swamp Creek Trunk. It is feasible to divert flows from LS-4 to the King County system. LS-4 flows are relatively low, however, and may not provide much downstream benefit. Further, connection to King County's system would likely be high in cost. There are no plans to make this diversion at this time.

6.6.2 Collection Alternatives

This Plan identifies two primary collection system alternatives, both which involve construction of new lift stations.

1. *LS-10*: City Center and Alderwood Mall areas are currently collected at and conveyed by Lift Station 10. LS-10 pumps through a 24-inch diameter force main that would be difficult and costly to replace in some sections. Further, the existing site limits the capacity of future improvements. It is estimated LS-10 could be upgraded to a 7,000-gpm capacity based on current limitations. Approximately 6,000 gpm capacity is forecasted for the station to meet LOS criteria in 2044. When LS-10 influent flows approach current and theoretical capacity is dependent on how fast and to what level City Center and Alderwood Malls area develop. Ultimately, a new site or new upstream lift station should be considered to address long-term capacity issues at LS-10.
2. *LS-16*: As discussed in **Section 6.5**, several conveyance projects and further study of the basins upstream of LS-16 are currently planned. The City will continue to monitor flows and capacity of LS-16. One possible alternative would be to construct a new lift station near SSMH 4-185 to collect flow from LS-16-B and LS-16-C basins. Force main routing would extend west along 188th St SW and Blue Ridge Drive, with ultimate discharge to the Olympic View Drive sewer main. If the City pursues this alternative, it may be possible to reduce future size of the new Scriber Creek Sewer Main.

6.7 RECLAIMED WATER

The City does not currently produce reclaimed water at their WWTP. Significant upgrades would be required to treatment processes, as well as new piping and pump stations to convey the reclaimed water to the desired area of discharge. Costs of these upgrades would be significant. Further, there is little benefit to aquifer recharge because there are no major well systems within the City boundary that reduce aquifer levels below natural conditions. Production and distribution of reclaimed water is not considered feasible or cost-effective over the planning horizon in this Plan.

If reclaimed water were to be pursued in the future, potential customers for reclaimed water include City parks, including the Municipal Golf Course. A discussion of reclaimed water is also provided in the City's Water System Plan.

Chapter 7 WWTP Improvement Program

7.1 BACKGROUND

The City of Lynnwood (City) owns and operates a Wastewater Treatment Plant (WWTP) that treats and disinfects wastewater prior to its discharge into the Puget Sound. The City's WWTP Facility Plan (Facility Plan), prepared by RH2 Engineering, Inc. and BHC Consultants, LLC, identifies needed improvements at the WWTP and includes recommendations for increasing the capacity and performance of the treatment facilities on the existing site to meet anticipated growth and nitrogen removal requirements. This chapter will develop and analyze two additional alternatives for providing the needed treatment capacity and nitrogen removal capability. One of the alternatives would be to develop an entirely new WWTP site within the Lynnwood city limits. The other alternative would be connection to a larger regional wastewater collection and treatment system. These options will be compared to the recommendations in the Facility Plan, including planning-level estimates, and provide a recommendation for final implementation and inclusion of one alternative in the Capital Improvement Plan (CIP).

7.1.1 Regulations for Surface Water Discharge

Wastewater flow and loading into the WWTP and treated plant effluent discharged to the Puget Sound are regulated through the City's National Pollutant Discharge Elimination System (NPDES) Permit, which is administered by the Washington State Department of Ecology (Ecology). The City's current revised NPDES Permit has an effective date of March 1, 2019, and an expiration date of February 29, 2024. The permitted flow and loading design criteria for the WWTP are included in **Table 7-1**.

Table 7-1
WWTP Permitted Flow and Loading Design Criteria

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	7.4 MGD
BOD_5 Influent Loading for Maximum Month	15,120 lb/d
TSS Influent Loading for Maximum Month	15,120 lb/d
MGD = million gallons per day	

7.1.2 Future Regulatory Changes

Ecology can change NPDES Permit effluent limits for the City's Outfall No. 001 at the WWTP as may be necessary to meet water quality standards that have been established for Puget Sound. Effective January 1, 2021, Ecology is changing the bacterial indicator from fecal coliform to *E. coli*. The City's NPDES Permit has a fecal coliform bacteria effluent limit for Outfall No. 001. When the current permit expires, an *E. coli* bacteria effluent limit will be developed and become effective at the time of that permit renewal.

Ecology also has developed the Salish Sea Model to better understand the role that nutrients (and nitrogen in particular) play in contributing to the low and decreasing dissolved oxygen levels in a number of critical areas throughout Puget Sound. The model results indicate that discharges of nutrients to Puget Sound from domestic WWTPs contribute significantly to the problem, with nitrogen determined to be the limiting nutrient, and inorganic nitrogen (consisting of nitrate-nitrite and ammonia) as the "biologically available" form. The City's WWTP is included in the modeling as one of the WWTPs with an outfall to the Puget Sound. Total inorganic nitrogen (TIN) consists of the sum of the nitrate, nitrite, and ammonia in the effluent discharged.

In January 2021, Ecology released a preliminary draft of the Puget Sound Nutrient General Permit (PSNGP) for public comment, and a formal version became effective on January 1, 2022, and expires on December 31, 2026. In response, the City has filed a Notice of Intent for coverage under the PSNGP and is submitting Daily Monitoring Reports (DMRs) as required by the PSNGP.

In addition, each of the WWTPs covered under the PSNGP must submit an annual Nitrogen Optimization Plan to Ecology. The permit establishes an action level of effluent TIN for each WWTP based on historical plant performance. An optimization plan must be submitted regardless of whether or not action levels are exceeded. The TIN action level for the City's WWTP is 340,000 pounds per year. If the City determines that the action level has been exceeded, steps must be taken to identify possible factors, to identify modifications that can be made to improve performance, to assess different strategies that may provide better process improvements, and to document any changes made while completing corrective action requirements.

7.2 EXISTING WWTP

A more detailed overview of the City's existing WWTP is provided in **Chapter 5**. The City's existing WWTP treats wastewater that is discharged to the Puget Sound in accordance with the requirements of the City's NPDES Waste Discharge Permit No. WA0024031 issued February 8, 2019, effective March 1, 2019, and expiring February 29, 2024. The WWTP NPDES Permit is provided in **Appendix F**.

The City's WWTP originally provided primary treatment, which consisted of a sewage grinder and bar screen, a primary clarifier, an outfall to Puget Sound, a sludge thickener, an incinerator, an operation building, and an office building. Numerous expansions have occurred since the plant was built in the 1960s. Today, the WWTP consists of primary treatment, secondary treatment, disinfection, and solids incineration, including the headworks and Main Plant Pump Station (MPPS).

7.2.1 Wastewater Flow and Loading

Current flows and loadings were analyzed to determine if the existing WWTP can provide adequate service to its existing customers. The projected flow and load analysis is used to identify if capacity is sufficient for future conditions. Historical flow values are summarized in **Table 7-2**.

Table 7-2
Historical WWTP Flow Summary (2015-2020)

Year	Sewer System Pop.	Sewer System Employees	AA Flow (MGD)	AA Flow per Capita per Day (ppcd)	MM Flow (MGD)	Max. Month Average Flow per Capita per Day (ppcd)	Percent of NPDES Permit Max. Month Limit	Flow MM/AA Peaking Factor
2015	39,900	29,233	4.17	105	5.91	148	80%	1.42
2016	40,108	29,233	4.47	112	6.22	155	84%	1.39
2017	40,483	29,233	4.60	114	6.24	154	84%	1.36
2018	41,060	29,233	4.32	105	6.14	150	83%	1.42
2019	42,093	29,233	4.04	96	5.01	119	68%	1.24
2020	42,093	29,233	4.20	100	5.98	142	81%	1.42
2015 to 2019 Average			**4.32**	**106**	**5.90**	**145**	**---**	**1.37**

Notes:
1) 2020 values are not included in the historical average due to the COVID pandemic.
2) Flow values are shown as reported in the City's DMRs.
3) Projected population, employee, and flow values were calculated by BHC (Tech Memo dated November 10, 2020).

Significant secondary treatment system improvements will be needed to meet the regulatory requirements for nitrogen reduction as a result of the PSNGP with the proposed seasonal average limit of 3 milligrams per liter (mg/L) from April 1st through October 31st. **Figure 7-1** shows the historical individual daily WWTP flow values on a year over year basis for comparison to the proposed seasonal TIN limit period. As seen in the chart, the months of April and October pose potentially higher flows driven by wet weather events, which would make a 3 mg/L effluent limit more difficult to meet during these periods.

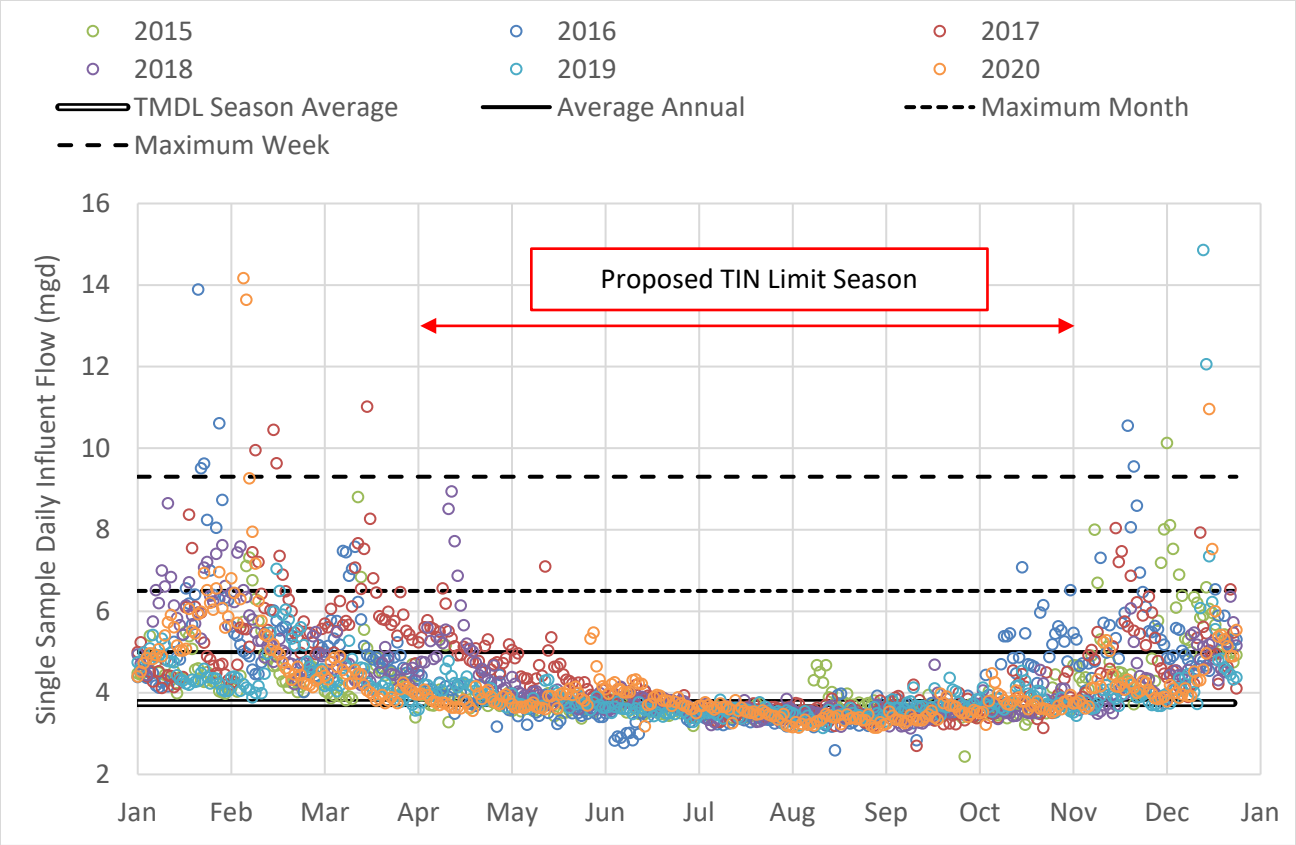

Figure 7-1
WWTP Daily Flow Values (2015-2020)

The WWTP experiences high peak flow events during periods of heavy precipitation due to high infiltration and inflow (I/I) into the collection system. During wet weather events, the WWTP has experienced peak hour flow events up to 20 MGD. For the purposes of planning preliminary treatment improvements, the Facility Plan conservatively projects future peak hour flows in excess of 20 MGD.

Historical loading trends for influent 5-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) were analyzed for the past 6 years (2015 through 2020) as shown in **Table 7-3** and **Table 7-4**. The onset of the COVID-19 pandemic significantly altered the population routines in the City, and as such, the loading data from 2020 is shown for informational purposes only.

Table 7-3
Historical WWTP Influent BOD5 Loading Summary

Year	Sewer System Pop.	Sewer System Employees	AA BOD_5 (mg/L)	AA BOD_5 (lb/d)	AA BOD_5 per Capita per Day (ppcd)	MM BOD_5 (mg/L)	MM BOD_5 (lb/d)	BOD_5 MM/AA Peaking Factor
2015	39,900	29,233	241	8,188	0.21	283	8,757	1.07
2016	40,108	29,233	241	8,510	0.21	293	9,211	1.08
2017	40,483	29,233	245	8,911	0.22	299	9,694	1.09
2018	41,060	29,233	249	8,632	0.21	296	9,336	1.08
2019	42,093	29,233	279	9,177	0.22	321	9,702	1.06
2020	42,093	29,233	259	8,675	0.21	313	9,630	1.11
2015 to 2019 Average			**251**	**8,684**	**0.21**	**298**	**9,340**	**1.08**

Notes:
1) 2020 values are not included in the historical average due to the COVID pandemic.
2) Population values established for 2019 also were used for 2020.
3) Employment values established for 2019 also were used for 2015 through 2020.

Table 7-4
Historical WWTP Influent TSS Loading Summary

Year	Sewer System Pop.	Sewer System Employees	AA TSS (mg/L)	AA TSS (lb/d)	AA TSS per Capita per Day (ppcd)	MM TSS (mg/L)	MM TSS (lb/d)	TSS MM/AA Peaking Factor
2015	39,900	29,233	212	7,175	0.18	249	7,740	1.08
2016	40,108	29,233	206	7,299	0.18	245	7,923	1.09
2017	40,483	29,233	206	7,512	0.19	252	7,958	1.06
2018	41,060	29,233	211	7,288	0.18	249	7,605	1.04
2019	42,093	29,233	227	7,452	0.18	265	7,998	1.07
2020	42,093	29,233	214	7,172	0.17	258	7,952	1.11
2015 to 2019 Average			**212**	**7,345**	**0.18**	**252**	**7,844**	**1.07**

Notes:
1) 2020 values are not included in the historical average due to the COVID pandemic.
2) Population values established for 2019 also were used for 2020.
3) Employment values established for 2019 also were used for 2015 through 2020.

From 2015 through 2020, annual average influent BOD_5 and TSS loadings show an overall moderate increase over this period. The WWTP currently has a permitted influent loading limit of 15,120 pounds per day (lb/d) for both BOD_5 and TSS per the NPDES Permit. This permit also stipulates that the

City shall submit a plan and schedule for continuing to maintain capacity when the loading reaches 85 percent or more of the permitted loading values for 3 consecutive months. Over the past 6 years, the City has not exceeded this planning threshold for BOD_5 or TSS.

Historical Nitrogen Loading Data

With the impending PSNGP requirements, the City began monitoring influent and effluent nitrogen in 2021. Average influent nitrogen concentration and loading values for 2021 are shown in **Table 7-5**.

Table 7-5
Lynnwood WWTP Influent Nitrogen Loading in 2021

Quarter of 2021	Avg Flow (MGD)	Avg NH_3 (mg/L)	Avg NO_2 + NO_3 (mg/L)	Avg TIN (mg/L)	Avg TIN (lb/d)	Avg TKN (mg/L)	Avg TKN (lb/d)
Q1	4.7	16.9	3.1	20.1	779	25.2	971
Q2	3.6	25.0	3.5	28.5	851	36.7	1,094
Q3	3.3	30.9	1.4	32.3	893	41.6	1,181
Q4	4.8	23.8	1.8	25.6	972	N/A	N/A

Notes:
1) NO_2 is nitrite and NO_3 is nitrate.

The influent data suggests that nitrogen enters the WWTP primarily in ammonia (NH_3) form. TIN, the sum of ammonia, nitrite, and nitrate forms of nitrogen, mostly consists of ammonia. Total Kjeldahl Nitrogen (TKN) (the sum of ammonia and organic nitrogen) consists primarily of ammonia, but the data also suggests that a significant fraction of organic nitrogen is present in the influent.

For reference, average effluent nitrogen concentration and loading values during 2021 are shown quarterly in **Table 7-6**.

Table 7-6
Lynnwood WWTP Effluent Nitrogen Loading in 2021

Quarter of 2021	Avg Flow (MGD)	Avg NH_3 (mg/L)	Avg NO_2 + NO_3 (mg/L)	Avg TIN (mg/L)	Avg TIN (lb/d)	Average TIN Reduction (%)
Q1	4.7	20.8	0.4	21.2	804.1	-3.0%
Q2	3.6	26.8	1.0	27.8	830.1	2.0%
Q3	3.3	21.4	3.6	25.0	691.8	23.0%
Q4	4.8	24.2	0.4	24.6	945.5	3.0%

The limited data suggests that nitrification does not reliably occur at the WWTP during cold weather months. During the warmest portion of the year, exhibited by Quarter 3, a significant drop in ammonia nitrogen occurs from influent to effluent. TIN also is reduced on average by 23 percent during this period, suggesting that some denitrification is occurring.

7.2.2 Projected Flow and Loading

Projected flow rates were estimated in **Chapter 4** and also in the Facility Plan. The slightly higher projections used in the Facility Plan for design loading are presented in **Table 7-7**, as these are more conservative for use in design criteria.

Table 7-7
Flow, BOD5, and TSS Loading Projections at WWTP

Population and Employment in Sewer Service Area					
	Existing (2019)	**Projected 2026**	**Projected 2030**	**Projected 2040**	**Projected 2050**
Population	42,093	49,696	53,951	64,771	74,431
Employees	29,233	32,317	32,257	45,242	49,882
Flow					
Annual Average Day (MGD)	4.1	5.2	5.5	6.4	7.0
Maximum Month Avg. Day (MGD)	5.0	6.7	7.0	8.1	8.9
BOD_5					
Annual Average Day (lb/d)	9,177	10,500	11,400	13,700	15,700
Concentration (mg/L)	*279*	*243*	*249*	*259*	*270*
Maximum Month Average Day (lb/d)	9,702	11,400	12,400	14,800	17,000
Concentration (mg/L)	*321*	*206*	*211*	*219*	*229*
TSS					
Annual Average Day (lb/d)	7,452	9,000	9,800	11,700	13,400
Concentration (mg/L)	*227*	*208*	*214*	*221*	*231*
Maximum Month Average Day (lb/d)	7,998	9,700	10,500	12,600	14,400
Concentration (mg/L)	*265*	*175*	*179*	*186*	*194*
TKN					
Annual Average Day (lb/d)	1,480	1,740	1,890	2,270	2,610
Concentration (mg/L)	*44*	*40*	*41*	*43*	*45*
Maximum Month Average Day (lb/d)	1,570	1,890	2,060	2,460	2,830
Concentration (mg/L)	*38*	*34*	*35*	*36*	*38*

Notes:
1) Highlighted values exceed the WWTP design criteria as listed in the NPDES Permit.
2) Projected population and employees were calculated by BHC (Tech Memo dated November 10, 2020).
3) All projected BOD and TSS loads have been rounded up to the nearest 100 pounds. TKN load values are rounded to the nearest 10 pounds.
4) All concentrations have been calculated from the flow and load values.
5) A conservative estimate of TKN is provided in this table based on a 6:1 ratio of influent BOD:TKN.

