

LAKE WHATCOM WATER AND SEWER DISTRICT
1220 Lakeway Drive
Bellingham, Washington 98229

COMPREHENSIVE SEWER PLAN
2020 UPDATE



March 26, 2020

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TABLE OF CONTENTS

GLOSSARY OF TERMS, ACRONYMS AND ABBREVIATIONS	IV
I. BACKGROUND	1
A. Scope and Objective of Update	1
1. General	1
2. Scope and Objective	1
3. Overview of Growth Management Implications on this Sewer Plan Update	1
B. System Owner/Operator Information	2
1. District Office Location and Governing Information	2
2. District Operations Information	3
C. Existing District Boundaries and Sewer System Locations	3
1. General District Boundary Information	3
2. Public Water System Information	4
II. EXISTING FACILITIES	1
A. Wastewater Collection and Delivery System	1
1. Sudden Valley – Geneva Collection System	1
2. North Shore Collection System	8
B. Pumping Facilities	13
1. Sudden Valley – Geneva Collection System	13
2. North Shore Collection System	13
C. City of Bellingham Wastewater Treatment Plant	13
1. Wastewater Treatment Agreement	13
2. Projected 20-Year Wastewater Flows	14
D. Industrial Wastewater-Producing Facilities within the District System	14
III. FUTURE SEWER SERVICE REQUIREMENTS	15
A. Potential Sewer Service in the Sudden Valley- Geneva Collection System	15
1. Other Developer Extensions / Local Improvement Districts	15
B. Potential Sewer Service in the North Shore Collection System	16
1. North Shore Road ULID	16
C. Potential Sewer Service in the South Bay / Blue Canyon Study Area	16

TABLE OF CONTENTS

IV. SEWER RATE STRUCTURE AND REVENUE PLANNING	18
A. Requirements for Connection to the District System	18
B. Revenue Planning	18
C. Sewer Rate Structure	19
1. Sewer Service Rates	19
2. General Facilities Connection Fee (GFC)	19
3. Cost per Service	19
V. FUTURE IMPROVEMENT PROJECTS	21
A. Future Maintenance and Operational Improvements	21
1. Sewer Flushing Program	21
2. I&I Identification Program	21
Annual I&I Analyses	21
Sewer Videoing Program	21
Targeted Smoke Testing Program	21
B. Future Administrative, Financial and Planning Improvements	22
1. Hazard Mitigation Plan For District Wastewater Facilities	22
2. Update Existing Emergency Response Plan	22
3. Maintenance Management Program Development	22
4. Lake Whatcom Watershed Committee (WRIA 1)	23
5. Sewer Service Rate Increases	23
C. Future Capital Improvement Projects	23
1. Pump Station Upgrades – Ongoing	23
2. Miscellaneous Sewer Line Replacement and Repair	23
3. Manhole Rehabilitation	24
4. Repair/Replace Lake Whatcom Boulevard Mains	24
VI. DOCUMENTS INCORPORATED BY REFERENCE	24
VII. NON-PROJECT SEPA	25
VIII. EXHIBITS	
EXHIBIT A. DISTRICT BOUNDARY	
EXHIBIT B. SEWER COLLECTION SYSTEMS	
EXHIBIT C. UPDATE OF I&I ANALYSIS	
EXHIBIT D. SUPPLEMENTAL HYDRAULIC SEWER MODEL ANALYSIS	
EXHIBIT E. SUDDEN VALLEY- GENEVA FLOW SCHEMATICS	
EXHIBIT F. NORTH SHORE FLOW SCHEMATIC	

TABLE OF CONTENTS

EXHIBIT G. CITY / DISTRICT SEWER AGREEMENT

EXHIBIT H. PUBLIC WATER SYSTEMS

EXHIBIT I. MASTER FEES AND CHARGES SCHEDULE

EXHIBIT J-1 TO J-4. POTENTIAL SEWER GROWTH MAP

EXHIBIT K. CAPITAL IMPROVEMENT PLAN

EXHIBIT L. WATER QUALITY MONITORING REPORT LAKE WHATCOM NORTH SHORE ON-SITE SEWAGE
SYSTEM LEACHATE DETECTION PROJECT

 NORTH SHORE ON-SITE SEPTIC SYSTEM PHOSPHORUS LOADING ANALYSIS

EXHIBIT M. NORTH SHORE SYSTEM EXTENSION PRELIMINARY INVESTIGATION

EXHIBIT N. STUDY AREA CHARACTERISTICS

GLOSSARY OF TERMS, ACRONYMS AND ABBREVIATIONS

Average dry weather flow	The average non-storm flow over 24 hours during the dry months of the year (May through September). It is composed of the average sewage flow and the average dry weather inflow/infiltration.
Average wet weather flow	The average flow over 24 hours during the wet months of the year (October through April) on days when no rainfall occurred on that or the preceding day.
BMPs	Best management practices
CAOs	Critical Areas Ordinances
CIP	Capital improvement program
City	City of Bellingham
Clean Water Act (CWA)	Also known as the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.).
Collection main	In collection systems, this is a larger pipe in which smaller branch and submain sewers are connected. The collection main may also be called a main or trunk sewer.
Collection system	In a wastewater system, a collection system is a system of pipes which receives and conveys sewage and/or storm water.
County	Whatcom County
District	Lake Whatcom Water and Sewer District
DOH	Washington State Department of Health.
Domestic wastewater	Human-generated sewage that flows from homes and businesses.
DNR	Washington Department of Natural Resources
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency.
ERU	Equivalent Residential Unit
ESA	Endangered Species Act
Fecal coliform bacteria	A group of organisms common to the intestinal tracts of humans and animals. The presence of fecal coliform bacteria in water, wastewater, or biosolids is an indicator of pollution and possible contamination by pathogens.
Force main	A pipeline leading from a pumping station that transports wastewater under pressure.