WWTP improvements are needed in the near term to expand and accommodate projected flow and loads. The maximum month flow is projected to exceed 85 percent of the design criteria listed in the NPDES by 2030 and 100 percent of the design criteria by 2040. The maximum month BOD_5 loading is projected to exceed 85 percent of the design criteria by 2040 and 100 percent of the design criteria by 2050.

7.3 EXISTING WWTP EVALUATION

The following subsections summarize the detailed analyses of the existing WWTP that were conducted for the Facility Plan, including analyses of the preliminary treatment, primary treatment, and secondary treatment systems.

7.3.1 Liquid Stream Evaluation

Preliminary Treatment

1. The influent pipe through Bertola Road is aging and should be evaluated for replacement where impacted by future improvements.
2. The location of the existing Parshall flume does not allow accurate influent flow measurement.
3. The existing headworks does not provide sufficient hydraulic capacity for projected peak flow conditions.
4. The existing headworks is undersized to provide sufficient space for mechanical equipment redundancy.
5. The mechanical equipment is aging and will require replacement during the planning period.

Primary Treatment

1. The primary clarifiers do not provide sufficient capacity to allow for redundancy during current or future peak flow conditions. If the WWTP remains as configured through the planning period, additional primary clarifier area or other improvements are necessary.
2. If the primary clarifier mechanisms are to remain in use through the planning period, budgeting for full replacement of the existing mechanisms is recommended. The City recently upgraded the three rectangular clarifiers in 2021-2022, and the improvements replaced the chains, rake mechanisms, and auger screws. The fourth, round clarifier was not upgraded as part of this project.

Bypass Overflow Structure and Primary Effluent

Flows above 14 MGD bypass secondary treatment due to the capacity limitations of the secondary treatment process. While this functions satisfactorily with the current permit conditions, to meet future nutrient limits, the secondary treatment system will need to treat all flow. The existing system is not expected to require improvements prior to the major secondary treatment system upgrade.

Main Plant Pump Station

The MPPS is not sufficiently sized to provide capacity for primary effluent flow higher than 14 MGD. While the MPPS functions satisfactorily with the current permit conditions, to meet future nutrient limits, the MPPS will need to be abandoned or reconfigured to allow all flow to be conveyed to the secondary treatment system. In the interim, the MPPS is not expected to require improvements prior to the major secondary treatment system upgrade.

Aeration Basins and Blowers

The future requirements for nitrogen reduction will require significant changes to the aeration basins and associated systems. In the near term, the remaining centrifugal blowers will be replaced with a combination of variable speed positive displacement screw blowers and turbo blowers in the existing Blower Room. This work is expected to be complete in 2023.

Secondary Clarifiers and RAS

1. Replace the older removable covers with aluminum Hallsten covers (to be handled as part of the WWTP operations and maintenance (O&M) program and budget and recommended to be performed by 2030).
2. Replace components for all four cross screw sludge collector mechanisms. The chains and flights were replaced as part of the 2019 Secondary Clarifier Repairs project; however, the existing cross collectors were not replaced as part of that project and are recommended to be handled as part of the WWTP O&M program and budget by 2026.

Secondary Effluent Disinfection System

1. The hydraulic and treatment capacity of the chlorine contact tank will be exceeded during the planning period, necessitating expansion or replacement of the existing effluent disinfection system.
2. Replacement of the automatic composite sampler will be necessary during the planning period and will be completed as part of the normal WWTP O&M program and budget.

Chlorination and Dechlorination Systems

The chlorination and dechlorination systems function satisfactorily and provide sufficient dosing capacity. However, the systems are aging, and if they are to be maintained for usage through the planning period, they should likely be upgraded to ensure reliability and improve safety. However, WWTP staff have expressed interest in other effluent disinfection systems to reduce the handling of chlorine at the WWTP.

Plant Effluent Outfall

As a condition of the NPDES Permit, the submerged outfall pipe must be inspected each permit cycle. The existing outfall pipe and diffuser were inspected on August 16, 2021, and the recommended repairs were completed on August 31, 2021. No major concerns are noted with the outfall at this time.

7.3.2 Solids Handling System Evaluation

Primary Sludge Conveyance

The primary sludge system is expected to be decommissioned or largely reconfigured as part of the future secondary treatment system improvements.

WAS Thickening

The waste activated sludge (WAS) thickening system is expected to be decommissioned or largely reconfigured as part of the future secondary treatment system improvements.

Dewatering

1. Replace the thickened sludge feed grinder, pumps (both), variable frequency drives (both), and flow meter (recommended to be performed by 2026).
2. Replace the dewatering system equipment and dewatered sludge conveyor (recommended to be performed between 2031 and 2040).
3. Analyze options and design improvements to replace the weight scales to provide accurate weight measurement of stored neat polymer (recommended to be performed by 2026).

Scum Concentrating

WWTP staff have determined through operation of the process that the scum collection basin, scum chopper pump, and scum concentrator do not have sufficient capacity. Improvements to this equipment are necessary to provide sufficient capacity and should include replacement of the scum hopper and concentrated scum pump.

Incineration System

Due to the historically high O&M costs associated with the incinerator and routine issues with meeting air quality standards, an analysis concluded that it is more cost effective for the City to suspend incineration and proceed with hauling of dewatered sludge until a new solids handling system can be constructed.

7.3.3 WWTP Site Considerations

An expansion of the WWTP will be necessary. The two most restrictive constraints for future expansion include the necessity to maintain existing WWTP operation during construction of new improvements and the physical constraints of the site that limit the developable area for new processes. **Figure 7-2** shows the approximate footprint of the only significant undeveloped area on the existing City property that could be used for expansion of WWTP processes while maintaining operation of the existing WWTP.

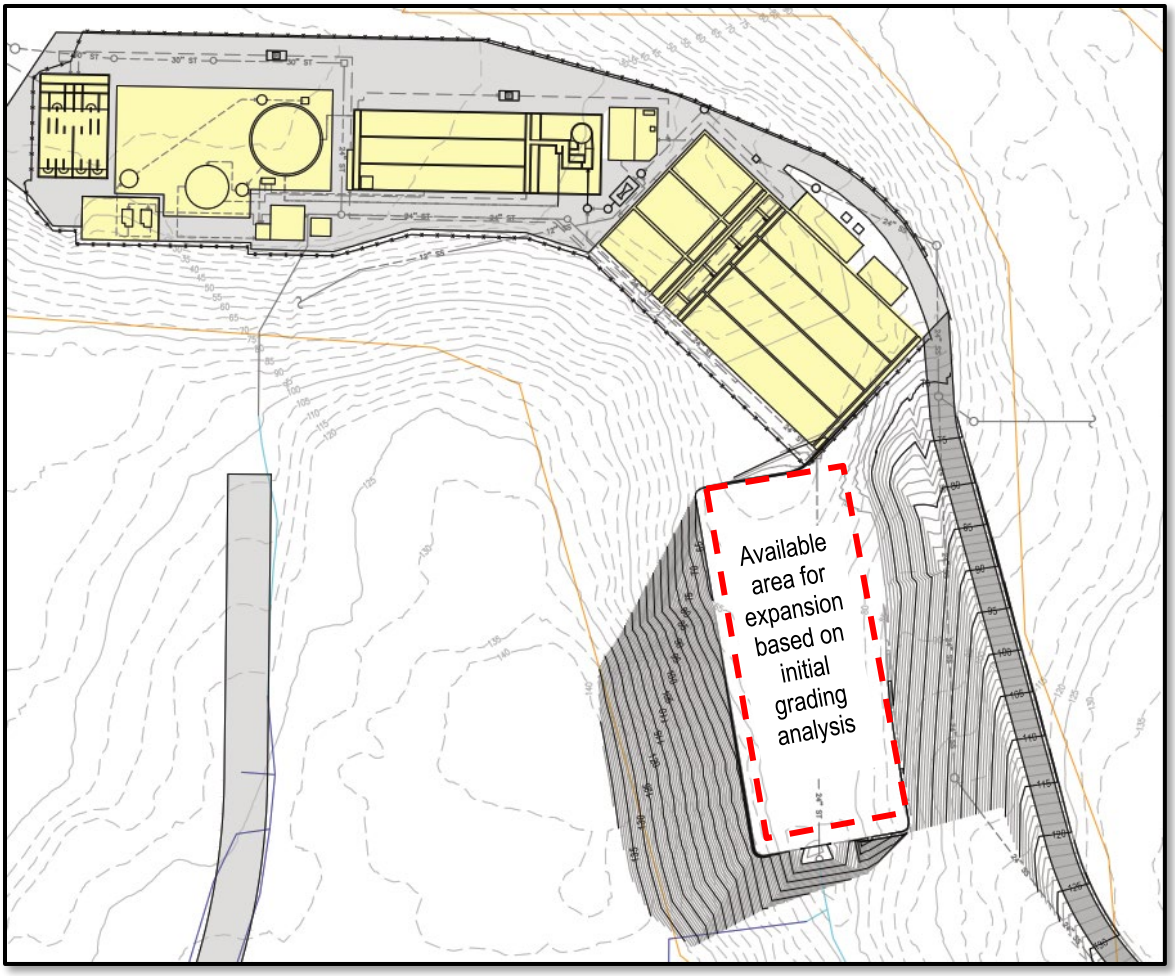

Figure 7-2
Approximate Footprint Available for Expansion Based on Preliminary Site Grading Analysis

7.4 WWTP ALTERNATIVES ANALYSES

The following WWTP alternatives are identified as feasible options to provide a facility that meets flow projections and future BOD_5 and TSS loading. This can be accomplished by expanding the existing WWTP, developing a new larger WWTP within City limits, or routing all City sewage to a large, regional WWTP offsite.

7.4.1 Alternative 1 – Existing WWTP Facility Plan Improvements

Alternative 1 consists of implementing the WWTP improvements identified in the Facility Plan, and summarized in this chapter, at the existing site to remedy deficiencies, expand processes to meet projected growth, and optimize treatment processes to comply with current effluent discharge regulations. These improvements should meet 2050 projection capacities and include the recommendations that follow. These improvements were evaluated based on the City's ability to meet the potential TIN reduction requirements of the PSNGP.

Preliminary Treatment

The existing headworks is limited in hydraulic capacity to pass future peak hour flow events. It is recommended a new headworks with mechanical screening and grit removal system redundancy is constructed uphill of the existing secondary clarifiers.

Influent metering will be necessary upstream of the proposed headworks location. Influent sewer pipe can be routed in a manner that dissipates energy from the influent and aligns the flow to allow for use of an open channel meter upstream of the screening channels, outside of the proposed Headworks Building.

The future screening system must be sized to pass the projected 2050 peak hour flow of approximately 30 MGD. The existing screening system consists of a single multi-rake screen with ¼-inch bar spacing with a capacity limitation of approximately 14 MGD. The City desires a higher level of screening with the future system in addition to the increased capacity. Two-dimensional perforated plate screening would provide significantly increased screenings removal compared to the current one-dimensional bar screen. A CFR-DAS system would be adequately protected by perforated plate screenings with 6 to 9 mm openings.

The existing grit removal system consists of a single 12-foot-diameter grit chamber, grit pump, and classifier. Similar to the screening system, the future grit removal system must provide significantly increased capacity, as well as redundancy in equipment. For the peak flows experienced at the City, vortex-style grit removal in concrete channels is a standard and proven approach to grit removal and is recommended.

Secondary Treatment

The analyses of the secondary treatment system are based on a PSNGP effluent TIN limit of 3 mg/L. Three technologies feasible for the WWTP were evaluated: integrated fixed film activated sludge (IFAS), membrane aerated biofilm reactor (MABR), and continuous flow reactor configured to achieve densified activated sludge (CFR-DAS). CFR-DAS was determined to have the lowest cost and the highest likelihood of success in achieving the future capacity needs and nutrient limits and is the recommended approach for mainstream secondary treatment at the WWTP.

Effluent Disinfection

The existing effluent disinfection system consists of a chlorine gas system and a liquid sodium bisulfate dechlorination system. The existing chlorination system is aging, and the City desires to change to an alternate disinfection system to avoid future use of chlorine gas, which bears high costs and risks associated with the transport, storage, and handling of a hazardous material. The City considered other disinfection alternatives and selected ultraviolet (UV) disinfection.

Solids Handling

The City considered five solids handling process alternatives: enhanced anaerobic digestion; vapor recompression drying; gasification; heat drying; and autothermal thermophilic aerobic digestion (ATAD). These alternatives were evaluated against capital cost, footprint, nutrient side stream, truck traffic, 30-year O&M cost, regulatory, proven technology, staffing, process complexity, carbon dioxide generation, and total energy use.

Vapor recompression drying and heat drying were scored the highest due to their relatively compact footprint, low truck traffic, and lowest capital costs. These two technologies warranted further in-depth evaluation reviewing specific equipment considering new criteria such as Inlet DS Concentration Sensitivity, Dewatering Requirement, and Pyrolysis Integration. Four manufacturers were considered for heat drying and one manufacturer was considered for vapor recompression drying. The Komline-Sanderson paddle wheel dryer was scored the highest due to its competitive capital and O&M costs, small footprint requirement, and minimal odor control requirements and is the recommended solids handling alternative. The total 2021 equipment cost for this recommended alternative is $7.9 million, with an annual 2021 O&M cost of $1.7 million, and a total 30-year life-cycle cost of $41.0 million. The recommended process, sized to meet the 2050 maximum month conditions with 85 percent uptime (310 days per year), will fit in the confined footprint at the site with fully redundant systems upstream of the dryer process.

Recommended Improvements

The recommended improvements for the City's WWTP include:

- Replacement of the existing preliminary treatment system with a new headworks located uphill from the existing secondary clarifiers;
- Removal of the primary treatment;
- New first and second stage aeration basins;
- Improvements to the existing aeration basins and secondary clarifiers;
- Replacement of the existing solids handling system with an indirect dryer system; and
- Replacement of the existing effluent chlorination system with a new UV disinfection system.

WWTP Upper Site Preparation

To accommodate a new headworks and additional aeration basins, the WWTP footprint will need to be expanded uphill. This will require significant clearing and grading, realignment of the existing access road and influent gravity sewer piping, and rerouting of Outfall Creek piping. The planning-level capital cost is estimated to be $19,360,000 in 2021 dollars.

Preliminary Treatment Improvements

The headworks infrastructure will be designed to provide capacity for the 2050 peak hour flow of 30 MGD. The proposed headworks will be housed in a two-floor concrete building. The proposed preliminary treatment improvements are designed to have complete redundancy at the 2050 peak hour flow condition. The screening system, grit chamber, screenings washer/compactors, grit pumps, and classifiers are all sized to handle this flow with identical equipment providing 100-percent online redundancy. The planning-level cost estimate for the planning, design, permitting, and construction of the future preliminary treatment system is estimated to be $26,482,000 in 2021 dollars.

Secondary Treatment Improvements

The secondary treatment improvements will remove the existing primary clarifiers and expand the aeration basin tankage, coupled with process control elements to facilitate CFR-DAS, and were determined to have the highest likelihood of meeting the 2050 capacity and TIN reduction requirements. The proposed secondary treatment system is expected to provide capacity for secondary treatment to conventional standards (BOD_5 and TSS) for the projected 2040 conditions and beyond.

A basic layout of the new secondary treatment system is shown in **Figure 7-3**, which shows two identical trains consisting of anaerobic (Ax), anoxic (Ax), and aerobic or oxic (Ox) zones in the first stage and activated sludge aeration basins and latter aerobic zones in the second stage basins. A swing (Sw) zone is also shown, which can be operated as aerobic or anoxic. The new headworks and the existing secondary clarifiers will be between the two stages of aeration basins. A new return activated sludge system will support the proposed secondary treatment system.

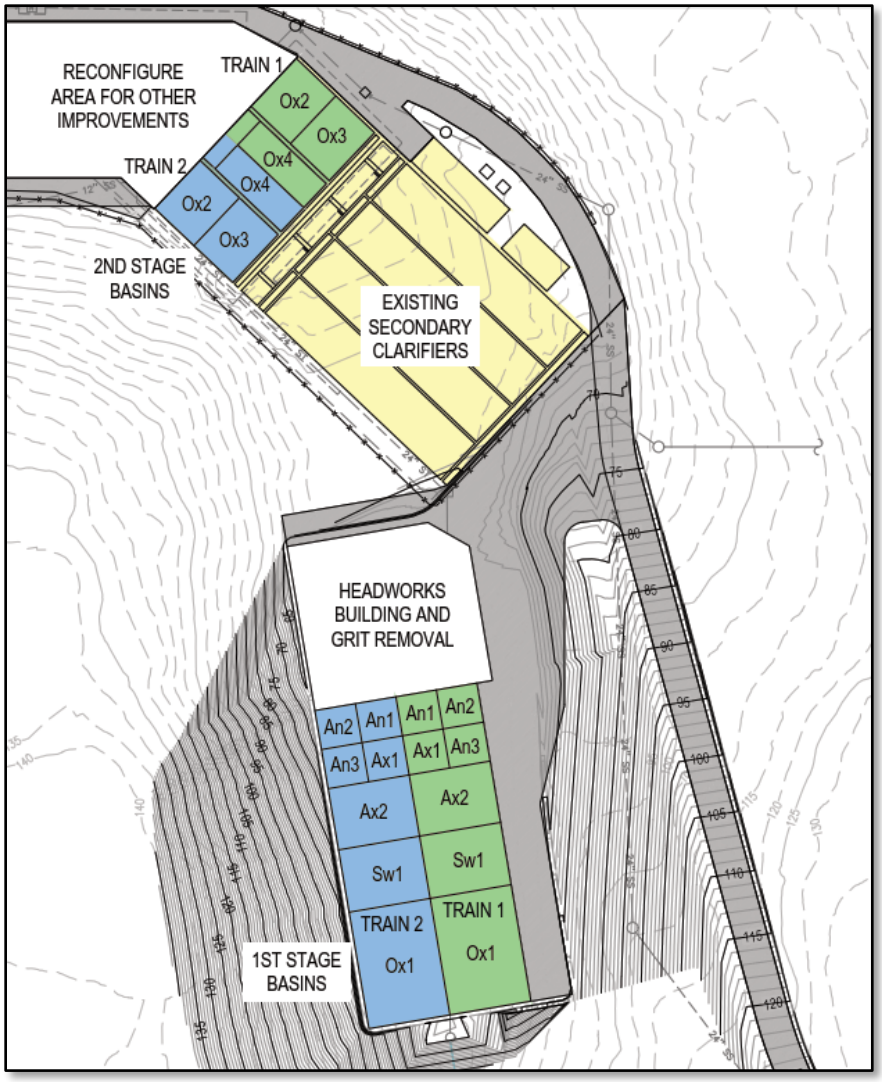

Figure 7-3
Proposed Secondary Treatment System

The planning-level cost estimate for the planning, design, permitting, and construction of the future secondary treatment system is estimated to be $88,080,000 in 2021 dollars.

Effluent Disinfection Improvements

Enclosed vessel UV disinfection was selected over open-channel UV disinfection since an enclosed vessel UV system has siting flexibility and can use the enclosure of the outfall system. The enclosed

UV disinfection system will be installed in either a new building or within a portion of an existing building. The UV disinfection system was sized to treat the projected 2050 peak hour flow of 30 MGD. The planning-level cost estimate for the planning, design, permitting, and construction of the future effluent disinfection system is estimated to be $10,478,000 in 2021 dollars.

Solids Handling Improvements

The existing solids handling system collects primary sludge from the primary clarifiers and blends it with thickened WAS from the secondary treatment system prior to dewatering. The primary sludge pumps were installed with the primary clarifiers in 1984. The primary sludge pumps, mixing manhole pumps, and dedicated control panels are all about 35 years of age, which is beyond the typical service life. In addition, the mixer is about 30 years old and will need replacing soon. As a result, the Facility Plan recommends decommissioning or largely reconfiguring the primary sludge system as part of the future secondary treatment system improvements described in more detail in the Facility Plan.

The solids handling improvements will accomplish the City's goals of fitting the new process onsite while meeting 2050 maximum month solids production. This process also will allow the City to minimize biosolids hauling truck traffic to 2 to 3 trucks per week by reliably producing 90-percent Class A biosolids. The Solids Handling Building is intended to be slab-on-grade with a metal frame and siding construction on two stories. The solids handling process is sized to account for 85 percent uptime while providing full redundancy for aerobic storage mixing/aeration, WAS thickening, and dewatering. The planning-level cost for the planning, design, permitting, and construction of the solids handling process is estimated to be $63,290,000 in 2021 dollars.

Total Planning-Level Cost Estimate

The total planning-level estimated capital cost for the recommended Facility Plan improvements is approximately $208 million in 2021 dollars, including Washington State sales tax. The improvements are recommended to be designed and constructed between 2024 and 2031. In addition, the Facility Plan recommends staffing 12.5 full-time employees (FTEs) for WWTP O&M once the expansion infrastructure has been constructed and is in operation.

7.4.2 Alternative No. 2 – Construct Replacement WWTP at New Site within the Lynnwood City Limits

Alternative 2 consists of finding and selecting a site within the City limits to construct a new WWTP to process the City's wastewater. In this alternative, the new WWTP would still convey the treated wastewater effluent to the Puget Sound through the City's existing Outfall No. 1. Based on the size of the existing WWTP and projected growth, this new WWTP site would need to be approximately 10 to 21 acres in size and would likely consist of an undetermined commercial or industrial site that the City could purchase or otherwise obtain for this purpose.

In addition to building the new WWTP facility to match existing treatment processes, meet future capacity projections, and meet or exceed PSNGP TIN reduction requirements, this alternative would require reconfiguring the existing sewage collection system to reroute the City's wastewater collection system to direct all flows towards this new WWTP location. This would be a massive undertaking and would include constructing new gravity sewer mains and/or redistributing existing gravity sewer mains and lift station flows to direct sewage towards the new WWTP site. The City also would need to reconfigure the existing collection system, lift stations, and sewer mains to convey treated sewage from the new WWTP site to the City's existing outfall to the Puget Sound.

Once the new site has been purchased, and the new WWTP has been constructed and is operational, the City would decommission the existing WWTP. This decommissioning process would require additional costs to remove all hazardous chemicals, salvage equipment and piping, and secure or demolish facilities to prevent unauthorized access.

The initial planning-level capital cost estimate for a new WWTP is estimated at $250 to $400 million, which does not include costs for land acquisition. Currently, there is no land owned by the City or vacant lots available in the acreage needed for the new plant. Costs for land acquisition are variable and subject to the market and the process the City uses to acquire the land; therefore, costs are not estimated at this time.

Additional costs associated with this alternative are any new sewer conveyance infrastructure (i.e., gravity main, force main, and lift stations) to redirect sewage flow to and from the new WWTP (initially conceptually estimated to range between $40M and $100M), as well as decommissioning of the existing WWTP (initially conceptually estimated up to $5M). For the new WWTP, it is assumed that the City will provide a similar staffing of 12.5 FTEs for O&M.

7.4.3 Alternative 3 – Regional Treatment

Alternative 3 consists of reconfiguring the City's wastewater collection system such that a regional facility (e.g., King County) treats and discharges the City's wastewater. Similar to Alternative 2, this alternative would include improvements to reconfigure the existing collection system and lift stations to flow to the regional facility instead of the City's existing WWTP. This alternative would also include costs to decommission the existing WWTP.

For estimating costs, it was assumed the City would contract with King County as the regional facility that would treat the City's wastewater. Currently, King County has a capacity charge per residential customer equivalent (RCE) per month of $70.39. This capacity charge is billed for 15 years, resulting in a cost of approximately $12,600 per RCE. Per BHC, the City's 2050 residential population is estimated at 74,431 people. If it is assumed that each connection consists of an average of 2.59 residents, the total cost for the City to connect all customers to this theoretical regional facility would total over $340 million in capacity charges alone.

In addition to the King County capacity charges, the City's rates to customers are expected to include additional increases for reconfiguring/upgrading the collection system (gravity and force mains, lift stations, etc.) for regional treatment.

King County's current charges do not reflect upgrades needed to comply with nitrogen reduction requirements, or capacity increases that would also be necessary. Other neighboring jurisdictions, such as Edmonds or Alderwood Water and Wastewater District, do not have sufficient capacity to take on all of the City's customers.

7.5 RECOMMENDED ALTERNATIVE

Based on a review of the alternatives presented in this chapter, it is recommended the City proceed with Alternative 1 and improve the existing WWTP onsite per the recommendations in the Facility Plan. Not only do these improvements have the lowest overall capital cost to meet projected growth and comply with current regulations, they also have the lowest impact to City customers. Expanding

the existing WWTP will not require the City to reconfigure collection system sewer main and lift stations, which would cause construction disruptions throughout the City.

Alternative 2 will require the City to acquire an additional, already improved, land site in a very built out area and results in higher overall costs; and Alternative 3 is unfeasible due to capacity and costs of connecting to other wastewater providers in the region. Both of these alternatives would have additional costs associated with decommissioning the existing WWTP. The cost and complexity of reconfiguring the sewer collection system also make Alternatives 2 and 3 not feasible, and it is recommended that the City continue to improve the existing WWTP onsite incrementally as outlined in the Facility Plan.

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Chapter 8 Operations and Maintenance

8.1 INTRODUCTION

The City of Lynnwood's (City) sewer system operations and maintenance (O&M) program consists of the following elements.

- Normal Operations
- Emergency Operations
- Preventive Maintenance

Additionally, the City owns and operates the Lynnwood Wastewater Treatment Plant (WWTP). Operation, maintenance, and staffing of this facility is described and evaluated in the City's WWTP Facility Plan. Operations and Maintenance information herein is limited to the sanitary sewer conveyance system – gravity piping, lift stations, and force mains; the WWTP is beyond the scope of this Chapter.

8.2 NORMAL OPERATIONS

8.2.1 City Personnel

The City's sewer system personnel are under the direction of the Deputy Director of Maintenance and Operations. As shown in **Figure 8-1**, the Deputy Director supervises the daily operations of the utility, including all water, wastewater, and stormwater operations. This position reports to the Director of Public Works.

The Sewer and Water Maintenance staff consists of several maintenance personnel that function under the Supervisor. The sewer system tasks that are performed by the O&M staff include inspection, testing, installation, and repair of system facilities, routine operation and preventive maintenance, recordkeeping, administrative tasks, general clerical work, and corrective or breakdown maintenance required in response to emergencies.

The City's Sewer and Water Maintenance division staff regularly work on both the sewer and water systems as shown on **Figure 8-1** and **Table 8-1**. However, there are two exceptions: Bob Williams, Pump Station Operator, works primarily on the sewer lift stations; and Wally Shaw, Utility Lead, primarily works on the water system facilities. This means that in the City's Sewer and Water Maintenance division there are 10 total staff, but only 7 staff members could work on the sewer system. However, many of these staff members are normally needed to address water system issues and are not available to support sewer system maintenance activities.

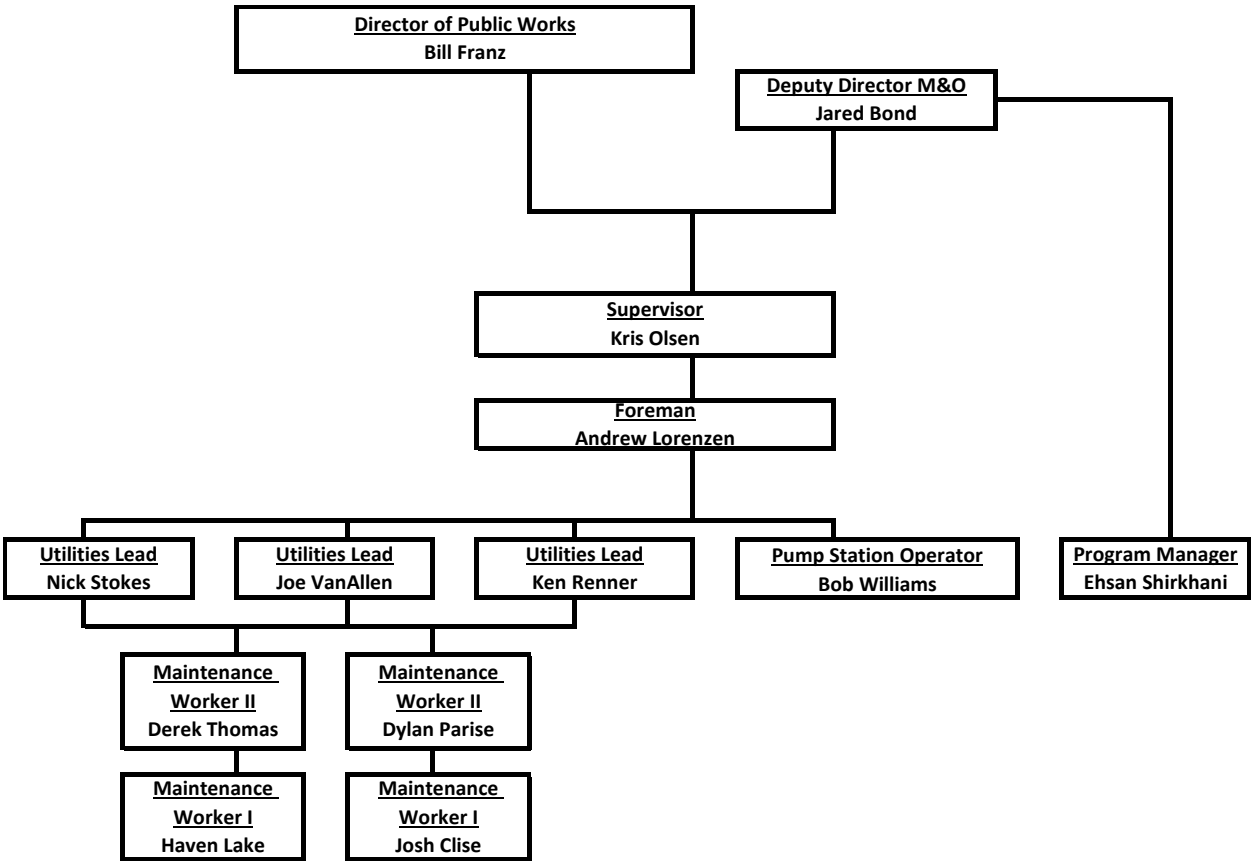

Figure 8-1
Sewer System Organization Chart

8.2.2 Personnel Responsibilities

The key responsibilities of the sewer O&M staff are summarized as follow.

Deputy Director – Directs all activities and programs within the water, sewer, and stormwater utilities.

Supervisor – The Supervisor is responsible for planning, organizing, staffing, and management activities within the Water and Sewer Maintenance division. For the sewer system, this position is responsible for the repair and maintenance of the sewer system, including gravity and force mains, and lift stations. Oversees all personnel issues, acts as the hiring manager, manages time cards, and plans long-range work. The Supervisor also ensures that any required public notifications regarding the sewer system are made and may serve as the press contact.

Foreman – The Foreman is responsible for overseeing daily operations, planning daily work, and dealing with day-to-day issues regarding personnel or customers. The Foreman also ensures that crews have the supplies and equipment they need to complete their work.

Utilities Lead – Reports to the Foreman and is responsible for all maintenance activities associated with the sewer collection system. This position leads crews in the field to complete assigned work, plans on-site job execution, and assigns equipment to his/her individual team members. As needed, this position also is responsible for utility locate requests.

Pump Station Operator – The Pump Station Operator is responsible for routine, daily checks and performing critical maintenance on the City's sewer lift stations. The Pump Station Operator also recommends improvements, where needed.

Program Manager – Currently referred to as the Project Manager, under the direction of the Deputy Director, the Program Manager oversees assigned annual capital projects, develops project schedules and scopes of work, and facilitates selection of consultants. The Program Manager also tracks progress through the development of plans, specifications, and estimates. This position coordinates bidding and contract execution, reviews and approves submittals, issues progress reports and pay estimates, and facilitates construction management/inspection and project closeout. The Program Manager oversees maintenance of the wastewater collection system model.

Maintenance Worker II – Reports to the Utilities Lead and is responsible for running pertinent equipment and executing assigned work as part of the crew. The Maintenance Worker II also requires a Class A Commercial Driver's License (CDL) to operate larger fleet vehicles.

Maintenance Worker I – This position is considered an entry level position. The Maintenance Worker I reports to the Utilities Lead and is responsible for executing assigned work as part of the crew while learning the proper techniques and required skills to operate safely. This position is responsible for maintenance activities like sewer main jetting.

8.2.3 Staff Certification

Table 8-1 shows the current certifications of the City's wastewater O&M staff. It is City policy to maintain a well-qualified, technically trained staff. The City annually allocates funds for personnel training, certification, and membership in professional organizations. The City believes that the time and money invested in training, certification, and professional organizations are repaid many times in improved safety, skills, and confidence.

Table 8-1
Staff Certification

Name	Position	Certification
Jared Bond	Deputy Director	WDM 4
Kris Olsen	Supervisor	WDM 3, CCCS
Andrew Lorenzen	Foreman	WDM 1
Bob Williams	Pump Station Operator	None
Ken Renner	Utilities Lead	None
Nick Stokes	Utilities Lead	WDM 2, CCCS
Joe VanAllen	Utilities Lead	WDM 2, CCCS, BAT, WWCS 2
Dylan Parise	Maintenance Worker II	WDM 1
Derek Thomas	Maintenance Worker II	WDM 1
Josh Clise	Maintenance Worker I	WDM 1
Haven Lake	Maintenance Worker I	WDM 1

WDM - Water Distribution Manager
WDS - Water Distribution Specialist
CCS - Cross-Connection Control Specialist
BAT - Backflow Assembly Tester
WWCS - Wastewater Control Specialist

8.2.4 Available Equipment

The wastewater department has several types of equipment available for daily routine O&M of the wastewater system. The equipment is stored at the Lynnwood O&M Center (LOMC). If additional equipment is required for specific projects, the City will rent or contract with a local contractor for the services needed. A stock of supplies in sufficient quantities for normal system O&M and anticipated emergencies is stored at the LOMC. A list of major equipment and chemicals used in the normal operation of the wastewater system can be found in the LOMC operational logs.

8.2.5 Service, Equipment, and Supply Vendors

The list in identifies the typical vendors for service, materials, and supplies. The City maintains adequate supplies and materials for normal operation. The suppliers are local and maintain adequate materials for unusual needs.

8.2.6 Routine Operations

Routine operations involve the analysis, formulation, and implementation of procedures to ensure the facilities are functioning efficiently and meeting the demands of the system. The sewer utility does not currently have the staff to adequately support routine operations; therefore, staff are limited to addressing mostly emergency responses/repairs and problem areas on a monthly basis.

8.2.7 Continuity of Service

As a municipality, the City has the structure, stability, authority, and responsibility to ensure that sewer service will be continuous. For example, changes in the City Council or staff would not have a pronounced effect on the City's customers or quality of service. The City has business continuity plans in place to support core processes within the conveyance and treatment systems in times of emergencies, such as a pandemic.

8.2.8 Operations and Maintenance Records

Facilities Operations and Maintenance Manuals

O&M manuals are available for staff members' reference. These manuals are kept on file at the LOMC. The City intends to maintain its policies of requiring complete O&M manuals for all new equipment and facilities.

Mapping and As-built Drawing Records

As-built records are essential to maintenance crews, City planners, engineers, developers, and anyone else needing to know how the wastewater system is laid out throughout the City. The drawing records are stored in files at the City Clerk's office and/or the LOMC.

Operations and Maintenance Records

Records are stored at the LOMC or in the City's Cartegraph database for the following items:

- Pump motor tests.
- Wastewater flow records.
- Wastewater system maintenance.
- Sewer collection notes.
- Side sewer connections.
- Sewer main cleaning/inspection.

8.2.9 Safety Procedures and Equipment

Safety is the concern and responsibility of all sewer O&M staff. To maintain the highest level of safety, the City actively educates and trains employees as to safe working procedures. The City's Safety Officer, Curt Russell, develops, supervises, implements, and administers the employee occupational safety, health, testing, and training program. Programs include Confined Space Entry, Control of Hazardous Energy, Accident Prevention Plan, Excavation and Trenching Plan, and a Hazard Communication Program. Safety equipment and other resources are always available to employees. The City is fully dedicated to providing a safe and secure work environment for each of its employees.

The following procedures are to be followed for O&M tasks that involve the most common potential work place hazards in the City's sewer system.

Working in Confined Spaces

Standard Procedure – Follow state requirements for confined space entry.

Working Around Heavy Equipment

Standard Procedure – Obtain proper training and follow all safety procedures. Use noise protection equipment and follow standard Labor and Industries (L&I) safety procedures.

Working in Traffic Areas

Standard Procedure – Wear proper clothing and provide adequate signage and flagging for work area. Follow standard Washington State Department of Transportation and L&I safety procedures. Certified flaggers are to be used when traffic management requires flagging around a work site.