GLOSSARY OF TERMS, ACRONYMS AND ABBREVIATIONS

GMA	Growth Management Act
GPD	A measurement of flow rate expressed in gallons per day.
gpcd	gallons per capita per day (gallons per person per day)
HDPE	High-density polyethylene pipe
HOA	home owner's association
HPA	Hydraulic Project Approval
I & I	Infiltration and inflow
Infiltration	The penetration of water from the land surface into the soil, or the penetration of water from the soil into a sewer system by such means as defective pipes, pipe joints or connections, or manhole walls.
Inflow	Flows of extraneous water into a wastewater conveyance system from sources other than sanitary sewer connections, such as roof leaders, basement drains, manhole covers, and cross-connections from storm sewers.
Interceptor sewers	The portion of a collection system that connects main and trunk sewers with the wastewater treatment plant, thereby controlling the flow into the plant.
LAMIRD	Limited Area of More Intense Rural Development
Large On-site sewage treatment system (LOSS)	A DOH permitted facility receiving less than 100,000 gpd of sewage from residential sources.
Lateral sewers	Pipes that receive sewage from homes and businesses and transport that sewage to trunks and mains.
LLRI	Lake Louise Road Interceptor
LWBI	Lake Whatcom Boulevard Interceptor
LWMP	Lake Whatcom Management Program
Main sewer	This is a larger pipe in which smaller branch and submain sewers are connected. It may also be called a trunk sewer.
MG	Million gallons, a measure of liquid volume.
MGD	A measurement of flow rate expressed in millions of gallons per day.
mg/L	A measurement of concentration in milligrams per liter sometimes expressed as parts per million (ppm).
National Pollutant Discharge Elimination System (NPDES)	Section 402 of the U.S. Clean Water Act, which prohibits discharge of pollutants into navigable waters of the United States unless a special permit is issued by EPA, a state, or (where delegated) a tribal government on an Indian reservation.

GLOSSARY OF TERMS, ACRONYMS AND ABBREVIATIONS

NPDES Permit	Permit issued under the National Pollution Discharge Elimination System, which establishes reporting requirements and other conditions for discharge of pollutants to receiving waters.
OSS	Residential on-site sewage treatment system
O&M	operation and maintenance
Pathogens	Microorganisms that can cause disease in other organisms or humans, animals, and plants. Pathogens include bacteria, viruses, fungi, or parasites found in sewage, in runoff from farms or city streets, and in water used for swimming. Pathogens can be present in municipal, industrial, and nonpoint source discharges.
Peak flow	The maximum flow expected to enter a facility.
Pump station	A pump station is used when sewer trunk lines have conveyed flows to a low-lying area. The pump station lifts the wastewater up to a point where it can flow by gravity to a wastewater treatment plant or another pump station
PVC	polyvinyl chloride pipe
Raw sewage	Untreated wastewater.
RCW	Revised Code of Washington
Sewer Basin / Zone	The land area tributary to a collection system point that includes all sources of the wastewater at issue.
Side sewer	A privately owned and maintained sewer which connects the plumbing system of the building to the public sewer pipes.
State Environmental Policy Act (SEPA)	A state law (Chapter 43.21C RCW) that requires state agencies and local governments to consider environmental impacts when making decisions about certain activities, such as development proposals over a certain size, and comprehensive plans. As part of this process, environmental impacts are documented and opportunities for public comment are provided.
SVCA	Sudden Valley Community Association
Telemeter	To transmit to a distant receiving station by radio or other electronic means.
TMDL	total maximum daily load
Treatment	Chemical, biological, or mechanical procedures applied to industrial or municipal wastewater or to other sources of contamination to remove, reduce, or neutralize contaminants.

GLOSSARY OF TERMS, ACRONYMS AND ABBREVIATIONS

Trunk sewer	This is a larger pipe in which smaller branch and submain sewers are connected. It may also be called a main sewer.
UGA	Urban Growth Area
ULID	Utility Local Improvement District
WAC	Washington Administrative Code
Wastewater collection system	The piping and pumping system used for the collection and conveyance of domestic, commercial, and industrial wastewater.
Water quality criteria	Standards used to protect of water for drinking, swimming, raising fish, farming or industrial use.
Watershed	Lake Whatcom Watershed
Wastewater Treatment Plant (WWTP)	An Ecology-permitted water pollution control facility intended to remove pollutants from wastewater and provide disinfection before discharge.
WCC	Whatcom County Code
WDFW	Washington Department of Fish and Wildlife

I. BACKGROUND

A. Scope and Objective of Update

1. General

This updated Comprehensive Sewer Plan for Lake Whatcom Water and Sewer District (District) has been prepared at the request of the District Board of Commissioners and in accordance with the Washington State Department of Ecology (Ecology) guidelines as presented in Washington Administrative Code (WAC) 173-240-050.

In accordance with Revised Code of Washington (RCW) 57.16.010, the District's Comprehensive Sewer Plan is submitted to the following persons and/or agencies for review and approval:

- Washington State Department of Ecology
- Director, Whatcom County Health Department
- County Engineer, Whatcom County Public Works Department
- Whatcom County Council

2. Scope and Objective

The purpose of this report is to provide a comprehensive overview of the existing sewage installations and treatment facilities operated and maintained by Lake Whatcom Water and Sewer District. In addition, this report addresses potential future facilities development and projected population growth.