Working on or Around Tall or Deep Structures

Standard Procedure – Follow proper safety harness procedures for working on tall or deep structures and follow standard L&I safety procedures.

Working in or Around Pump Stations

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

Personal Protection Equipment

Standard Procedure – Wear all appropriate safety gear for the work activity.

Blood Borne Pathogen and Infectious Disease Control Training

Standard Procedure – Training and practice techniques to eliminate exposure and how to report exposure.

Self-Contained Breathing Apparatus Training

Standard Procedure – Fit test and training on how to use self-contained breathing apparatus.

Control of Hazardous Energy Training

Standard Procedure – Training and practice techniques to control hazardous energy.

Powered Industrial Lift Truck Training

Standard Procedure – Training and practice procedures to maintain safe operation.

General Safety Awareness Training

Standard Procedure – Safety talks on all subjects.

Working on Asbestos Cement (AC) Pipe

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

Sewer utility personnel are required to take recurrent training courses regarding the following topics: confined spaces; fall protection; competent persons; heavy equipment operation; CPR; first aid; traffic flagging; lockout-tagout; and blood-borne pathogens.

The City's facilities are equipped with confined space entry equipment and lockout-tagout equipment. Each City vehicle is equipped with first aid and blood-borne handling kits. The utility also owns flagging signs and equipment for safe operations in traffic. The City also owns two oxygen-gas detectors for staff use.

The Public Works 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:

- Chapter 296-809 Washington Administrative Code (WAC) – Confined spaces.
- WAC 296-155-650 to 66411 Part N – Excavation, trenching, and shoring.
- WAC 296-155-429 – Lockout-tagout for work on energized or de-energized equipment or circuits.
- Chapter 296-880 WAC – Unified safety standards for fall protection.
- *Manual on Uniform Traffic Control Devices* – Traffic control for work in the public right-of-way.

8.3 EMERGENCY OPERATIONS

8.3.1 Capabilities

The City is well equipped to accommodate short-term system failures and abnormalities. The City's capabilities are as follows.

Emergency Equipment

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

Emergency Telephone

Key or on-call personnel can be reached by calling the City's Public Works Department at (425) 329-6205. If an emergency occurs outside of normal working hours, the after-hours service contacts the Public Works on-call person. This person checks the emergency situation and calls the necessary crew to respond and resolve the situation.

On-call Personnel

The on-call "Person-In-Charge" (PIC) is equipped with a service vehicle and required to respond to a call within 30 minutes. A list of emergency telephone numbers is provided to each on-call employee. New employees are not placed on-call until they are familiar with the systems and maintenance procedures and are properly certified as may be required.

<u>Contacts</u>

The City maintains a list of utility and agency contacts for routine and emergency use as shown in **Table 8-2**.

Table 8-2
Utility and Agency Contacts

Agency	Contact	Phone
Utility Contact		
Puget Sound Energy	On-Call	888-225-5773
City of Lynnwood Public Works Department		425-670-5200
City of Lynnwood WWTP		425-670-6272
Agency Contacts		
Puget Sound Energy		
Puget Sound Clean Air	Main Number	206-343-8800
Seattle/King County Public Health	Compliance Hotline	206-263-8255
Ecology NW Regional Office	Main Number	425-649-7000
Ecology NW Region Biosolids Coordinator	Coordinator	360-791-4755

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 are adequate for most common emergencies that can reasonably be anticipated. The City 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. Additionally, the City has been provided with after-hours emergency contact phone numbers for key material suppliers, which gives the City 24-hour access to parts not kept in inventory.

8.4 PREVENTIVE MAINTENANCE

Maintenance schedules that meet or exceed the manufacturer's recommendations have been established for all critical components in the sewer system. The following schedule is used as a minimum for preventive maintenance, and manufacturers' recommendations should be followed where conflicts exist. The following tables describe the level of preventative maintenance the City should be performing based on the City's *Operations and Maintenance Manual* contained in **Appendix J**. The City cannot currently provide the desired level of service due to staffing limitations.

8.4.1 Sewer Collection System

Frequency	*Task or Activity*
Monthly	Clean sewer mains near Alderwood Mall, Lift Station 8, 196th St SW and 44th Ave W, 60th Ave W between approximately 188th St SW and 196th St SW, and other areas identified on Figure 8-2 with known fats, oils, and grease (FOG) and trash problems. Sewer main jetting depending on location.
Every 6 Months to 1 Year	Flush all difficult access sewer mains depending on location. Sewer lines included in these additional "hot spot" cleaning activities are selected based on historical maintenance logs, operator experience, and sewer main video inspection results.
Annually	Inspect all manholes in easements. Inspect, rod, and clean sewer lines with known root intrusion and/or FOG problems. Sewer main jetting depending on location.
Annually	Inspect all manholes and repair as needed.
Every 3 Years	Clean entire sewer collection system.
Every 10 years	Video inspect all sewer mains on a rotating basis. Perform routine sewer main maintenance and repairs based on video inspections.

8.4.2 Sewage Lift Stations

Frequency	*Task or Activity*
Daily	Receive and analyze telemetry readings.
Weekly	Evaluate pump station reports. Clean Lift Stations. Clean rag racks.
Weekly/As Needed	Change motor oil. Perform routine maintenance of lift station structures and surrounding site.
Monthly	Change filters, clean probes, clean priming tanks, and run vibration tests. Clean smaller lift stations.
Annually/As Needed	Clean all lift station wet wells.
As Needed	Take inventory of parts, pumps, and motors.

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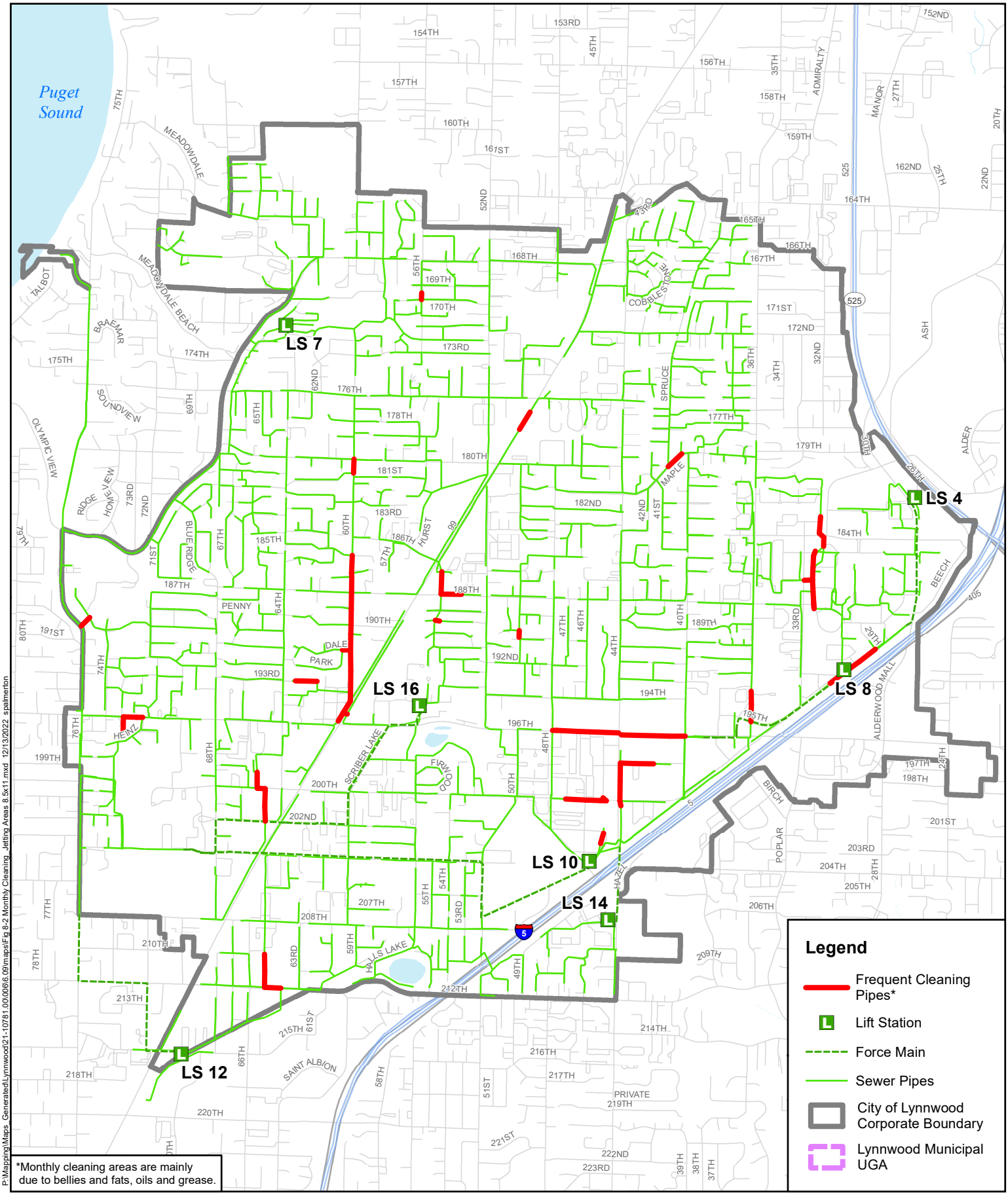

*Monthly cleaning areas are mainly due to bellies and fats, oils and grease.

P:\Mapping\Maps_Generated\Lynnwood\21-10781.00\006\6.09\maps\Fig 8-2 Monthly Cleaning_Jetting Areas 8.5x11.mxd 12/13/2022 spalmerton

This map is a geographic representation based on information available. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

bhc CONSULTANTS

0 1,250 2,500 Feet

N

LYNNWOOD WASHINGTON

Monthly Cleaning/ Jetting Areas

Sewer Comprehensive Plan
City of Lynnwood
January 2023

Figure **8-2**

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8.4.3 Engine Generator Sets

Note: The City contracts with a service company to conduct maintenance on the generators at the lift stations and the portable generator. Additionally, monthly generator exercise is performed by City personnel.

Frequency	*Task or Activity*
Bi-Monthly	Exercise generators under load.
Bi-Annually	Perform generator load tests.
Bi-Annually/As Needed	Replace fluids and filters in accordance with manufacturer's recommendations (or more frequently depending on amount of use).
Bi-Annually/As Needed	Perform tune-up; replace parts as necessary.
As Needed	Perform routine maintenance in accordance with manufacturer's recommendations.

8.4.4 Telemetry and Control System

Frequency	*Task or Activity*
Daily	Backup program and data.
As Needed	Visually inspect cabinets and panels for damage, dust, and debris.
As Needed	Inspect inside of cabinets and panels for damage, dust, and debris.
As Needed	Vacuum clean all modules.
As Needed	Test alarm indicator units.
As Needed	Clean and flush all pressure sensitive devices.
As Needed	Visually inspect all meters to coordinate remote stations.
As Needed	Check master and remote telemetry units for proper operation; repair as necessary.

8.4.5 Tools and Equipment

Frequency	*Task or Activity*
Rolling Stock	
Weekly	Check all fluid levels and brakes. Fluid levels and brakes are checked each time the equipment is used if less than weekly.
As Needed	Replace fluids and filters in accordance with manufacturer's recommendations (or more frequently depending on type of use); perform preventive maintenance per manufacturer's recommendations.

Frequency	Task or Activity
Tools	
As Needed	Clean after each use; lubricate and maintain as necessary; inspect for damage and wear before each use; perform preventive maintenance per manufacturer's recommendation.

8.5 STAFFING

The City's intended preventive maintenance procedures, as well as the intended normal and emergency operations of the utility, are described in the previous sections. The hours of labor and supervisory activity required to effectively provide these ongoing O&M schedules form the basis for determining adequate staffing levels.

8.5.1 Current Staff

As previously indicated, the City's Wastewater Division staff currently includes 13 personnel assigned to the operation and maintenance of the sewer system. The staff is made up of supervisory personnel and utility workers as shown in **Figure 8-1**.

8.5.2 Staffing Requirements

The estimated number of staff and hours of work recommended to provide optimum operation and maintenance of the sewer system is shown in **Table 8-3**. This table identifies the typical staffing time for maintenance tasks, operational tasks, capital improvements tasks, and construction of sewer collection system facilities as presented in Water Pollution Control Federation Manual of Practice No. 7, *Operation and Maintenance of Wastewater Collection Systems*. **Table 8-3** does not include some of the staff that are needed to operate a sewer system, such as clerks and construction inspectors, due to assistance the Wastewater Division receives from other divisions and departments. Staff titles shown in parentheses in **Table 8-3** represent the staff titles used by the City to describe those positions identified in the Water Pollution Control Federation Manual of Practice No. 7, *Operation and Maintenance of Wastewater Collection Systems*. The recommended number of labor hours and full-time equivalent staff (FTE) shown in **Table 8-3** are interpolated from the values provided in Water Pollution Control Federation Manual of Practice No. 7, *Operation and Maintenance of Wastewater Collection Systems* using the City's sewer service area population.

Table 8-3
Sewer Staffing Recommendation

Population	39,118			25,000	50,000	39,118		25,000	50,000
Occupational Title (Lynnwood Corresponding Job Title)	**City's Existing Wastewater Division Full-Time Equivalent Staff (FTE)**	**City's Existing Wastewater Division Staff**	**Recommended Number of FTEs**			**City's Existing Wastewater Division Labor Hours**	**Recommended Labor Hours per Week[1]**		
Superintendent (Supervisor)[1]	0.5	1	0.8	*0.5*	*1.0*	20	31	*20*	*40*
Foreman (Foreman)[1]	0.5	1	0.6	-	*1.0*	20	23	-	*40*
Lead (Utilities Lead)[1]	1.5	3	0.8	*0.5*	*1.0*	60	31	*20*	*40*
Senior Maintenance (Maintenance Worker II)[1]	1.0	2	0.8	*0.5*	*1.0*	40	31	*20*	*40*
Utility Workers (Maintenance Worker I)[1]	1.0	2	2.3	*1.5*	*3.0*	40	94	*60*	*120*
Maintenance Equipment Operator	-	-	1.6	*1.0*	*2.0*	-	63	*40*	*80*
Construction Equipment Operator	-	-	0.8	*0.5*	*1.0*	-	31	*20*	*40*
Laborer	-	-	1.6	*1.0*	*2.0*	-	63	*40*	*80*
Maintenance Mechanic II (Pump Station Operator)[2]	1.0	1	0.5	-	-	40	19	-	-
Maintenance Mechanic I[3]	-	-	0.5	-	-	-	19	-	-
Maintenance Mechanic Helper[3]	-	-	0.5	-	-	-	19	-	-
Pretreatment Technician	-	-	-	-	-	-	-	-	-
Total FTEs[4]	**5.5**	**10**	**10.6**	***5.5***	***12.0***	**220**	**423**	***220***	***480***

Notes:
1) Recommended number of staff and labor hours per week are interpolated from information provided by Water Pollution Control Federation Manual of Practice No. 7 "Operations and Maintenance of Wastewater Collection Systems." Supervisor referred to as Superintendent, Foreman referred to as Maintenance Supervisor, Lead referred to as Foreman and Utility Leads, Maintenance Worker II referred to as Maintenance II and Mason II, Maintenance Worker I referred to as Maintenance I and Mason I, and Pump Station Operator referred to as Maintenance Mechanic II in Water Pollution Control Federation Manual of Practice No. 7 "Operations and Maintenance of Wastewater Collection Systems."
2) Multiply number of lift stations maintained by 2.67 to approximate number of labor hours per week recommended. The City has seven lift stations that it maintains.
3) Multiply number of lift station visits per week by 2.67 to approximate number of labor hours per week recommended. The City has seven lift stations that it visits each week for maintenance.
4) Some time for FTEs, such as clerks and construction inspectors, have been omitted from this list due to support the Wastewater Division receives from other divisions and departments.

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Based on the suggested staffing requirements in **Table 8-3**, approximately 10.6 full-time staff equivalents (approximately 423 labor hours) are recommended to operate and maintain the City's sewer system. However, the City is only able to dedicate approximately 5.5 full-time staff equivalents (approximately 220 labor hours, excluding the Deputy Director) to the operation and maintenance of the sewer system, which is not sufficient to provide the optimum level of service. At the current staffing level, the City is capable of adequately operating the sewer system and complying with the minimum requirements of the Washington State Department of Ecology. Approximately 5.1 additional full-time staff equivalents (approximately 203 labor hours) would achieve optimum operation and maintenance of the sewer system. The City will add staff in the future, as necessary and as allowed by the budget, to meet the increasing requirements of system O&M due to customer growth and increased regulatory requirements.

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Chapter 9 Capital Improvement Program

9.1 BACKGROUND

The City of Lynnwood's (City) Capital Improvement Program (CIP) incorporates recommended improvements identified through the **Chapter 6 Conveyance System Evaluation, Chapter 7 WWTP Program,** and **Appendix A Facility Plan**. The following chapter provides a brief description of the basis of the cost estimates and assumptions used, planned improvement projects, and the funding sources utilized for the CIP.

9.2 OPINION OF PROBABLE CONSTRUCTION AND PROJECT COST

The opinions of probable costs presented within this wastewater plan are planning-level opinions. Contingencies range from 20 percent to 50 percent based on preliminary risk assessment for different projects. Detailed opinion of probable project costs and one-page project overview summaries are presented in **Appendix E**.

9.3 CAPITAL IMPROVEMENT PROGRAM

A summary of the projects included in the CIP is provided in **Section 9.3.1** and **Section 9.3.2** below. Projects are organized under the 6-year and long-term planning horizons. Locations of each project are shown on **Figure 9-1**; a short summary of each project is provided below with additional details in **Appendix E**; recommended implementation of a 6-year CIP is provided in **Table 9-1**. Timing of when many of these projects are implemented will depend on the rate of development within the City's service area and based on updated budgeting and prioritization analyses from the City that occur after this Sewer Comprehensive Plan Update (Plan).

9.3.1 6-Year Capital Improvement Program

Proposed capital projects are organized by WWTP ('W' Projects), Gravity and Force Main Conveyance ('C' Projects), Lift Station ('L' Projects) and administrative or study projects ('S' Projects). The following provide individual project summaries of the projects identified in the 6-year CIP:

Conveyance Projects

The following provide individual project summaries of the projects identified in the 6-year CIP.

<u>Project C-1: Scriber Creek Corridor Sewer Main Improvements</u>

The Scriber Creek Sewer Main was constructed using older construction techniques and is under-sized during peak flow events. The sewer is likely subject to high inflow and infiltration due to its age and proximity to Scriber Creek. This project involves gravity sewer replacement of the Scriber Creek Sewer Main from LS-16 to near Highway 99. Sizing for the new sewer main should be 21-inches to meet future capacity needs. Preliminary design is advisable for this project to assess alternative routing options and to assess environmental permitting associated with any work around Scriber Creek.