This report will cover the following topics:

- system owner/operator information,
- sewer system layout including a description of the existing system boundaries,
- description of existing collection facilities including recently completed improvements,
- discussion of development trends within sewer district boundaries,
- discussion of existing and future collection and treatment issues such as existing and future sewer flows, and infiltration/inflow (I&I),
- discussion of sewer rate structure and revenue planning,
- discussion of present and future development alternatives within the district boundaries,
- outline of future improvement projects within the District.

3. Overview of Growth Management Implications on this Sewer Plan Update

This update of the Comprehensive Sewer Plan for the District seeks to comply with the Whatcom County Comprehensive Plan, Whatcom County Code 20.82.030(4), and the requirements of the Washington State Growth Management Act (GMA), Chapter 36.70A RCW.

I. BACKGROUND

The primary reasons for Lake Whatcom Water and Sewer District to update its plan at this time are:

- to ensure compliance with RCW requiring regular updates,
- to incorporate capital improvements made in the last several years,
- to outline and update the District’s Capital Improvement Plan, and
- to ensure the District’s ability to set and collect appropriate General Facilities Charges (i.e. connection charges) and sewer service charges for all District facilities.

The District owns and operates wastewater facilities in unincorporated Whatcom County. The District boundary includes the area around Lake Whatcom that is not part of the City of Bellingham. The District operates collection systems on both the north and south shore of Lake Whatcom and now has twenty-six sewer pump stations (after replacing Country Club Pump Station with a gravity main and decommissioning the pump station in 2019), all located in Whatcom County.

Whatcom County is the land-use planning and permitting authority for the District area. Whatcom County Comprehensive Plan Policy 5T-1 is to “Discourage extension of sewer lines in areas not designated as urban growth areas or Rural Communities, except in those limited circumstances shown to be necessary to protect basic public health and safety and the environment and when such services are financially supportable at rural densities and do not permit urban development” (see also Policy 2EE-4). Although not presently permitted under GMA or by its current comprehensive plan, Whatcom County previously approved development and lot creation at urban densities around Lake Whatcom, both inside and outside of what are now designated as urban growth areas (UGAs) and limited areas of more intense rural development (LAMIRDs, Whatcom County Code [WCC] 20.80.100). This Comprehensive Sewer Plan endeavors to be consistent with the provisions contained in the Whatcom County Comprehensive Plan and Whatcom County Code 20.82.030(4). However, the forecasting included in this Plan is based on the District’s judgment that, where such residential development already exists or is permitted under previous Whatcom County subdivision and development approvals, these urban-density properties should be connected to public sewers and on-site septic systems (OSS) should not be allowed.

In accordance with the District’s Administrative Code, properties that lie within the District’s boundaries are generally required to connect to the sewer if the property lies within 200 feet of the public sewer and is inside of a UGA or LAMIRD, or within 150 feet of the public sewer and is outside of a UGA or LAMIRD.

B. System Owner/Operator Information

1. District Office Location and Governing Information

The sewer collection facilities covered in this report are owned and operated by:
Lake Whatcom Water and Sewer District (formerly Whatcom County Water District 10)
1220 Lakeway Drive
Bellingham, Washington 98229
(360) 734-9224 – Office Telephone
(360) 738-8250 – Office Fax

I. BACKGROUND

The District is administered by a five-person Board of Commissioners (Board) who are each elected to six (6) year terms. This Board meets twice monthly and holds special sessions as the need arises.

2. District Operations Information

The District is responsible for planning, construction, operation and maintenance of all public sewer facilities within the District's boundaries around Lake Whatcom, Washington. In addition, the District is responsible for operation and maintenance of a 10-inch force main and a 12-inch force main and several gravity mains operating between the District's sewer collection system and the City of Bellingham's sewer collection system for transport to the City's Post Point Wastewater Treatment Plant. The operations and maintenance of the District's facilities is overseen by the General Manager who works with a support staff consisting of an Assistant General Manager/Engineer, Finance Manager, Operations and Maintenance Manager, and six other office administrative / technical staff members. The field crew consists of an additional eight employees. The District contracts for legal counsel, consulting engineers, and auditors. The District operates out of their office at 1220 Lakeway Drive, and their maintenance facility at 1010 Lakeview Street, Bellingham, Washington.

C. Existing District Boundaries and Sewer System Locations

1. General District Boundary Information

Lake Whatcom Water and Sewer District (formerly Whatcom County Water District No. 10) was originally formed in November 1968 to provide sewer service to the residences around Lake Whatcom that were not already served by the City of Bellingham. In 1971 a sewer interceptor between Sudden Valley and Geneva was constructed to transport sewage to the City of Bellingham for treatment. At the same time, a series of utility local improvement districts (ULID Nos. 1-5) were established in Geneva and Edgewater Lane (on North Shore) for the construction of branch collector sewers. Collector sewers and pump stations were installed in Sudden Valley as each platted Division was developed. Subsequent to formation, the District assumed control and operation of the Sudden Valley Development water and sewer system on January 1, 1977, and of the Geneva Water Corporation July 1, 1977.

In the late 1970s, the District helped establish two utility local improvement districts (ULID No. 11 and ULID No. 16) and constructed the majority of the North Shore Sewer System. These two ULIDs financed the main interceptor and pump stations. Developer extension agreements have expanded the sewer collection system to include the Eagleridge, Agate Heights, and Edgewood subdivisions.

The District boundary includes areas in southwestern Whatcom County which are situated around and/or in the immediate vicinity of Lake Whatcom. The extent of the District's existing boundaries is detailed on Exhibit A.

Lake Whatcom Water and Sewer District can be divided into the following three main components for the purpose of analyzing its wastewater systems:

I. BACKGROUND

- a. Sudden Valley - Geneva Collection System – The District owns and operates a wastewater collection and force main transport system on the south-west shore of Lake Whatcom serving the Geneva area, the Sudden Valley Divisions and adjacent areas.
- b. North Shore Collection System – The District owns and operates a wastewater collection and force main transport system on the north and north-east shore of Lake Whatcom serving many of the properties along Northshore Drive outside of City of Bellingham city limits. There are approximately 100 residences on septic systems within 200 feet of Lake Whatcom that are within the District’s boundary but beyond the extents of the existing wastewater collection and force main transport system.
- c. South Bay / Blue Canyon Study Area – This area is included within the District’s official boundary and encompasses the area adjacent to the southern end of Lake Whatcom. The District does not currently provide water or sewer service to the existing developed properties in the South Bay / Blue Canyon Study Area, so all rely on septic systems and wells or lake draws for drinking water. In late 2006, the District was approached by a developer interested in sewer service in this Study Area, and a feasibility study was completed. The study was incorporated in the District’s 2008 Comprehensive Sewer Plan because it includes an area-wide analysis with comprehensive planning information. Because the Growth Management Act limits sewer extensions outside of defined urban areas, the District is not actively pursuing extending service to the South Bay / Blue Canyon Study Area, which is not a designated UGA or LAMIRD, as allowed under WCC 20.80.100, in the Whatcom County Comprehensive Plan. However, extending sewer service to already-built areas in the Lake Whatcom watershed is one approach to reducing phosphorus and/or bacteria loading and would support the Lake Whatcom total maximum daily load (TMDL) reduction goals.

More information on the topography, geology, hydrology and soils of each area can be found in Section VII, Exhibit N - Study Area Characteristics.

2. Public Water System Information

The District owns and operates public water systems within its boundaries in Whatcom County. The District’s Water System Comprehensive Plan was approved by the Washington State Department of Health (DOH) on October 3, 2018 and by Whatcom County Health Department March 2018.

There are several small Group A and Group B water systems that also operate within the District’s boundaries which are shown in Exhibit H.

The District operates sewer collection and transmission facilities only. The District does not have existing domestic wastewater treatment facilities, nor is it proposing any new domestic wastewater treatment facilities. Therefore, it is not necessary to include a discussion or map of the relationship between the location of existing private and public wells, other sources of water supply, and water distribution structures and domestic wastewater treatment facilities in this sewer plan.

II. EXISTING FACILITIES

A. Wastewater Collection and Delivery System

This section describes and analyzes the existing District facilities which are divided into two service areas:

- Sudden Valley - Geneva Collection System;
- North Shore Collection System.

Analysis of the existing and future projected wastewater flows for the system, as well as a discussion of the system inflow and infiltration, is included. Hydraulic modeling of both service areas was also performed and discussion is included.

1. Sudden Valley – Geneva Collection System

a) System Description

Originally put into service between 1970 and 1975, the Sudden Valley sewer collection system consists of 6-inch to 10-inch gravity lateral sewers feeding either the interceptor system along Lake Whatcom Boulevard (LWB) or the Lake Louise Road (LLR) interceptor with lift stations, pump stations and force mains. This system provides sewage collection for all service connections inside the Sudden Valley subdivisions and delivers this wastewater via either the LWB interceptor or the LLR interceptor to the City of Bellingham for treatment. The Geneva sewer collection system consists of 6-inch to 10-inch gravity lateral sewers feeding the LWB interceptor. Each sewer lift station or pump station installation is comprised of a wet well, dry-pit or top-mounted pumping equipment, local pump station controls and telemetry communication system. In addition, fourteen lift stations are connected to emergency backup generators to ensure normal pump station operation in the event of a power outage. The remaining lift stations are equipped with onsite generator receptacle outlets for connection to the District's portable generators in the event of a power outage and Camp Firwood PS has an automatic transfer switch with a dedicated portable generator on site Fall through Spring.

Table 1 summarizes the collection and delivery system components for the Sudden Valley - Geneva Collection System. Reference Exhibits B-1 to B-3 for additional information and mapping for this system.

II. EXISTING FACILITIES

Table 1: Sudden Valley - Geneva Collection System - Component Listing

System Component	Approximate Quantity
Sewer Manholes	1,790
Sewer Lift Stations	23
SV Sewer Detention Basin	1 @ 725,000 gallon capacity
4-inch Force Main	4,920 LF
6-inch Force Main	4,665 LF
8-inch Force Main	6,625 LF
10-inch Force Main	20,380 LF
12-inch Force Main	28,135 LF
15-inch Force Main	160 LF
6-inch Gravity Branch Sewer	13,275 LF
8-inch Gravity Branch Sewer	298,779 LF
10-inch Gravity Branch/Interceptor Sewer	8,620 LF
12-inch Gravity Sewer Interceptor	4,810 LF
14-inch Gravity Sewer Interceptor	5,090 LF
Total LF of Pipe	395,459 LF

The District has completed several improvement projects included in the previous Comprehensive Plan. These included smoke testing and video inspection to find leaks or illicit connections, spot repairs of leaking gravity mains, and grouting of leaking manholes. Over the past several years the District has installed manhole inserts (dishes) in areas with a high risk of flooding or surface water flow to reduce inflow into the collection system.