Project C-2: 60th Avenue West Sewer Main Improvements – 176th St SW to Highway 99

The current gravity main along 60th Avenue West was constructed with nearly flat-slopes and is nearing its life expectancy. The City commits considerable resources to cleaning this gravity main, particularly at the downstream sections. Further, the sewer main is under-sized based on City level of service criteria. Model results indicated sizing for the new sewer main should be 10-inches to meet future capacity needs. However, there are relatively small cost differences between installation of a 12-inch and 10-inch gravity sewer at similar depths. A 12-inch upsize is currently planned, based on City input, from MH 4-1 to MH 4-72. Modeling indicates larger pipe is necessary to MH 4-79, which is less than the extent currently identified. The City could consider phasing, reducing or altering the scope of this project if cost reductions are necessary. For example, the project could stop at MH 4-79 as the northernmost extent. Or the pipe north of MH 4-79 could be rehabilitated through cured-in-place-piping or pipe bursting methodologies.

Project C-3: 48th Avenue West Sewer Main Improvements – Phase 2

The sanitary sewer main in 48th Avenue West is undersized. Phase 1 of this project replaced the existing sanitary sewer with 18-inch PVC sewer main from the Scriber Creek Trail to north of 200th Street SW. An 18-inch pipe was also extended north-south through 196th Street SW as part of the 196th Street Sewer Improvements project. Phase 2 of this project calls for upsizing and replacement of the sewer main along 48th Avenue West, just north of 200th Street SW up to 194th Street SW. The sewer main should be designed at a minimum of 18-inches to meet future capacity needs. Depending on City preference and budget allowances, this project could also be combined with the pipe upgrades on 194th Street SW (see project C-7).

Project C-4: 52nd Avenue West Sewer Main Reroute

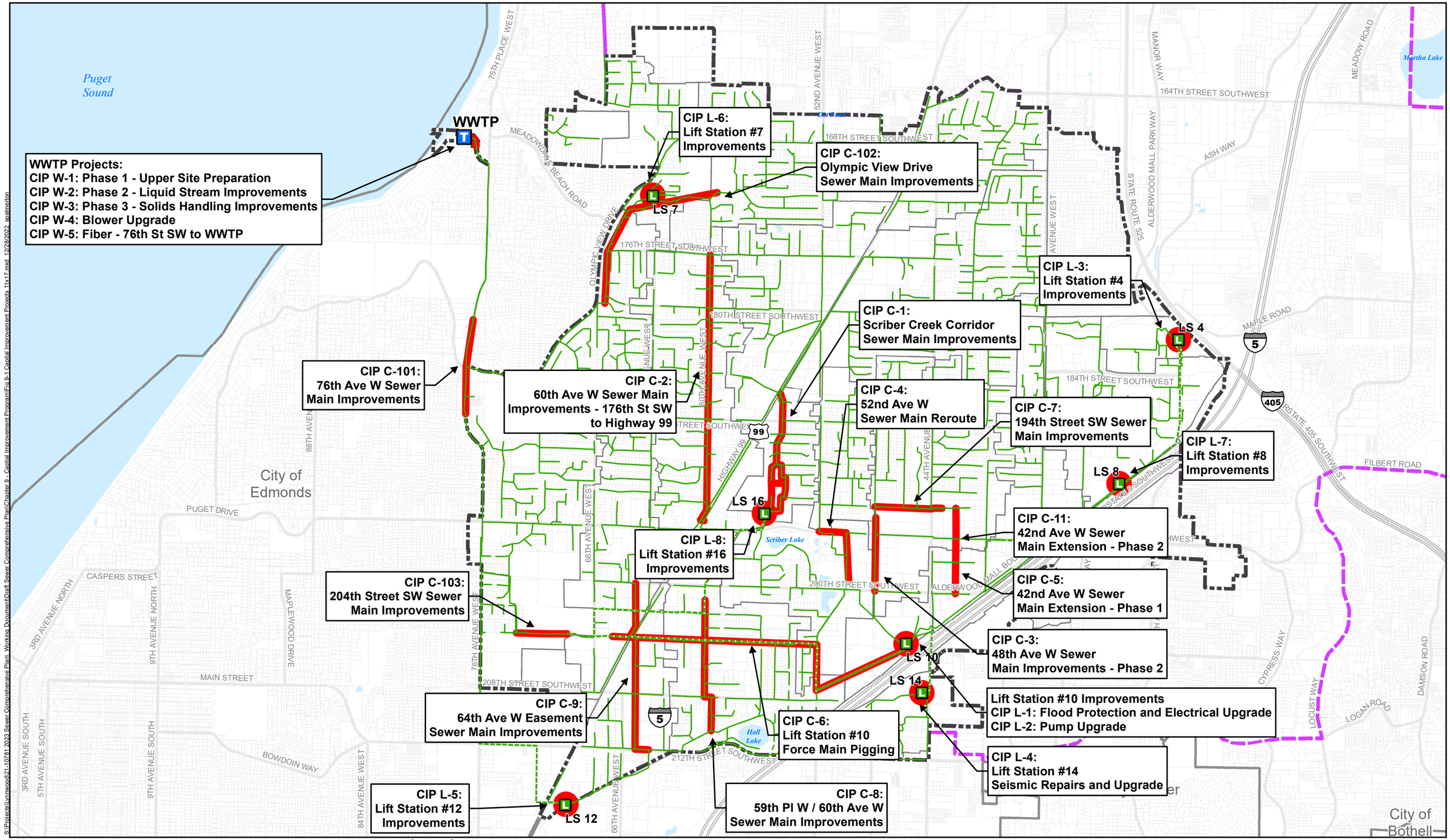
During peak flow events, surcharging occurs in the sanitary sewer near 52nd Avenue West and 196th Street SW. The primary surcharge location is at SSMH 5-125, which is in the intersection of 52nd Avenue West and 196th Street SW. Downstream of SSMH 5-125, the sewer traverses a private property easement (formerly known as the 'Wight Property'). The sanitary sewer is deep and installed at low slopes through the easement. The City continues to analyze this area for possible solutions. This project, as proposed, would upsize and replace the existing sanitary sewer from SSMH 5-115 to SSMH 5-125. A new 12-inch sanitary sewer main will be extended north along 50th Avenue West and west along 196th Street SW; and the pipe between SSMH 5-123 and SSMH 5-125 will be upsized or replaced with 12-inch main. A construction feasibility analysis is currently underway to evaluate constructability and the particular impact and risk of deep installations, associated with this reroute.

Project C-5: 42nd Avenue West Sewer Main Extension – Phase 1

The City is planning for a new roadway extension along 42nd Avenue West between Alderwood Mall Blvd and 194th Street SW. Phase 1 of the project will construct a new roadway between Alderwood Mall Blvd and 196th Street SW. The City will install a new sanitary sewer main to support the 42nd Avenue West extension. Sizing calls for a minimum 12-inch diameter sanitary sewer main. The 42nd Avenue West extension, including utility improvements, is currently in preliminary design.

Project C-6: LS #10 Force Main Pigging

LS #10 is currently pumping below theoretical capacity. Additional capacity will be required from the station to accommodate future development in City Center. It is believed that the lower pumping capacity could be due to sediment buildup in the force main. This project will facilitate cleaning the pipeline via pigging and includes the possible installation of additional force main access points that may be required due to the pipeline length and geometry. Following the project, the lift station capacity should be reassessed to evaluate the resulting change in pumping capacity.



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Legend

- WWTP
- Lift Station
- Force Main
- Sewer Pipes
- Conveyance CIP
- Lift Station CIP
- City of Lynnwood Corporate Boundary
- Lynnwood Municipal UGA
- Other City Boundaries

N

Sewer System: City of Lynnwood.
GIS Base Data: Snohomish County
This map is a geographic representation based on information available. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

0 1,500 3,000 Feet

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LYNNWOOD WASHINGTON

Capital Improvement Projects
City of Lynnwood
Sewer Comprehensive Plan
January 2023

Figure
9-1

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Table 9-1
6-Year CIP

CIP No.	Project	Opinion of Probable Project Cost[1]	2023	2024	2025	2026	2027	2028
	6 Year CIP - Conveyance							
C-1	Scriber Creek Corridor Sewer Main Improvements	$6,186,000	$761,000	$5,425,000	$0	$0	$0	$0
C-2	60th Ave W Sewer Main Improvements - 176th St SW to Highway 99	$8,160,000	$0	$884,000	$7,276,000	$0	$0	$0
C-3	48th Ave W Sewer Main Improvements - Phase 2	$2,532,000	$0	$0	$0	$365,000	$2,167,000	$0
C-4	52nd Ave W Sewer Main Reroute	$1,351,000	$194,000	$1,157,000	$0	$0	$0	$0
C-5	42nd Ave W Sewer Main Extension - Phase 1	$1,000,000	$0	$0	$1,000,000	$0	$0	$0
C-6	LS #10 Force Main Pigging[3]	$200,000	$200,000	$0	$0	$0	$0	$0
C-7	194th Street SW Sewer Main Improvements	$2,019,000	$0	$0	$0	$0	$291,000	$1,728,000
C-8	59th Pl W / 60th Ave W Sewer Main Improvements	$2,087,000	$0	$0	$257,000	$1,830,000	$0	$0
C-9	64th Ave W Easement Sewer Main Improvements	$5,385,000	$0	$0	$0	$0	$662,000	$4,723,000
C-10	Sewer Replacement and/or Rehabilitation Program	$9,000,000	$0	$0	$0	$3,000,000	$3,000,000	$3,000,000
C-11	42nd Ave W Sewer Main Extension - Phase 2	$746,000	$0	$0	$0	$0	$134,000	$612,000
	Total 6-Year Conveyance CIP	**$38,666,000**	**$1,155,000**	**$7,466,000**	**$8,533,000**	**$5,195,000**	**$6,254,000**	**$10,063,000**
	6 Year CIP - Lift Stations							
L-1	LS #10 Flood Protection and Electrical Upgrade	$500,000	$0	$500,000	$0	$0	$0	$0
L-2	LS #10 Pump Upgrade	$2,047,000	$0	$0	$0	$296,000	$1,751,000	$0
L-3	LS #4 Improvements	$4,381,000	$909,000	$3,472,000	$0	$0	$0	$0
L-4	LS #14 Seismic Repairs and Upgrade	$2,021,000	$0	$292,000	$1,729,000	$0	$0	$0
L-5	LS #12 Improvements	$2,098,000	$0	$0	$303,000	$1,795,000	$0	$0
L-6	LS #7 Improvements	$369,000	$0	$0	$0	$54,000	$315,000	$0
L-7	LS #8 Improvements	$138,000	$0	$21,000	$117,000	$0	$0	$0
L-8	LS #16 Improvements	$505,000	$0	$0	$0	$0	$74,000	$431,000
	Total 6-Year Lift Station CIP	**$12,059,000**	**$909,000**	**$4,285,000**	**$2,149,000**	**$2,145,000**	**$2,140,000**	**$431,000**
	6 Year CIP - Wastewater Treatment Plant							
W-1	WWTP Phase 1 - Upper Site Preparation	$19,360,000	$0	$3,872,000	$15,488,000	$0	$0	$0
W-2	WWTP Phase 2 - Liquid Stream Improvements	$119,180,000	$0	$11,918,000	$11,918,000	$31,781,333	$31,781,333	$31,781,333
W-3	WWTP Phase 3 - Solids Handling Improvements[2]	$12,000,000	$0	$0	$0	$0	$6,000,000	$6,000,000
W-4	WWTP Repairs - Blower Upgrade[3]	$1,000,000	$1,000,000	$0	$0	$0	$0	$0
W-5	Fiber - 76th St SW to WWTP	$500,000	$0	$500,000	$0	$0	$0	$0
	Total 6-Year Wastewater Treatment Plant CIP	**$152,040,000**	**$1,000,000**	**$16,290,000**	**$27,406,000**	**$31,781,333**	**$37,781,333**	**$37,781,333**
	6 Year CIP - Administrative or Studies							
S-1	GIS Database Upgrades	$100,000	$0	$100,000	$0	$0	$0	$0
S-2	Flow Monitoring	$100,000	$0	$50,000	$50,000	$0	$0	$0
S-3	AWWD Interlocal Agreement	$50,000	$0	$50,000	$0	$0	$0	$0
	Total 6-Year Administrative or Study CIP	**$250,000**	**$0**	**$200,000**	**$50,000**	**$0**	**$0**	**$0**
	Total 6-Year CIP	**$203,015,000**	**$3,064,000**	**$28,241,000**	**$38,138,000**	**$39,121,333**	**$46,175,333**	**$48,275,333**

Notes:
1) All costs are presented in 2022 dollars.
2) The total project cost for the new solids handling facility is $60,000,000, and $12,000,000 of which is projected to be spent during the 6-year planning period. The remaining $48,000,000 in project costs ($16,000,000 annually) will be spent between 2029 and 2031.
3) Costs were provided by the City via the ongoing 2022 rate study.

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Project C-7: 194th Street SW Sewer Main Improvements

The 8-inch sanitary sewer main in 194th Street SW is undersized. This proposed project involves upsizing approximately 1,650 linear feet of pipe along 194th Street SW between 48th Avenue West to 44th Avenue West from SSMH 5-59 to SSMH 5-9 to a minimum 12-inch diameter pipe.

Project C-8: 59th Pl W / 60th Avenue West Sewer Main Improvements

The 8-inch sanitary sewer main along 59th Place W and 60th Avenue West between 212th Street SW and 200th Street SW is undersized. This proposed project involves upsizing approximately 3,270 linear feet of pipe from SSMH 2-78 to SSMH 2-4. A minimum diameter of 10-inches is required, however; a 12-inch diameter pipe is recommended due the increased available capacity and marginal increase in cost associated with a 12-inch pipe versus a 10-inch pipe.

Project C-9: 64th Avenue West Easement Sewer Main Improvements

The 8-inch sanitary sewer main located in the 64th Avenue West easement between 212th Street SW and 200th Street SW is undersized. This proposed project involves upsizing approximately 4,450 linear feet of pipe from SSMH 1-69 to SSMH 11-8 to a minimum 12-inch diameter pipe.

Project C-10: Sewer Replacement and/or Rehabilitation

As discussed in **Chapter 6**, approximately 75 percent of the City's gravity sewer main is concrete pipe that was installed in the 1960's or 1970's. Estimated life expectancy of concrete sewer main is 50- to 100-years depending on the type of sewage conveyed and how well it is maintained. To replace or rehabilitate all concrete pipe in the next 50-years the City will need to replace or rehabilitate approximately 8,300 linear feet per year. The City would need to allocate approximately $3,000,000 annually to replacement and rehabilitation projects assuming 5,000 linear feet of sewer main is rehabilitated via cured-in-place piping (CIPP) and an additional 3,300 is replaced via open-cut construction every year. The 6-year CIP schedule currently shows funding for the Sewer Replacement and/or Rehabilitation program starting in 2026. The City can assess locations of these projects annually based on video inspections, input from operations, known problem areas and/or potential synergies with other projects.

Project C-11: 42nd Avenue West Sewer Main Extension – Phase 2

As discussed in Project C-5, The City is planning for a new roadway extension along 42nd Avenue West between Alderwood Mall Blvd and 194th Street SW. Phase 2 of this project will complete the extension of the 12-inch sanitary sewer main from 196th to 194th.

Lift Station Projects

Project L-1: LS #10 Flood Protection and Electrical

Lift Station 10 (LS #10) is located adjacent to Scriber Creek, and the 100-year flood elevation is higher than the building threshold and various site structures, posing a risk to operational performance, equipment integrity, and operational access during a flood event. Structural improvements to harden the facility against water intrusion and/or the installation of submersible equipment is necessary. Additionally, aging electrical equipment is reaching the end of its useful life and is susceptible to damage during a flood event. This project includes providing flood protection and electrical upgrades for the LS #10 facility. This project may take place concurrently with Project L-2 (LS #10 Pump Upgrade), as new submersible pump motors will be required for final floodproofing.

Project L-2: LS #10 Pump Upgrades

Lift Station 10 (LS #10) was constructed in 1993, and the equipment is aging. Additionally, the station has ongoing maintenance challenges due to debris and grease buildup within the wet well. Depending on how fast the City Center and Alderwood Mall areas develop, LS #10 also is predicted to be under capacity at current pumping rates between now and 2044. Mechanical upgrades will be necessary to prolong the life of the facility, increase capacity, and address the wet well problems. This project should be reassessed following Project C-6 (LS #10 Force Main Pigging) based on how successful the force main cleaning is at increasing capacity with the existing pumps. This project may take place concurrently with Project L-1 (LS #10 Flood Protection and Electrical), as some electrical and control equipment will be replaced when the new pumps are installed.

Project L-3: LS #4 Improvements

Lift Station 4 (LS #4) was built in 1987 and has reached the end of its useful life. Pump capacity has deteriorated below theoretical capacity and cannot accommodate the desired upcoming development within the basin, which will contribute to increased future flows. The existing facility also is inaccessible to necessary maintenance vehicles. This project will facilitate construction of a new LS #4 on a nearby, vacant, City-owned property. Flows from the new lift station will be routed through the 8-inch force main on Alderwood Mall Boulevard and Alderwood Parkway.

Project L-4: LS #14 Seismic Repairs and Upgrades

Lift Station 14 (LS #14) was constructed in 1990. The facility is in an area with poor soils, and there is a documented history of wet well structure settlement that poses a risk to the force main piping. Additionally, water from nearby Scriber Creek enters the site and the wet well during flood events, compromising station access and performance. The LS #14 basin also may see future re-development that cannot be accommodated by the existing pump capacity. This project will facilitate construction of a new or rehabilitated lift station with new equipment and adequate capacity for future flows. A predesign alternatives analysis is currently underway.

Project L-5: LS #12 Improvements

Lift Station 12 (LS #12) was constructed in 1993, and the equipment is aging. Additionally, baseline model simulations indicate the lift station may be under capacity during a 20-year flow event. Upgrades to this lift station are identified to replace aging pump equipment and improve pumping capacity, replace aging electrical equipment, and install a flow meter to provide improved monitoring.

Project L-6: LS #7 Improvements

Lift Station 7 (LS #7) was constructed in 1978 and remodeled more recently (date is unknown). Minor upgrades are necessary to improve the resilience and performance of the station. This project will include installation of a permanent generator, a replacement control panel, and a flow meter, as well as procurement of a spare pump for added redundancy.

Project L-7: LS #8 Improvements

Lift Station 8 (LS #8) was constructed in 2021. Minor upgrades are desired to improve operator ease of access and maintenance. This project will facilitate additional site paving and the installation of motorized pump removal equipment. The City anticipates coordinating and completing this project in-house. It is included in the CIP to ensure the project receives sufficient funding.

Project L-8: LS #16 Improvements

Lift Station 16 (LS #16) was constructed in 2016 and minor upgrades are desired to improve redundancy, repair recently sustained damage, and improve operator access. This project will replace the damaged flow meter, install a sump pump within the vault, and add an automatic card reader and gate opener for the site fencing. The City also desires to have a spare pump and new pump removal system, which it is in the process of procuring.