Additionally, the District has an ongoing program to upgrade its aging sewer lift stations. For some, the equipment has been completely replaced (including wet wells); others have been upgraded with new pump impellers and refurbished motors, and one has been taken out of service having been replaced by a gravity main. Table 2 lists the pump stations that have been upgraded since 2014.

Table 2: Sudden Valley-Geneva Collection System – Sewer Lift Station Upgrades Completed

Sewer Lift Station	Upgrade Description
Strawberry Point Pump Station (2016)	Smith & Loveless top-mounted pump station converted to a submersible pump station with new duplex pumps, increased capacity, new controls and telemetry, and wetwell rehabilitation.
Par Pump Station (2018)	Smith & Loveless top-mounted pump station converted to a submersible pump station with new duplex pumps, VFDs, controls and telemetry, wetwell rehabilitation and relocated emergency generator receptacle for easier access adjacent to the road.
Geneva Pump Station (2019)	Smith & Loveless top-mounted pump station converted to a submersible pump station with new duplex pumps, controls, power service, telemetry, wetwell rehabilitation and new standby generator.

II. EXISTING FACILITIES

Sudden Valley Pump Station (2016)	Replaced level transmitters with new submersible level transmitter and radar level transmitters for redundant wetwell level monitoring.
Beaver Pump Station (2018)	Replaced level transmitters with new submersible level transmitter and radar level transmitters for redundant wetwell level monitoring.
Flat Car Pump Station (2017)	Emergency bypass pipe and fittings procured and stored at the pump station for emergency redirection of flow from Flat Car to Sudden Valley Pump Station for maintenance and repairs of Beaver Pump Station and Lake Louise Road Interceptor.
(2018)	Replaced level transmitters with new submersible level transmitter and radar level transmitters for redundant wetwell level monitoring.
Strawberry Canyon Pump Station (2017)	New standby generator, I&I repairs and re-route of the overflow path of existing 500,000 gallon water reservoir out of this basin, because an overflow would inundate the station in the event of an overflow.
Lowe Pump Station (2018)	Replace aging Rotophase unit with VFDs.
Marina & Tomb Pump Stations (2016)	New standby generator (operates both pump stations).
Airport Generator (2019)	New standby generator.
Country Club Pump Station (2019)	New gravity sewer main installed by HDD methods enabled removal of pump station.
Camp Firwood Pump Station (2018)	New automatic transfer switch to operate a seasonally-dedicated towable generator.

The District has also completed several other projects that add to the operational flexibility of the sewer system. Table 3 lists the projects that have been completed since 2014.

Table 3: Sudden Valley-Geneva Collection System –Sewer System Projects Completed

	Upgrade Description
Sewer Capacity, Management, Operations and Maintenance (CMOM) Projects (on-going)	Smoke testing, pressure grouting and cure-in-place pipe (CIPP) repairs.
Whatcom Falls Manhole Sewer Rehab (2016)	Replaced a deteriorating 48-inch diameter sewer manhole in Whatcom Falls Park with a new 60-inch manhole with fiberglass reinforced plastic (FRP) liner and connecting piping.
Sewer Push Camera (2018)	The District purchased a portable sewer push camera for use in small diameter, 4 and 6-inch, pipes. This camera supplements the District's camera van inspection system.

II. EXISTING FACILITIES

Lake Whatcom Boulevard Interceptor Valve (2017)	Install gate valve inside an existing sewer manhole to allow for flow control of North Point Pump Station during wet weather events. Closing this valve routes North Point Pump Station flows through the Lake Louise Road Interceptor, allowing Airport Pump Station to pump without competing with North Point pumps.
Compulsory Sewer Connections (on-going)	Project compelled several single family residences with on-site sewage disposal systems to connect to public sewer. Additional compulsory sewer connections ongoing.
Backhoe (2019)	The District purchased a new CAT 420F2 HRC Backhoe to aid in ongoing operations and maintenance projects.
Vac Trucks (used - 2014; new - 2020)	The District purchased a used VacCon V390LHA and a new Vactor 2100-I to aid in ongoing operations and maintenance projects.
Boom Truck (2013)	The District purchased a new F-550 with Liftmoore crane to aid in ongoing operations and maintenance projects. (2013)

b) Inflow and Infiltration

As stated previously, the Sudden Valley- Geneva sewer collection system consists of 6-inch to 12-inch gravity lateral sewers feeding either of two interceptor systems with lift stations and force mains. The District regularly conducts video inspections of the gravity sewers to determine locations and severity of inflow and infiltration, and schedule repairs. The District has also completed projects in the South Shore collection system to reduce I&I including installing manhole dishes in areas of high surface inflow, and smoke testing to look for areas of likely I&I and illegal drain connections.

Previous analyses of the District's I&I were based on the evaluation criteria outlined in the Sewer System Infrastructure Analysis and Rehabilitation Handbook (EPA/625/6-91/030) for construction grant applicants:

“No further I/I analysis will be necessary if domestic wastewater plus non-excessive infiltration does not exceed **120 gallons per capita per day (gpcd)** during periods of high groundwater. The total daily flow during a storm should not exceed **275 gpcd**, and there should be no operational problems such as surcharges, bypasses or poor treatment performance resulting from hydraulic overloading of the treatment works during storm events.”

The results of the 2011-2012 I&I analyses indicated that the Sudden Valley- Geneva sewer collection system inflow and infiltration rates were substantially lower than the EPA criteria. During periods of high groundwater, the domestic wastewater plus non-excessive infiltration ranged from 69-73 gpcd and did not exceed 120 gpcd. The

II. EXISTING FACILITIES

total daily flow during a storm ranged from 169-174 gpcd and did not exceed 275 gpcd. The total daily flow during dry weather/no rain ranged from 56-60 gpcd.

While the South Shore I&I levels are within the EPA's guidelines, the District recognizes that I&I is an ongoing, costly issue. The District continues to search for sources of I&I and has developed a methodology using sewer flow meters and historical pump run times from its SCADA system to identify problem sewer basins by the excess flows when compared to the driest month (typically August). These areas are targeted for video inspection or smoke testing to identify non-compliant connections and/or specific problems that can then be included in a repair contract.

In 2019 the District purchased a portable weir for fitting inside 8-inch sewer mains. The weir is a Thel-Mar volumetric weir that can be used to analyze changes in flowrates comparing dry weather flows to flows during rain events. The weir will be deployed in targeted locations in an effort to narrow the areas for video inspection or smoke testing.

The I&I analysis and calculations based on pump run times is included in Exhibit C.

c) Existing Wastewater Flows

As of October 2019, the District provides sewer service to approximately 3,653 customers within the Sudden Valley-Geneva Collection System. All residential service connections are un-metered and based upon a usage assessment of one (1) equivalent residential unit (ERU) per connection. The non-residential connections (schools, camps, strip mall, etc.) are charged based on the number of equivalent residential units the facility represents, as determined by the District's Administrative Code. The number of ERUs served by the District within the Sudden Valley-Geneva Collection System is 3,953 (October 2019). Based on data from January 2018 – September 2019, monthly influent flows through the meters from the Sudden Valley-Geneva Collection System have averaged 20.6 million gallons per month, or about 705,000 gallons per day. The average daily flow per existing ERU is approximately 179 gallons per day including inflow and infiltration, or **67** gpcd (at **2.67** residents per ERU). The same data set yields a minimum month average daily flow per existing ERU of approximately 111 gallons per day, or **40** gpcd, and a maximum month average daily flow per existing ERU of approximately 298 gallons per day, or 111 gpcd. See Table 4 below.

The District's contract with the City of Bellingham specifies a maximum flow rate which is discussed in detail in Section C - City of Bellingham Wastewater Treatment Plant, 1. Wastewater Treatment Agreement. The District operates within those contract limits.

d) Future Projected Wastewater Flows

To finance the construction of the Lake Louise Road Interceptor project, the District formed Utility Local Improvement District (ULID) 18. All vacant properties within the Geneva and Sudden Valley "urban growth areas" (UGAs)¹ were included in the

¹ Sudden Valley was later defined as a Limited Area of More Intense Development (LAMIRD).

II. EXISTING FACILITIES

benefit area unless the property owner “opted out” and restricted the property from development for twenty-five years (ending in 2028). Properties not included in the UGAs but abutting the benefit area and the project improvements were allowed to “opt-in”. Of the 1,100 parcels originally restricted, approximately 50 are “vacant” and not combined with other parcels or otherwise permanently restricted per recent Whatcom County assessor data. These 50 vested properties could potentially be developed starting in 2028. These numbers should be revisited and possibly adjusted as the restriction period draws to an end in 2028.

There are approximately 640 vacant parcels close enough to connect to existing sewer mains in the Sudden Valley-Geneva Collection System boundaries. See Table 4 below for existing and buildout projections.

Although projected wastewater flows were previously calculated the two ways – using the South Shore flow meter data and using industry-standard rates –the two numbers were diverging. The metered data shows a decrease in flows per ERU from 195 GPD to 180 GPD. The industry standard uses 100 GPD per person, and the number of persons per household has increased from 2.6 to 2.67². The design standard would then be 267 GPD per ERU, which is 48% higher than the number derived from the metered data. The District has elected to use the metered data since it is a more accurate representation of actual conditions.

Based on the annual average metered wastewater flows, and a peak wastewater flow calculated using a peaking factor, Sudden Valley-Geneva Collection System is projected to have the following average and peak daily flows:

² Sudden Valley and Geneva, 2017 American Community Survey by the U.S. Census Bureau, weighted average

II. EXISTING FACILITIES

Table 4: Sudden Valley-Geneva Study Area – Population / Flow Projections

Study Area: Sudden Valley / Geneva	LWWSD Existing (2019)	Whatcom County Projections** Year-2036	LWWSD Projections 20 years – 2039 (@15 ERU/year*)	LWWSD Projections Full build-out ***
Equivalent Residential Units ERUs* (Service connections)	3,953 (3,653)	Households : 4,304	4,253 (3,953)	4,657 (4,357)
Population Estimate (2.67 residents per service)	10,555	11,147 (@ 2.59persons /household)	11,356	12,434
Projected Average Daily Flow (GPD): Flow Meter Average - 180 GPD per ERU	711,540 GPD	774,720 GPD	765,540 GPD	838,260 GPD
Projected Peak Daily Flow (GPM): Flow Meter Average x 3 Peaking Factor	1,482 GPM	1,614 GPM	1,595 GPM	1,746 GPM

* For most future growth, assume 1 connection = 1 ERU. Vacant parcels larger than 5 acres were allocated 1 ERU/5 acres.