Wastewater Treatment Plant (WWTP) Projects

As outlined in the WWTP Facility Plan, necessary upgrades to the WWTP are recommended in three phases. Phase 1 involves grading, utilities, and preparation of the upper WWTP site; Phase 2 involves a new headworks, aeration basins and effluent disinfection; and Phase 3 involves a new solids handling facility. Phase 1 and Phase 2 are included in the 6-year CIP and Phase 3 will occur following Phase 1 and Phase 2, in the long-term planning horizon.

Project W-1: WWTP Phase 1 – Upper Site Preparation

Further discussed in WWTP Facility Plan, this project is the first of three WWTP upgrade projects. The project includes excavation and grading; realignment of access road and sewer piping; rerouting of outfall piping; and a new electrical service.

Project W-2: WWTP Phase 2 – Liquid Stream Improvements

Further discussed in WWTP Facility Plan, this project is the second of three WWTP upgrade projects. The project includes a new headworks; removal of primary clarifiers; added and reconfigured aeration basins; and ancillary secondary treatment components.

Project W-3: WWTP Phase 3 –Solids Handling Improvements

Further discussed in WWTP Facility Plan, this project is the last of three WWTP upgrade projects. The project includes a sludge storage and thickening improvements; dewatering improvements; wheel dryer and truck loading and a new solids handling facility.

Project W-4: WWTP Repairs – Blower Upgrade

The existing aeration blowers at the WWTP do not have sufficient capacity to meet current daily evening air demands to maintain desired dissolved oxygen (DO) levels in the aeration basins from May through October. They also have reached their expected service life, are not automatically controlled, and have several operation constraints. This project involves replacing the two existing centrifugal blowers with one high-speed turbo blowers and two screw blowers. The final system will be fully integrated with the City's SCADA system, utilize variable frequency drives (VFDs) for turndown, facilitate greater air supply to the aeration basins during high oxygen demand periods, and allow the system to operate during "dirty power" events.

Project W-5: Fiber 76th Street SW to WWTP

The City currently leases fiber optic communications at the WWTP from a 3rd party. This project would install approximately 1,300 linear feet of new fiber optic from existing City owned fiber to the WWTP.

Studies or Administrative Projects

The following projects are recommended for better public works oversight of the City's sanitary sewer system.

Project S-1: Geographic Information Systems (GIS) Database Upgrades

The City may consider upgrades and improvements to their GIS database. The database could be reviewed for accuracy against current improvements. Additionally, either through review of record drawings and/or survey results, the system could be improved for updated coordinates, rim and invert elevations for all manholes. A budget of $100,000 is allocated for GIS database upgrades.

Project S-2: Flow Monitoring

Figure 6-3 identifies areas in the City's with known infiltration and inflow (I/I). The City will use internal resources to address and improve areas of known I/I in their sanitary sewer system. It may be practical to track progress and monitor performance of these improvements. Doing so will require use of in-stream flow monitoring equipment. A budget of $100,000 is allocated for purchase and training of in-stream flow-monitoring equipment.

Project S-3: AWWD Interlocal Agreement

As discussed in **Section 3.2**, the City has interlocal agreements (ILAs) in place with Edmonds and Mountlake Terrace. There is no ILA for Alderwood Water and Wastewater District (AWWD). The City may prioritize drafting, negotiating, and executing an ILA to clarify and contract the sewer agreement with AWWD. A budget of $50,000 is allocated for the AWWD ILA.

9.3.2 Long-Term Capital Improvement Projects

In addition to the 6-year CIPs identified in **Section 9.3.1** and **Table 9-1**, the following conveyance related projects are identified for longer-term implementation in **Table 9-2**. There are no lift station or wastewater treatment plant CIPs identified in the long-term CIP at this time.

Table 9-2
Long-Term CIP

Long-Term CIP - Conveyance		
C-101	76th Ave W Sewer Main Improvements	$3,653,000
C-102	Olympic View Drive Sewer Main Improvements	$5,999,000
C-103	204th Street SW Sewer Main Improvements	$5,707,000
	Total Long-Term CIP - Conveyance	**$15,359,000**

Project C-101: 76th Avenue West Sewer Main Improvements

The 24-inch pipe along 76th Avenue West experiences above-ground surcharging near the intersection of 76th Avenue West and Olympic View Drive, just upstream of the recently installed 28-inch HDPE 76th Avenue West Relief Sewer. This proposed project involves extending the relief sewer approximately 1,850 linear feet to the intersection of 76th Avenue West and Olympic View Drive.

Project C-102: Olympic View Drive Sewer Main Improvements

The 15-inch sanitary sewer main along Olympic View Drive near Lift Station 7 is undersized and cannot accommodate projected future flows. This proposed project involves upsizing approximately 1,850 linear feet of pipe along Olympic View Drive to a minimum 18-inch diameter pipe.

Project C-103: 204th Street SW Sewer Main Improvements

The 36-inch sanitary sewer main along 204th Street SW and 76th Avenue West experiences above-ground surcharging in the future 2044 model scenario. Model results indicate that a hydraulic jump is created due to abrupt changes in pipe slope between SSMH 6-160 and SSMH 6-15, resulting in above-ground surcharging. This proposed project involves installing 36-inch diameter pipe at a constant slope between SSMH 6-160 to SSMH 6-15 to correct the predicted hydraulic jump.

9.4 FUNDING SOURCES

Chapter 10 describes the City's financial program and funding requirements to fund the Plan per the schedule and costs outlined in the Capital Improvement Program.

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Chapter 10 Financial Program

10.1 INTRODUCTION

This chapter was prepared by FCS GROUP to provide a financial program that allows the City of Lynnwood (City) wastewater utility to remain financially viable during the planning period. This financial viability analysis considers the historical financial condition, current and identified future financial and policy obligations, operation and maintenance (O&M) needs, and the financial impacts of the capital projects identified in this Sewer Comprehensive Plan (Plan). Furthermore, this chapter provides a review of the wastewater utility's current rate structure with respect to rate adequacy and customer affordability.

10.2 PAST FINANCIAL PERFORMANCE

This section includes a historical summary of financial performance as reported by the City, including fund resources and uses arising from cash transactions, as well as a historical summary of comparative statements of net position, which are useful indicators of the City's financial position.

10.2.1 Comparative Financial Statements

The City legally owns and operates water, sewer, and stormwater utilities. Operations and financial reporting occur on a combined utility fund basis. **Table 10-1** shows a summary of the utility fund resources and uses arising from cash transactions for the previous 6 years (2016 through 2021) for the water, sewer, and stormwater utilities combined. **Table 10-2** shows a summary of assets and liabilities, with the difference between the two reported as "net position." Increases or decreases in net position are useful indicators of the financial position of the City's utility fund. Noteworthy findings and trends are discussed following each table to demonstrate the historical performance and condition of the City's combined utility fund.

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Table 10-1
Summary of Historical Comparative Statements of Net Position

Statement of Net Position	2016	2017	2018	2019	2020	2021
Assets						
Current Assets:						
Cash and cash equivalents	$ 5,097,897	$ 11,843,282	$ 3,804,647	$ 13,095,779	$ 22,480,418	$ 11,022,057
Restricted assets: cash and cash equivalents	7,836,000	107,956	19,533	21,173	23,713	-
Investments	3,244,695	4,922,501	12,329,552	7,841,046	4,102,034	2,073,535
Receivables:						
Accounts	3,654,455	3,268,528	2,981,274	3,278,787	4,080,358	10,458,253
Intergovernmental	-	-	-	-	-	-
Interest	5,101	10,232	12,111	-	-	-
Inventories	-	32,210	-	-	-	-
Prepaid items	136,655	273,289	381,406	138,165	81,127	76,599
Total Current Assets	**$ 19,974,803**	**$ 20,425,788**	**$ 19,528,523**	**$ 24,374,950**	**$ 30,767,650**	**$ 23,630,444**
Noncurrent Assets:						
Restricted assets: cash and cash equivalents	$ 7,067,221	$ 1,865,542	$ 18,383,899	$ 13,670,247	$ 3,438,468	$ -
Notes receivable	61,322	61,322	61,322	61,322	61,322	61,322
Net pension asset	-	-	-	-	-	3,082,818
Capital assets:						
Nondepreciable	9,820,041	13,759,111	10,417,561	11,272,229	17,329,139	21,821,474
Depreciable, net	56,047,525	55,948,362	64,594,665	66,551,891	71,257,577	76,893,587
Total Noncurrent Assets	**$ 72,996,109**	**$ 71,634,337**	**$ 93,457,447**	**$ 91,555,689**	**$ 92,086,506**	**$ 101,859,201**
TOTAL ASSETS	**$ 92,970,912**	**$ 92,060,125**	**$ 112,985,970**	**$ 115,930,639**	**$ 122,854,156**	**$ 125,489,645**
Deferred Outflows of Resources						
Deferred Outflows of Resources - pensions	$ -	$ -	$ -	$ -	$ 507,461	$ 399,154
TOTAL DEFERRED OUTFLOWS OF RESOURCES	**$ 465,019**	**$ 471,728**	**$ 419,942**	**$ 446,815**	**$ 507,461**	**$ 399,154**
Liabilities						
Current Liabilities:						
Accounts payable	$ 1,424,867	$ 963,433	$ 1,001,990	$ 702,073	$ 3,436,729	$ 1,619,602
Accrued payroll	189,875	263,370	241,301	262,772	174,486	130,830
Retainage payable	183,886	123,283	78,199	-	25,506	15,894
Interfund payable	-	-	-	-	-	-
Custodial accounts payable	40,720	30,558	3,101	4,741	7,281	5,301
Compensated absences payable	108,977	138,074	106,701	101,899	351,617	521,723
Claims and judgments payable	-	-	-	-	-	-
Deposits payable	-	-	-	-	-	-
Unearned revenue	-	-	-	-	-	-
Revenue bonds payable	1,405,000	1,559,514	2,029,701	2,256,828	2,391,828	2,486,828
Accrued interest payable	109,400	103,961	303,621	160,878	142,508	134,449
Total Current Liabilities	**$ 3,462,725**	**$ 3,182,193**	**$ 3,764,614**	**$ 3,489,191**	**$ 6,529,955**	**$ 4,914,627**
Long-Term Liabilities: (net of current portion)						
Compensated absences payable	$ 253,659	$ 289,713	$ 225,675	$ 202,249	$ 224,433	$ 225,362
Interfund payable	-	-	-	-	-	-
Net pension liability	2,711,244	2,542,238	1,746,845	1,370,871	1,352,828	316,257
Revenue bonds payable	$ 34,311,108	$ 32,662,082	$ 50,205,763	$ 47,943,935	$ 45,565,508	$ 43,078,680
Total Long-term Liabilities	**$ 37,276,011**	**$ 35,494,033**	**$ 52,178,283**	**$ 49,517,055**	**$ 47,142,769**	**$ 43,620,299**
TOTAL LIABILITIES	**$ 40,738,736**	**$ 38,676,226**	**$ 55,942,897**	**$ 53,006,246**	**$ 53,672,724**	**$ 48,534,926**
Deferred Inflows of Resources						
Deferred Inflows of Resources - gain on refunding	$ -	$ -	$ 133,239	$ 118,296	$ 133,496	$ 115,274
Deferred Inflows of Resources - pensions	-	-	645,559	743,812	394,125	3,254,291
TOTAL DEFERRED INFLOWS OF RESOURCES	**$ 85,044**	**$ 435,201**	**$ 778,798**	**$ 862,108**	**$ 527,621**	**$ 3,369,565**
Net Position						
Net investment in capital assets	$ 38,401,124	$ 35,362,594	$ 40,949,223	$ 41,175,308	$ 41,377,400	$ 52,423,971
Restricted for:						
Debt service	1,405,000	1,865,542	575,698	576,511	554,428	299,133
Operating reserves	1,973,258	-	-	-	-	
Capital reserves	2,094,248	-	-	-	-	
Capital projects	8,468,678	-	-	-	-	
Pension asset	-	-	-	-	-	498,411
Unrestricted	269,843	16,192,290	15,159,296	20,757,281	27,229,444	20,762,793
TOTAL NET POSITION	**$ 52,612,151**	**$ 53,420,426**	**$ 56,684,217**	**$ 62,509,100**	**$ 69,161,272**	**$ 73,984,308**
Current Ratio	**3.5**	**6.3**	**5.1**	**6.9**	**4.7**	**4.8**
Debt to Net Position Ratio	**0.7**	**0.6**	**0.9**	**0.8**	**0.7**	**0.6**
Debt to Noncurrent Capital Asset Ratio	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.4**

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10.2.2 Findings and Trends

- The current ratio is a measure of short-term liquidity or the City's ability to pay its current bills – it is calculated by dividing unrestricted current assets (excluding inventories, prepaid items and restricted assets) by current liabilities. A ratio of 1.0 indicates that the utility has exactly enough to pay its bills; higher values are desirable as they suggest an ability to pay large or unanticipated bills. The ratio begins at 3.5 in 2016 increasing to a high of 6.9 in 2019 before ending 2021 at 4.8, suggesting that the City has capacity to meet its short-term financial obligations.
- The debt to net position ratio compares total debt (revenue bonds payable current and long term) liabilities to total net position (the difference between current assets and liabilities). The metric is often used to evaluate whether a utility is overleveraged, with a ratio above 0.5 to 0.60, for city utilities, suggesting a utility may have too much debt. Excessive indebtedness can be viewed negatively in the context of a fiscal health evaluation, as debt comes with incremental costs (e.g., interest) and requirements (e.g., covenants, reserves) that may reduce a utility's financial flexibility. This ratio ends 2016 at 0.7, then increases to 0.9 in 2018, before dropping to 0.6 by 2021, reflecting the City's efforts to repay its existing debt obligations.
- The debt to noncurrent capital asset ratio compares total debt to noncurrent assets, which are defined as property, plant, and equipment. This ratio begins at 0.5, or 50 percent debt to 50-percent noncurrent assets, in 2016. Noncurrent capital assets increase nearly $30 million (M) throughout the 6-year history, while total liabilities increase by $8M; therefore, the ratio decreased to 0.4 by 2021. Maintaining a ratio less than 0.6 is a general industry target. Similar to the debt to net position ratio discussed above, the debt to noncurrent asset ratio is impacted by the City's ability to repay debt obligations and has decreased over the last six years with repayment of loans.

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Table 10-2
Summary of Historical Fund Resources and Uses Arising from Cash Transactions

Statement of Revenues, Expenses and Changes in Fund Net Position	2016	2017	2018	2019	2020	2021
Operating Revenues						
Charges for services	$ 19,870,417	$ 20,793,661	$ 21,623,701	$ 23,140,625	$ 24,244,548	$ 25,025,415
Rentals	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-
Total Operating Revenues	**$ 19,870,417**	**$ 20,793,661**	**$ 21,623,701**	**$ 23,140,625**	**$ 24,244,548**	**$ 25,025,415**
Operating Expenses						
Administration and general	4,189,770	4,119,466	4,051,873	4,986,057	4,947,666	5,749,743
Operations and maintenance	8,634,036	11,797,552	10,914,179	9,831,287	11,612,216	10,896,865
Insurance and claims	-	-	-	-	-	-
Other Services	-	-	-	-	-	-
Depreciation	1,043,069	2,389,269	2,727,320	2,706,068	2,797,284	3,030,811
Total Operating Expenses	**$ 13,866,875**	**$ 18,306,287**	**$ 17,693,372**	**$ 17,523,412**	**$ 19,357,166**	**$ 19,677,419**
Operating Income	**$ 6,003,542**	**$ 2,487,374**	**$ 3,930,329**	**$ 5,617,213**	**$ 4,887,382**	**$ 5,347,996**
Non-Operating Revenues (Expenses)						
Interest and fiscal charges	$ (1,345,523)	$ (1,212,424)	$ (1,314,436)	$ (1,778,035)	$ (1,688,002)	$ (1,495,208)
Other nonoperating revenue	-	-	-	-	51,463	367,388
Gain (Loss) on disposition of capital assets	(126,027)	(1,072,469)	(302,047)	12,100	(25,127)	(86,479)
Debt issuance costs	(5,425)	(5,425)	(249,100)	-	(46,788)	(1,247)
Investment earnings	152,059	224,924	471,142	1,124,991	439,307	58,273
Miscellaneous revenue	3,187	3,176	5,338	4,570	-	-
Total Non-Operating Revenues (Expenses)	**$ (1,321,729)**	**$ (2,062,218)**	**$ (1,389,103)**	**$ (636,374)**	**$ (1,269,147)**	**$ (1,157,273)**
Income (Loss) Before Contributions and Transfers	**$ 4,681,813**	**$ 425,156**	**$ 2,541,226**	**$ 4,980,839**	**$ 3,618,235**	**$ 4,190,723**
Contributions	875,036	476,358	280,465	844,044	3,033,937	810,004
Transfers In	53,665	563,005	442,100	-	-	-
Transfers Out	(2,101,824)	(656,244)	-	-	-	(88,725)
Change in Net Position	**$ 3,508,690**	**$ 808,275**	**$ 3,263,791**	**$ 5,824,883**	**$ 6,652,172**	**$ 4,912,002**
Net Position Beginning of Year	49,103,461	52,612,151	53,420,426	56,684,217	62,509,100	69,161,272
Prior Period Adjustment	-	-	-	-	-	(88,966)
Net Position End of Year	**$ 52,612,151**	**$ 53,420,426**	**$ 56,684,217**	**$ 62,509,100**	**$ 69,161,272**	**$ 73,984,308**
Reconciliation of the fund level operating statement to the government-wide statement of activities:						
Change in net position	3,508,690	808,275	3,263,791	-	6,652,172	4,912,002
Internal service fund charges (credits) to enterprise funds, resulting in changes to operating expenses.	73,833	(404,164)	141,291	249,387	62,798	324,993
Adjusted Change in Net Position	**$ 3,582,523**	**$ 404,111**	**$ 3,405,082**	**$ 6,074,270**	**$ 6,714,970**	**$ 5,236,995**
O&M Coverage Ratio	**143.3%**	**113.6%**	**122.2%**	**132.1%**	**125.2%**	**127.2%**
Net Operating Income as a % of Operating Revenue	**30.2%**	**12.0%**	**18.2%**	**24.3%**	**20.2%**	**21.4%**
Debt Service Coverage Ratio	**5.0**	**3.1**	**3.3**	**3.7**	**3.2**	**3.4**

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10.2.3 Figures and Trends

- The City's combined charges for services increased from $19.9M in 2016 to $25.0M in 2021. The annual compounding growth rate is 4.7 percent per year, with a total increase of 25.9 percent from 2016 to 2021. Expenses range from $13.9M in 2016 to $19.7M in 2021, showing increases every year. With an annual compounding growth rate of 7.3 percent, expenses have grown faster than revenues over the past 6 years and have increased 41.9 percent overall. While combined utility maintenance and operations expenses have increased 26.2 percent, the largest contributor to increases in expenses is depreciation, growing by 190.6 percent since 2016.
- The O&M coverage ratio (total operating revenues divided by total operating expenses) started at 143.3 percent in 2016 and has trended downward reaching a low of 113.6 percent in 2017 before recovering to 127.2 percent in 2021. A ratio of 100.0 percent or greater shows that revenue will successfully cover expenses, and the City has remained above this ratio for the past 6-year period.
- Net operating income as a percent of operating revenue was 30.2 percent in 2016. This metric has varied over the past 6 years with a high of the 2016 figure of 30.2 percent reaching a low of 12.0 percent in 2017 before increasing to 21.4 percent in 2021. Similar to the O&M coverage ratio, these trends help to show how successfully operating revenue actually covered operating expenses, with higher positive numbers being the best and negative numbers showing need for improvement. In addition, these trends demonstrate the ability of the utility to invest in capital, whether through direct cash transfers or the issuance and servicing of debt.
- The debt service coverage ratio measures the amount of cash flow available to meet interest and principal payments. Typically, bond debt service coverage requires a minimum factor of 1.25 during the life of the loans. This ratio is calculated by dividing cash operating income (revenues less expenses before depreciation) by annual revenue bond expenses. The debt service coverage ratio for revenue bond debt ends 2016 at a high of 5.0 and fluctuates year to year to a low of 3.1 in 2017, before ending 2021 at 3.4. The ability of this ratio to remain at levels significantly higher than the bond covenant minimum of 1.25 indicates a stable capacity for new debt and will likely result in more favorable terms when entering the bond market.