** Based on Whatcom County Comprehensive Plan Update FEIS (November 2015) Appendix E: Preferred Alternative Allocations by Service Provider. Assumes a 90%/10% split between South Shore and North Shore service areas; does not allocate any households to South Bay / Blue Canyon.

*** Reduction includes permanently restricted lots, substandard lots with adjacent ownership, shorelands, etc.

It should be noted that the population and connection projections used for this report will not exactly match projections made by the City of Bellingham or Whatcom County, primarily because the sewer service area boundaries are different than the boundaries used by the City and County. In addition, sewer planning analyses typically “round up” when determining potential connections to avoid future capacity issues, while the City’s Annual Build-out Analysis always “rounds down”, but counts all vacant parcels without making any determination regarding whether they are viable parcels for development.

e) Hydraulic Modeling

Hydraulic modeling of portions of the South Shore collection system trunk mains was performed for the District’s Comprehensive Sewer Plan - 2014 Update to evaluate capacity during peak hourly wet weather flow conditions. The physical model network consisted of the Sudden Valley Pump Station, LWBI force main, LWBI gravity main, and Cable Street Pump Station. The South Shore model was used to simulate several operational scenarios that the District typically uses. Conditions have not materially changed and the previous results are still valid and are summarized below. (The Lake Louise Road Interceptor design in 2001 sufficiently addressed the various operating scenarios through build-out conditions).

Hydraulic modeling of the Lake Whatcom Boulevard Interceptor (LWBI) trunk main portion of the South Shore system was performed to evaluate capacity for multiple operational scenarios during peak hourly wet weather flow conditions. This full analysis can be found in Exhibit D of the 2014 Comprehensive Sewer Plan Update.

II. EXISTING FACILITIES

The standard District operating mode sends the flow from the Sudden Valley Pump Station (via Flat Car PS) to the Lake Louise Road Interceptor (LLRI) – the former “High Energy” scenario – because of the lack of sufficient capacity in the LWBI. The schematic for this standard operating mode is shown in Exhibit E-1.

The District maintains the capability to send flows from the Sudden Valley Pump Station and the Flat Car Pump Station to the LWBI. This operating mode is used only during dry weather and mainly to facilitate maintenance on the LLRI and its associated facilities (Flat Car and Beaver Pump Stations). This reverse mode was used during the reconstruction of the Whatcom Falls sewer manhole, which is the discharge location of the LLRI into the City of Bellingham’s sewer collection system. The schematic for this reverse operating mode is shown in Exhibit E-2.

The previous model simulations identified capacity limitations in the LWBI under future (build-out) conditions and the current operating scenario (Exhibit E-1). LWBI does not have capacity for this scenario (flooding manholes and many pipes at or above capacity). Previous simulations indicate that manhole flooding along Lake Whatcom Boulevard occurs at 1,190 gpm, which is less than what is needed for buildout. One option previously identified to address this shortfall is to re-route flows from North Point PS to flow south to Sudden Valley PS, and to the LLRI instead of north to the LWBI (see Exhibit E-3). This scenario was modeled to see if there was a sufficient diversion of flows to eliminate the capacity issues.

The results indicate that by re-routing the North Point flows, the manhole flooding is eliminated. Several pipes still show that they would be at capacity, but this model did not update the flow loads to account for any reduction in residential flows since 2014. This analysis will be revisited with updated residential flows as the system gets close to having 1,190 gpm in the LWBI. More details regarding this supplemental hydraulic modeling are included in the attached Supplemental Hydraulic Analysis Technical Memorandum (Exhibit D).

2. North Shore Collection System

a) System Description

Originally put into service between 1975 and 1977, the North Shore sewer collection system consists of 6-inch to 10-inch gravity lateral sewers feeding the North Shore Road interceptor system with lift stations and force mains. This system provides sewage collection for service connections along North Shore Road and in the Eagleridge, Dellesta Park, Agate Heights, Edgewood and Georgia Point subdivisions. This wastewater is delivered to the City of Bellingham for treatment. Each lift station installation is comprised of a wet well, dry-pit or top-mounted pumping equipment, local pump station controls and telemetry communication system. One lift station is connected to an emergency backup generator to ensure normal pump station operation in the event of a power outage. The other two lift stations are equipped with onsite generator receptacle outlets for connection to the District’s portable generators in the event of a power outage.

II. EXISTING FACILITIES

Table 5 summarizes the collection and delivery system components for the North Shore Collection System. Reference Exhibit B-4 for additional information and mapping for this system.

Table 5: North Shore Collection System - Component Listing

System Component	Approximate Quantity
Sewer Manholes	152
Sewer Lift Stations	3
4-inch Force Main	1,053 LF
8-inch Force Main	5,781 LF
6-inch Gravity Branch Sewer	402 LF
8-inch Gravity Branch /Interceptor Sewer	16,654 LF
10-inch Gravity Branch/Interceptor Sewer	7,292 LF
12-inch Gravity Sewer Interceptor	2,059 LF
15-inch Gravity Sewer Interceptor	5,838 LF
16-inch Gravity Sewer Interceptor	1,087 LF
Total LF of Pipe	40,166 LF

The District has also completed several projects associated with the North Shore sewer system. Table 6 lists the projects that have been completed since 2014.