10.3 FINANCIAL PLAN

While the City reports year-end financials on a combined basis, the financial plan will concentrate on the wastewater sources and uses specifically, to ensure viability on a standalone basis.

The wastewater utility is responsible for generating sufficient revenue to meet all of its costs. The primary source of funding is derived from ongoing bi-monthly service charges, with additional revenue coming from sewer treatment services provided to the City of Edmonds as well as other miscellaneous revenues. The City controls the level of user charges and, with City Council approval, can adjust user charges as needed to meet financial objectives.

The financial plan can only confirm financial feasibility if it considers the total system costs of providing wastewater services, both operating and capital. To meet these objectives, the following elements have been completed.

1. **Capital Funding Plan**. Identifies the total capital improvement plan (CIP) obligations of the planning period. The plan defines a strategy for funding the CIP, including an analysis of available resources from rate revenues, existing reserves, connection charge revenues, debt financing, and any special resources that may be readily available (e.g., grants, developer contributions, etc.). The capital funding plan impacts the financial plan through the use of debt financing (resulting in annual debt service) and the assumed rate revenue made available for capital funding.
2. **Financial Forecast**. Identifies future annual non-capital costs associated with the operation, maintenance, and administration of the wastewater system. Included in the financial plan is a reserve analysis that forecasts cash flow and fund balance activity, along with testing for satisfaction of actual or recommended minimum fund balance policies. The financial plan ultimately evaluates the sufficiency of utility revenues in meeting all obligations, including cash uses such as operating expenses, debt service, capital outlays, and reserve contributions, as well as any coverage requirements associated with long-term debt. The plan also identifies the future adjustments required to fully fund all utility obligations in the planning period.

10.3.1 Capital Funding Plan

To properly evaluate future capital funding needs, capital costs were escalated by 6.00 - 4.00 percent annually to the year of planned spending. A 6.00 percent escalation rate was used through 2024, reflecting the current inflationary environment, before falling to 4.00 percent for the remainder of the forecast. The CIP developed for this Plan identifies $278.4M in un-escalated project costs over the 10-year planning horizon from 2023-2032. This results in $357.3M in project costs escalated to the year of construction. The latter 10-year period forecasts an annual $3 million in un-escalated costs for general sewer replacement and rehabilitation projects, resulting in $57.6M in escalated project costs between 2033-2042.

A summary of the 10-year and 20-year CIPs are shown in **Table 10-3**. As shown, each year has varied capital cost obligations depending on construction schedules and infrastructure planning needs.

Table 10-3
10- Year and 20- Year CIPs

Year	Unescalated $	Escalated $
2023	$ 3,064,000	$ 3,247,840
2024	28,241,000	31,731,588
2025	38,138,000	44,565,931
2026	39,121,333	47,543,599
2027	46,175,333	58,360,874
2028	48,275,333	63,455,660
2029	19,731,000	26,972,893
2030	23,122,000	32,872,835
2031	24,941,000	36,877,287
2032	7,565,000	11,632,883
10-Year Total	**$ 278,374,000**	**$ 357,261,391**
2033-2042	30,000,000	57,601,694
20-Year Total	**$ 308,374,000**	**$ 414,863,085**

Table 10-4 provides more detail for the 10-year CIP.

Table 10-4
10- Year CIP (Escalated $)

Project	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Conveyance										
Scriber Creek Corridor Sewer Main Improvements	$ 806,660	$ 6,095,530	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
60th Ave W Sewer Main Improvements - 176th St SW to Highway 99	-	993,262	8,502,326	-	-	-	-	-	-	-
48th Ave W Sewer Main Improvements - Phase 2	-	-	-	443,579	2,738,865	-	-	-	-	-
52nd Ave W Reroute	205,640	1,300,005	-	-	-	-	-	-	-	-
42nd Ave W Sanitary Sewer - Phase 13	-	-	1,168,544	-	-	-	-	-	-	-
LS#10 Force Main Pigging	212,000	-	-	-	-	-	-	-	-	-
194th Street SW Sewer Main Improvements	-	-	-	-	367,794	2,271,375	-	-	-	-
59th Pl W/60th Ave W Sewer Main Improvements	-	-	300,316	2,223,973	-	-	-	-	-	-
64th Ave W Easement Sewer Main Improvements	-	-	-	-	836,700	6,208,162	-	-	-	-
Sewer Replacement and/or Rehabilitation Program	-	-	-	3,645,857	3,791,692	3,943,359	4,101,094	4,265,137	4,435,743	4,613,173
42nd Ave W Sewer Main Extension - Phase 2	-	-	-	-	169,362	804,445	-	-	-	-
76th Ave W Sewer Main Improvements	-	-	-	-	-	-	999,300	4,154,244	-	-
Olympic View Drive Sewer Main Improvements	-	-	-	-	-	-	-	1,706,055	7,095,710	-
204th Street SW Sewer Main Improvements	-	-	-	-	-	-	-	-	1,688,539	7,019,711
Lift Stations										
LS #10 Flood Protection and Electrical	-	561,800	-	-	-	-	-	-	-	-
LS #10 Pump Upgrade	-	-	-	359,725	2,213,084	-	-	-	-	-
LS #4 Improvements	963,540	3,901,139	-	-	-	-	-	-	-	-
LS #14 Seismic Repairs and Upgrade	-	328,091	2,020,413	-	-	-	-	-	-	-
LS #12 Improvements	-	-	354,069	2,181,438	-	-	-	-	-	-
LS #7 Improvements	-	-	-	65,625	398,128	-	-	-	-	-
LS #8 Improvements	-	23,596	136,720	-	-	-	-	-	-	-
LS #16 Improvements	-	-	-	-	93,528	566,529	-	-	-	-
Wastewater Treatment Plant										
WWTP Phase 1 - Upper Site Preparation	-	4,350,579	18,098,409	-	-	-	-	-	-	-
WWTP Phase 2 - Liquid Stream Improvements	-	13,391,065	13,926,707	38,623,402	40,168,338	41,775,071	-	-	-	-
WWTP Phase 3 - Solids Handling Improvements	-	-	-	-	7,583,383	7,886,718	21,872,499	22,747,399	23,657,295	-
WWTP Repairs - Blower Upgrade	1,060,000	-	-	-	-	-	-	-	-	-
Fiber - 76th St SW to WWTP	-	561,800	-	-	-	-	-	-	-	-
Administrative or Studies	-	-	-	-	-	-	-	-	-	-
GIS Database Upgrades	-	112,360	-	-	-	-	-	-	-	-
Flow Monitoring	-	56,180	58,427	-	-	-	-	-	-	-
AWWD Interlocal Agreement	-	56,180	-	-	-	-	-	-	-	-
Total:	**$ 3,247,840**	**$ 31,731,588**	**$ 44,565,931**	**$ 47,543,599**	**$ 58,360,874**	**$ 63,455,660**	**$ 26,972,893**	**$ 32,872,835**	**$ 36,877,287**	**$ 11,632,883**

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10.4 AVAILABLE FUNDING ASSISTANCE AND FINANCING RESOURCES

Feasible long-term capital funding strategies must be defined to ensure that adequate resources are available to fund the CIP identified in this Plan. In addition to the City's resources, such as accumulated cash reserves, capital revenues, and rate revenues designated for capital purposes, capital needs can be met from outside sources, such as grants, low-interest loans, and bond financing. The following is a summary of the City's internal and external resources.

10.4.1 City Resources

Resources appropriate for funding capital needs include accumulated cash in the capital fund, rate revenues designated for capital spending purposes, developer contributions, and capital-related charges such as general facility charges. The first two resources will be discussed in the **Fiscal Policies** section of the **Financial Forecast**. Capital-related charges are discussed below.

10.4.2 General Facilities Charges

A connection charge such as the City's general facilities charge (GFC) refers to a one-time charge imposed on new customers as a condition of connecting to the wastewater system. The purpose of the GFC is two-fold: 1) to promote equity between new and existing customers; and 2) to provide a source of revenue to fund capital projects. Revenue can only be used to fund utility capital projects or to pay debt service incurred to finance those projects. In the absence of a connection charge, growth-related capital costs would be borne in large part by existing customers. The City's existing GFC is $2,480 per ERU.

10.4.3 Local Facilities Charges

While a connection charge is the manner in which new customers pay their share of system investment costs, local facilities charge funding is used to pay the costs of local facilities that connect each property to the system's infrastructure. Local facilities funding is often overlooked in rate forecasting because it is funded upfront by either connecting customers and developers, or through an assessment to properties, but never from rates.

A number of mechanisms can be considered toward funding local facilities. One of the following scenarios typically occurs: (a) the utility charges a connection fee based on the cost of the local facilities (under the same authority as the general facilities charge); (b) a developer funds an extension of the system to its development and turns those facilities over to the utility (contributed capital); or (c) a local assessment is set up called a Utility Local Improvement District (ULID/LID) or a Local Utility District (LUD), which collects tax revenue from benefited properties.

A local facilities charge (LFC) is a variation of the connection charge. It is a city-imposed charge to recover the cost related to service extension to local properties. Often called a front-footage charge and imposed on the basis of footage of the main "fronting" a particular property, it is usually implemented as a reimbursement mechanism to a city for the cost of a local facility that directly serves a property. It is a form of connection charge and thus can accumulate up to 10 years of interest. It typically applies in instances when no developer-installed facilities are needed through developer extension due to the prior existence of available mains already serving the developing property.

The developer extension is a requirement that a developer install on-site and sometimes off-site improvements as a condition of extending service. These are in addition to the connection charge required and must be built to City standards. Part of the agreement between the City and the developer planning to extend service might include a latecomer agreement, resulting in a latecomer charge to new connections for the developer extension.

Latecomer charges are a variation of developer extensions, whereby new customers connecting to a developer-installed improvement make a payment to the City based on their share of the developer's cost. The City passes this charge on to the developer who installed the facilities. As part of the developer extension process, this defines the allocation of costs and records latecomer obligations on the title of affected properties. No interest is allowed, and the reimbursement agreement cannot exceed 20 years in duration.

ULID/LID is another mechanism for funding infrastructure that assesses benefited properties based on the special benefit received by the construction of specific facilities. Most often used for local facilities, some ULIDs also recover related general facilities costs. Substantial legal and procedural requirements can make this a relatively expensive process, and there are mechanisms by which a ULID can be rejected.

10.4.4 Outside Resources

This section outlines various grant, loan, and bond opportunities available to the City through federal and state agencies to fund the CIP identified in the Plan.

10.4.5 Grants and Low-Cost Loans

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However, these assistance programs have been mostly eliminated, substantially reduced in scope and amount, or replaced by loan programs. Remaining grant programs are generally lightly funded and heavily subscribed. Nonetheless, the benefit of low-interest loans makes the effort of applying worthwhile.

Appendix L contains a document entitled "*Funding Programs for Drinking Water and Wastewater Projects; Updated 1-11-2023*". This document is maintained by the State of Washington's Department of Commerce and contains details on government programs, eligibility requirements, and contact information, should the City wish to inquire about program offerings and eligibility requirements.

10.4.6 Bond Financing

General Obligation Bonds – General obligation (G.O.) bonds are bonds secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, G.O. bonds have relatively low interest rates and few financial restrictions. However, the authority to issue G.O. bonds is restricted in terms of the amount and use of the funds, as defined by the Washington constitution and statute. Specifically, the amount of debt that can be issued is linked to assessed valuation.

Revised Code of Washington (RCW) 39.36.020 states:

> (2)(a)(ii) Counties, cities, and towns are limited to an indebtedness amount not exceeding one and one-half percent of the value of the taxable property in such counties, cities, or towns without the assent of three-fifths of the voters therein voting at an election held for that purpose.

(b) In cases requiring such assent counties, cities, towns, and public hospital districts are limited to a total indebtedness of two and one-half percent of the value of the taxable property therein.

While bonding capacity can limit the availability of G.O. bonds for utility purposes, these can sometimes play a valuable role in project financing. A utility rate savings may be realized through two avenues: the lower interest rate and related bond costs, and the extension of repayment obligation to all tax-paying properties (not just developed properties) through the authorization of an ad valorem property tax levy.

Revenue Bonds – Revenue bonds are commonly used to fund utility capital improvements. The debt is secured by the revenues of the issuing utility. With this limited commitment, revenue bonds typically bear higher interest rates than G.O. bonds and require security conditions related to the maintenance of dedicated reserves (a bond reserve) and financial performance (added bond debt service coverage). The City agrees to satisfy these requirements by resolution as a condition of bond sale.

Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except perhaps the practical limit of the utility's ability to generate sufficient revenue to repay the debt and provide coverage. In some cases, poor credit might make issuing revenue bonds problematic.

10.4.7 Capital Financing Strategy

An ideal capital financing strategy would include the use of grants and low-cost loans when debt issuance is required. However, these resources are very limited and competitive in nature and do not provide a reliable source of funding for planning purposes. It is recommended that the City pursue these funding avenues but assume revenue bond financing to meet the needs which can't be met by available cash resources. The capital financing strategy developed to fund the CIP identified in this Plan assumes the following funding resources:

- Accumulated cash reserves,
- Transfers of excess cash (over minimum balance targets) from the Operating Fund,
- General facilities charge revenue, and
- Interest earned on Capital Fund balances and other miscellaneous capital resources.

The cash resources described above are anticipated to fund 27.6 percent of the 10-year CIP and 34.7 percent of the 20-year CIP. The remaining funding is assumed to come from new revenue bond proceeds. **Table 10-5** presents the 10-year and 20-year capital financing strategy.

Table 10-5
10-Year and 20-Year Capital Financing Strategy

Year	Capital Expenditures Escalated	Connection Charges	Revenue Bonds	Cash Funding	Total Financial Resources
2023	$ 3,247,840	$ 1,011,506	$ -	$ 2,236,334	$ 3,247,840
2024	31,731,588	1,032,546	26,750,000	3,949,042	31,731,588
2025	44,565,931	1,054,023	26,750,000	16,761,908	44,565,931
2026	47,543,599	1,075,946	42,500,000	3,967,653	47,543,599
2027	58,360,874	1,098,326	42,500,000	14,762,548	58,360,874
2028	63,455,660	1,121,171	44,000,000	18,334,489	63,455,660
2029	26,972,893	1,144,492	22,000,000	3,828,401	26,972,893
2030	32,872,835	1,168,297	21,500,000	10,204,538	32,872,835
2031	36,877,287	1,192,598	21,500,000	14,184,690	36,877,287
2032	11,632,883	1,217,404	-	10,415,480	11,632,883
Total:	**$ 357,261,391**	**$ 11,116,308**	**$ 247,500,000**	**$ 98,645,083**	**$ 357,261,391**
2033-2042	57,601,694	12,454,143	-	45,147,551	57,601,694
Total:	**$ 414,863,085**	**$ 23,570,451**	**$ 247,500,000**	**$ 143,792,634**	**$ 414,863,085**

10.5 FINANCIAL FORECAST

The financial forecast, or revenue requirement analysis, forecasts the amount of annual revenue that needs to be generated by user rates. The analysis incorporates operating revenues, O&M expenses, debt service payments, rate-funded capital needs, and any other identified revenues or expenses related to operations. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates. In addition to annual operating costs, the revenue needs also include debt covenant requirements and specific fiscal policies and financial goals of the City.

For this analysis, two revenue sufficiency tests have been developed to reflect the financial goals and constraints of the City: cash needs must be met; and debt coverage requirements must be realized. In order to operate successfully with respect to these goals, both tests of revenue sufficiency must be met.

Cash Test – The cash flow test identifies all known cash requirements for the City in each year of the planning period. Typically, these include O&M expenses, debt service payments, rate-funded system reinvestment funding or directly funded capital outlays, and any additions to specified reserve balances. The total annual cash needs of the City are then compared to projected cash revenues using the current rate structure. Any projected revenue shortfalls are identified, and the rate increases necessary to make up the shortfalls are established.

Coverage Test – The coverage test is based on a commitment made by the City when issuing revenue bonds and some other forms of long-term debt. For the purposes of this analysis, revenue bond debt is assumed for any needed debt issuance. As a security condition of issuance, the City would be required per covenant to agree that the revenue bond debt would have a higher priority for payment (a senior lien) compared to most other expenditures; the only outlays with a higher lien are O&M expenses. Debt service coverage is expressed as a multiplier of the annual revenue bond debt service

payment. For example, a 1.00 coverage factor would imply that no additional cushion is required. A 1.25 coverage factor means revenue must be sufficient to pay O&M expenses, annual revenue bond debt service payments, and an additional 25 percent of annual revenue bond debt service payments. The excess cash flow derived from the added coverage, if any, can be used for any purpose, including funding capital projects. Targeting a higher coverage factor can help the City achieve a better credit rating and provide lower interest rates for future debt issues.

In determining the annual revenue requirement, both the cash and coverage sufficiency tests must be met, and the test with the greatest deficiency drives the level of needed rate increase in any given year.

10.5.1 Current Financial Structure

The City maintains a fund structure and implements financial policies that target management of a financially viable and fiscally responsible wastewater system.

10.5.2 Fiscal Policies

A summary of the key financial policies employed by the City, as well as those recommended and incorporated in the financial program, are discussed below.

Operating Fund – Operating reserves are designed to provide a liquidity cushion to ensure that adequate cash working capital will be maintained to deal with significant cash balance fluctuations, such as seasonal fluctuations in billings and receipts, unanticipated cash expenses, or lower than expected revenue collections. Like other types of reserves, operating reserves also serve another purpose: they help smooth rate increases over time. Target funding levels for an operating reserve are generally expressed as a certain number of days of O&M expenses, with the minimum requirement varying with the expected revenue volatility. Industry practice for utility operating reserves ranges from 30 days (8 percent) to 120 days (33 percent) of O&M expenses, with the lower end more appropriate for utilities with stable revenue streams and the higher end more appropriate for utilities with significant seasonal or consumption-based fluctuations.

This financial plan targets a minimum balance in the wastewater utility Operating Fund equal to 45 days of O&M expenses.

Capital Fund – A utility capital contingency reserve is an amount of cash set aside in case of an emergency should a piece of equipment or a portion of the utility's infrastructure fail unexpectedly. The reserve also could be used for other unanticipated capital needs, including capital project cost overruns. Industry practices range from maintaining a balance equal to 1 to 2 percent of fixed assets, an amount equal to a 5-year rolling average of CIP costs, or an amount determined sufficient to fund equipment failure (other than catastrophic failure). The final target level should balance industry practices with the risk level of the City.

This financial plan targets a minimum balance in the wastewater utility capital fund equal to 2 percent of fixed assets. This results in a target balance ranging from $2.3M - $9.4M from 2023-2032.

System Reinvestment – System reinvestment funding promotes system integrity through ongoing repair and replacement of system infrastructure. Ideally, a detailed asset management plan would guide the level of rate funded system reinvestment, however, in absence of this level of effort, annual depreciation expense is commonly used as a measure of the decline in asset value associated with routine use of the system. Particularly for utilities that do not already have an explicit system reinvestment policy in place, implementing a funding level based on full depreciation expense could significantly impact rates. An alternative benchmark is annual depreciation expense net of debt principal payments on outstanding debt. This approach recognizes that customers are still paying for certain assets through the debt component of their rate and intends to avoid simultaneously charging customers for an asset and its future replacement. The specific benchmark used to set system reinvestment funding targets is a matter of policy that must balance various objectives, including managing rate impacts, keeping long-term costs down, and promoting "generational equity" (i.e., not excessively burdening current customers with paying for facilities that will serve a larger group of customers in the future).

The City is currently phasing in system reinvestment funding towards annual depreciation, starting at 85 percent of depreciation in 2022, and planning to reach 100 percent by 2027. With this phase-in strategy in place, the City's annual rate funded system reinvestment is forecasted to fund an average of $7.2 million in capital costs annually through rate revenues.

Debt Management – It is prudent to consider policies related to debt management as part of a broader utility financial policy structure. Debt management policies should be evaluated and formalized, including the level of acceptable outstanding debt, debt repayment, bond coverage, and total debt coverage targets. The City has three outstanding wastewater revenue bonds, which will all be repaid between 2030-2038.

Because the City intends to continue using revenue bonds as a source of capital funding, and in alignment with internal City policies, this financial plan targets coverage of 1.50. Targeting a higher than required coverage ratio, such as the City's internal ratio, helps the City maintain its credit rating and can provide lower interest rates on future debt.

10.5.3 Financial Forecast

The financial forecast is primarily based upon the City's 2022/2023 biennial budget and takes into consideration other key factors and assumptions needed to develop a complete portrait of the City's annual wastewater utility financial obligations. The following is a list of the key revenue and expense factors and assumptions used to develop the financial forecast.

- **Growth** – Rate revenue escalation is based on the forecast of dry weather flow provided in **Chapter 4, Table 4-9**. On average, annual growth for the forecast period is 2.08% per year.
- **Revenue** – The City has two general revenue sources: 1) wastewater service charges (rate revenue); and 2) miscellaneous (non-rate) revenue. In the event of a forecasted annual shortfall, rate revenue can be increased to meet the annual revenue requirement. For the purpose of this financial forecast, rate revenues are forecasted to increase with customer growth and the majority of non-rate revenues are held constant throughout the forecast period.

In addition, it is assumed that the City of Edmonds will contribute to future capital projects related to treatment plant upgrades equal to 4.00 percent of the overall treatment plant expenses. Actual contributions will depend on future negotiations between the City of Lynnwood and the City of Edmonds and their share of allocated capacity.

- **General Facilities Charge Revenue** – The existing general facilities charges are applied to the projected new connections to forecast connection charge revenue. Based on the growth assumptions described above, the connection charges will generate an average of $1.1 million annually from 2023-2032. This equates to an average of 448 new connections per year. Connection charge revenue is directed towards annual capital needs.
- **Expenses** – O&M expense projections are based on the City's 2022/2023 biennial budget with general cost inflation increases ranging from 6.00 - 3.00 percent, labor cost increases of 6.00 - 3.00 percent, and benefit cost inflation increases of 8.0 percent per year. Taxes are calculated based on forecasted revenues and prevailing tax rates. The near-term inflation rates are representative of the current economic climate which has been exacerbated by the global pandemic and supply chain issues. The forecast assumes that the increased inflation levels are in effect in the short term, and future inflation will return to historical levels. If the current increased inflation trends continue, the City will need to revisit the forecasted rate strategy.
- **Existing Debt** – The wastewater utility has three outstanding revenue bond debt issues. The 2015 revenue bond has annual payments averaging $1.2 million that end in 2035, with the 2018 bond carrying payments averaging $1.3 million annually through 2038, and the 2020 refunded bond carrying payments averaging $374,000 annually through 2030. The total annual existing debt service obligations begin 2023 at $2.9M and are reduced to $2.5 by 2032 and will be completely repaid by 2038.
- **Future Debt** – The capital financing strategy developed for this Plan forecasts the need for $247.5M in new debt proceeds in four (4) separate issuances throughout the ten-year forecast. The analysis performed assumes all new debt is through revenue bond financing. Annual new debt service obligations begin in 2024 at $4.3M, before increasing to $11.2M in 2026 and then $16.6M in 2028, before finally rising to $20.1M in 2030. The City will revisit actual borrowing needs as the date of issuance approaches.
- **Transfers to Capital** – Operating fund balance above the minimum requirement is assumed to be available to fund capital projects and projected to be transferred to the Capital Fund each year, if needed. On average, and in addition to the City's dedicated rate funding provision, the utility is forecast to transfer $1.6M to the Capital Fund annually from 2023 to 2032.
- **O&M Additions –** In addition to the O&M line-item budget, the forecast includes new full-time employees (FTEs) as well as biosolids hauling while the new treatment plant is constructed.
    - As identified in **Chapter 8** of this Plan, 5.1 new FTEs are planned throughout the study period. For forecasting purposes, and based on discussions with City staff, it was assumed that the average FTE will add $130,000 per year in salary and benefit expenses (in 2022 dollars).
    - Beginning in 2023, the City also expects to incur $1.0M (2022 dollars) in additional expenses related to biosolids hauling while the new treatment plant is constructed. These additional expenses will be eliminated when the new treatment plant is operational.

Although the financial plan is completed through 2042, the rate strategy focuses on the shorter-term planning period of 2023 through 2032. It is recommended that the City revisit the proposed rates every 2 to 3 years to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the financial plan and future rates should be adjusted as needed.

Table 10-6 summarizes the annual revenue requirements based on the forecast of revenues, expenditures, fund balances, and fiscal policies.

Table 10-6
10-year Financial Forecast

Revenue Requirement	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Revenues										
Rate Revenues Under Existing Rates	$ 12,262,890	$ 12,517,958	$ 12,778,332	$ 13,044,121	$ 13,315,439	$ 13,592,400	$ 13,875,122	$ 14,163,724	$ 14,458,330	$ 14,759,063
Non-Rate Revenues	621,901	635,127	630,107	637,549	639,005	640,528	642,156	643,478	644,846	644,035
Total Revenues	**$ 12,884,791**	**$ 13,153,085**	**$ 13,408,439**	**$ 13,681,670**	**$ 13,954,443**	**$ 14,232,928**	**$ 14,517,278**	**$ 14,807,203**	**$ 15,103,176**	**$ 15,403,098**
Expenses										
Cash Operating Expenses	$ 9,272,379	$ 9,816,231	$ 10,305,660	$ 10,824,521	$ 11,374,362	$ 11,975,310	$ 12,405,098	$ 12,853,475	$ 12,117,780	$ 12,570,259
Existing Debt Service	2,938,037	2,933,824	2,935,216	2,938,679	2,935,383	3,039,175	3,037,989	3,038,162	2,503,395	2,507,304
New Debt Service	-	4,336,342	4,336,342	11,225,857	11,225,857	16,575,363	16,575,363	20,060,647	20,060,647	20,060,647
Rate Funded System Reinvestment	2,211,154	2,885,450	3,832,476	4,842,778	7,156,407	8,742,799	9,417,121	10,238,942	11,160,874	11,451,696
Total Expenses	**$ 14,421,570**	**$ 19,971,847**	**$ 21,409,695**	**$ 29,831,834**	**$ 32,692,009**	**$ 40,332,647**	**$ 41,435,570**	**$ 46,191,226**	**$ 45,842,697**	**$ 46,589,906**
Total Surplus (Deficiency)	**(1,536,779)**	**(6,818,762)**	**(8,001,256)**	**(17,294,892)**	**(18,737,566)**	**(26,099,719)**	**(26,918,293)**	**(31,476,515)**	**(30,739,521)**	**(31,186,808)**
Annual Rate Adjustment	**24.25%**	**24.25%**	**24.25%**	**24.25%**	**12.00%**	**12.00%**	**5.00%**	**5.00%**	**0.00%**	**0.00%**
Cumulative Annual Rate Adjustment	**24.25%**	**54.38%**	**91.82%**	**138.33%**	**166.93%**	**198.97%**	**213.91%**	**229.61%**	**229.61%**	**229.61%**
Rate Revenues After Rate Increase	$ 15,236,641	$ 19,325,302	$ 24,511,131	$ 31,088,546	$ 35,543,410	$ 40,636,639	$ 43,555,975	$ 46,685,036	$ 47,656,085	$ 48,647,331
Additional In-Lieu of Taxes from Rate Increase	58,291	133,438	229,986	353,707	435,713	530,121	581,804	637,483	650,742	664,278
Net Cash Flow After Rate Increase	**$ 1,378,681**	**$ (144,855)**	**$ 3,501,557**	**$ 1,540,554**	**$ 3,054,693**	**$ 414,398**	**$ 2,180,756**	**$ 499,805**	**$ 1,807,492**	**$ 2,037,182**
Coverage After Rate Increases	2.6	1.5	2.2	1.5	1.8	1.5	1.7	1.5	1.6	1.7

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The financial forecast indicates that at existing rate levels the utility will be deficient beginning in 2023. As growth in expenses outpace growth in revenues and the utility ramps up capital funding through dedicated rate revenues and future bond proceeds, the identified deficiency will grow without rate action. Annual increases of 24.25 percent from 2023 through 2026, 12.00 percent in 2027 and 2028, followed by 5.00 percent through 2030, are needed to meet the forecasted annual operating and capital needs of the system. The City currently performs rate studies on a three-year cycle and adopts rates based on most recent capital, operating and debt information available. As the City approaches the first projected debt issuance, the rate strategy may be modified based on actual project costs and debt terms.

10.5.4 City Funds and Reserves

Table 10-7 shows a summary of the projected Operating Fund and Capital Fund ending balances through 2032 based on the rate forecasts presented above. The Operating Fund is maintained at a minimum of 45 days of O&M expenses. Depending on the year, the Capital Fund balance does fall below the target of 2.00 percent of fixed assets, recovering the following year. The Capital Fund balance is projected to meet or exceed its target annually starting 2032 and thereafter. When evaluating fund reserve levels and objectives, it is important to recognize that the value of reserves lies in their potential use. A reserve strategy that deliberately avoids any use of reserves negates their purpose. Fluctuation of reserve levels merely indicates that the system is working, while lack of variation over many years strongly suggest that the reserves are, in fact, unnecessary.

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Table 10-7
Ending Cash Balance Summary

Ending Fund Balance	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Operating Fund	$ 2,346,413	$ 1,210,220	$ 1,270,561	$ 1,334,530	$ 1,402,319	$ 1,476,408	$ 1,529,396	$ 1,584,675	$ 1,493,973	$ 1,549,758
Capital Fund	8,402,609	35,853,040	1,254,359	47,669,820	2,872,364	17,335,071	3,311,586	25,340,189	3,094,671	6,158,704
Total	**$ 10,749,022**	**$ 37,063,260**	**$ 2,524,920**	**$ 49,004,350**	**$ 4,274,683**	**$ 18,811,479**	**$ 4,840,981**	**$ 26,924,864**	**$ 4,588,643**	**$ 7,708,462**

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10.6 CURRENT AND PROJECTED RATES

10.6.1 Current Rates

The City's current rate structure consists of a fixed bi-monthly charge based on customer class and a variable charge per hundred cubic feet (CCF), with a 20 CCF bi-monthly allowance for all classes except sewer only accounts. The sewer only accounts are assessed a fixed bi-monthly charge without a variable charge. **Table 10-8** shows the existing rate schedule. The City offers reduced rates for those that qualify.

Table 10-8
Existing Schedule of Rates

Wastewater Rates	Current
Single Family	
Fixed Rate	$124.86
Volume Charge (>20 ccf)	$5.09
Multi-Family and Mobile	
Fixed Rate	$93.79
Volume Charge (>20 ccf)	$4.39
Commercial	
Fixed Rate	
5-8" - 3/4"	$200.27
1"	$256.75
1.5"	$308.10
2"	$462.16
3"	$1,553.36
4"	$1,964.18
6"	$2,914.15
Volume Charges (>20 ccf)	
Volume S1 & S2	$6.47
Volume S3	$10.21
Volume S4	$16.79
Volume S5	$19.55
Sewer Only	
Residential	$130.26
Commercial	$396.94

10.6.2 Projected Rates

The financial forecast discussed above indicates the need for annual rate adjustments in order to satisfy all forecasted financial obligations. The fund this Plan as scheduled, annual rate increases are proposed at 24.25 percent from 2023 through 2026, 12.00 percent from 2027 through 2028, and 5.00 percent increases through 2030. **Table 10-9** shows the projected rates with increases applied uniformly to all wastewater classes.

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Table 10-9
Proposed Schedule of Rates

Wastewater Rates	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Existing	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed	Proposed
Single Family											
Fixed Rate	$103.19	$128.21	$159.31	$197.94	$245.94	$275.45	$308.50	$323.93	$340.12	$340.12	$340.12
Volume Charge (>20 ccf)	$4.21	$5.23	$6.50	$8.08	$10.03	$11.24	$12.59	$13.22	$13.88	$13.88	$13.88
Multi-Family and Mobile											
Fixed Rate	$77.51	$96.31	$119.66	$148.68	$184.73	$206.90	$231.73	$243.31	$255.48	$255.48	$255.48
Volume Charge (>20 ccf)	$3.63	$4.51	$5.60	$6.96	$8.65	$9.69	$10.85	$11.40	$11.96	$11.96	$11.96
Commercial											
Fixed Rate											
5-8" - 3/4"	$165.51	$205.65	$255.52	$317.48	$394.47	$441.80	$494.82	$519.56	$545.54	$545.54	$545.54
1"	$212.19	$263.65	$327.58	$407.02	$505.72	$566.41	$634.38	$666.09	$699.40	$699.40	$699.40
1.5"	$254.63	$316.38	$393.10	$488.43	$606.87	$679.69	$761.26	$799.32	$839.29	$839.29	$839.29
2"	$381.95	$474.57	$589.66	$732.65	$910.32	$1,019.55	$1,141.90	$1,199.00	$1,258.94	$1,258.94	$1,258.94
3"	$1,283.77	$1,595.08	$1,981.89	$2,462.50	$3,059.66	$3,426.82	$3,838.03	$4,029.94	$4,231.43	$4,231.43	$4,231.43
4"	$1,623.29	$2,016.94	$2,506.05	$3,113.76	$3,868.85	$4,333.11	$4,853.08	$5,095.74	$5,350.52	$5,350.52	$5,350.52
6"	$2,408.39	$2,992.42	$3,718.09	$4,619.72	$5,740.01	$6,428.81	$7,200.26	$7,560.28	$7,938.29	$7,938.29	$7,938.29
Volume Charges (>20 ccf)											
Volume S1 & S2	$5.35	$6.65	$8.26	$10.26	$12.75	$14.28	$15.99	$16.79	$17.63	$17.63	$17.63
Volume S3	$8.44	$10.49	$13.03	$16.19	$20.12	$22.53	$25.23	$26.49	$27.82	$27.82	$27.82
Volume S4	$13.88	$17.25	$21.43	$26.62	$33.08	$37.05	$41.50	$43.57	$45.75	$45.75	$45.75
Volume S5	$16.16	$20.08	$24.95	$31.00	$38.51	$43.14	$48.31	$50.73	$53.26	$53.26	$53.26
Sewer Only											
Residential	$107.65	$133.76	$166.19	$206.49	$256.57	$287.35	$321.84	$337.93	$354.83	$354.83	$354.83
Commercial	$328.05	$407.60	$506.45	$629.26	$781.85	$875.68	$980.76	$1,029.80	$1,081.29	$1,081.29	$1,081.29

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10.7 AFFORDABILITY

A common affordability metric used by the Environmental Protection Agency (EPA) to measure the relative financial impact wastewater rates have on a community as a whole considers whether rates exceed 2.50 percent of a community's median household income. The average median household income for the City was $67,576 in 2021 based on 2017 through 2021 data provided by the U.S. Census Bureau. The 2021 value is escalated utilizing the 6.00 - 3.00 percent general cost inflation rate used in the financial forecast to project the median household income in future years. **Table 10-10** presents the City's equivalent monthly wastewater bill, projected through 2032 and tested against the 2.50 percent monthly affordability threshold.

Table 10-10
Community Affordability Test

Year	Inflation	Median HH Income	2.5% Monthly Threshold	Projected Monthly Bill	% of Median Income
2021		$ 67,576			
2022	5.00%	70,955	$ 147.82	$ 51.60	0.87%
2023	6.00%	75,212	156.69	64.11	1.02%
2024	6.00%	79,725	166.09	79.65	1.20%
2025	3.00%	82,117	171.08	98.97	1.45%
2026	3.00%	84,580	176.21	122.97	1.74%
2027	3.00%	87,117	181.49	137.72	1.90%
2028	3.00%	89,731	186.94	154.25	2.06%
2029	3.00%	92,423	192.55	161.96	2.10%
2030	3.00%	95,196	198.32	170.06	2.14%
2031	3.00%	98,051	204.27	170.06	2.08%
2032	3.00%	100,993	210.40	170.06	2.02%

Applying the 2.50 percent test, the City's rates are forecasted to remain within the indicated affordability range through 2032.

10.8 CONCLUSION

The results of this analysis indicate that existing rates are not sufficient to fund ongoing operations, including capital spending schedules outlined in **Chapter 9**, beginning in 2023. To keep pace with expenses and plan for upcoming treatment plant infrastructure investments the following rate increases are forecasted:

- 24.25 percent annually from 2023 through 2026,
- 12.00 percent annually from 2027 through 2028, and
- 5.00 percent annually through 2030.

It is recommended that the City regularly review and update the key underlying assumptions that compose the multi-year financial plan to ensure that adequate revenues are collected to meet the City's total financial obligations.

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