Table 6: North Shore Sewer System – Projects Completed

Projects	Description
Dellesta Pump Station (Construction - 2020)	90% design and permitting complete for future pump station upgrades.
Edgewater Pump Station (Construction - 2020)	90% design and permitting complete for future pump station upgrades.
North Shore Sewer Force Main Protection (2019)	Project encased a sewer force main exposed in an existing creek bed and raised stream bed with fill and cobbles to further protect pipe and facilitate fish passage.
North Shore Sewer Extension Preliminary Investigation (2015-2017)	Preliminary investigation to determine feasibility of sewer extension to connect existing on-site septic systems.
North Shore Water Sampling (2017)	Study conducted by Herrera Environmental Consultants to determine if on-site sewage systems around Lake Whatcom impacts the water quality of Lake Whatcom. (See Exhibit M).

b) Inflow and Infiltration

As stated previously, the North Shore sewer collection system consists of 8-inch-10-inch gravity lateral sewers feeding an interceptor system with lift stations and force mains. The District regularly conducts video inspections of the gravity sewers to determine locations and severity of inflow and infiltration.

II. EXISTING FACILITIES

Previous analyses of the District's I&I were based on the evaluation criteria outlined in the Sewer System Infrastructure Analysis and Rehabilitation Handbook (EPA/625/6-91/030) for construction grant applicants:

“No further I/I analysis will be necessary if domestic wastewater plus non-excessive infiltration does not exceed **120 gallons per capita per day (gpcd)** during periods of high groundwater. The total daily flow during a storm should not exceed **275 gpcd**, and there should be no operational problems such as surcharges, bypasses or poor treatment performance resulting from hydraulic overloading of the treatment works during storm events.”

The results of the 2011-2012 I&I analyses indicated that the North Shore sewer collection system inflow and infiltration rates were substantially lower than the EPA criteria. During periods of high groundwater, the domestic wastewater plus non-excessive infiltration ranged from 58-86 gpcd and did not exceed 120 gpcd. The total daily flow during a storm ranged from 102-145 gpcd and did not exceed 275 gpcd. The total daily flow during dry weather/no rain ranged from 57-66 gpcd.

While the North Shore I&I levels are within the EPA's guidelines, the District recognizes that I&I is an ongoing, costly issue. The District continues to search for sources of I&I and has developed a methodology using historical pump run times from its SCADA system to identify problem sewer basins by the excess flows when compared to the driest month (typically August). These areas are targeted for video inspection smoke testing to identify specific problems that can then be included in a repair contract.

As noted previously, the I&I analysis and calculations based on metered flows and pump run times is included in Exhibit C.

c) Existing Wastewater Flows

As of October 2019, the District provides sewer service to approximately 366 customers within the North Shore Collection System. All residential service connections are un-metered and based upon a usage assessment of one (1) equivalent residential unit (ERU) per connection. The non-residential connections (residential treatment center, Agate Bay Trailer Park) are charged based on the number of equivalent residential units the facility represents, as determined by the Uniform Plumbing Code fixture count method. The number of ERUs served by the District within the North Shore Collection System is 391 (October 2019). Based on data from January 2018 – September 2019, monthly influent flows through the meters from the North Shore Collection System have averaged 1.9 million gallons per month, or about 65,600 gallons per day. The average daily flow per existing ERU is approximately 170 gallons per day including inflow and infiltration, or 67 gpcd (at 2.55 residents per ERU). The same data set yields an average minimum daily flow per existing ERU of approximately 105 gallons per day, or 41 gpcd, and an average maximum daily flow per existing ERU of approximately 264 gallons per day, or 104 gpcd. See Table 7 below.

II. EXISTING FACILITIES

The District's contract with the City of Bellingham specifies a maximum flow rate which is discussed in detail in Section C - City of Bellingham Wastewater Treatment Plant, 1. Wastewater Treatment Agreement. The District operates within those contract limits.

d) Future Projected Wastewater Flows

Continuing efforts by Whatcom County and the City of Bellingham have substantially reduced the potential density and developable land in the North Shore service area from what had been envisioned when the sewer collector system was designed. The County has down-zoned the area to a 5-acre minimum parcel size for any new subdivision of property. There have also been numerous land purchases and development restrictions by the City and others in the North Shore service area.

There are approximately 50-170 potential additional connections to the North Shore Collection System for an estimated 528 connections (553 ERUs) at build-out. These potential additional connections consist of previously created lots suitable for residential development under current land use regulations that are near existing sewers and existing residential development served by on-site septic systems near Lake Whatcom that could be served by sewer extensions should they be permitted in the future.

Although projected wastewater flows were previously calculated in two ways – using the North Shore flow meter data and using industry-standard rates –the two numbers were diverging. The metered data shows a decrease in flows per ERU from 180 GPD to 168 GPD. The industry standard uses 100 GPD per person, and the number of persons per household has increased from 2.5 to 2.55³. The design standard would then be 255 GPD per ERU, which is 50% higher than the number derived from the metered data. The District has elected to use the metered data since it is a more accurate representation of actual conditions.

The numbers presented below are the existing and projected flows for the North Shore Collection System. As discussed above, the projected flows are based on the metered data and assumes an average daily wastewater flow per ERU of 168 gallons and a peak daily wastewater flow per ERU of 672 gallons (4 times average daily flow). The twenty-year projection is based on a growth rate of 1 ERU/year, which is representative of the actual growth of recent years. The build-out projection includes the 100-125 properties at the east end of Northshore Road that currently do not have sewer available. See Table 7 below.

³ Whatcom County, 2017 American Community Survey by the U.S. Census Bureau

II. EXISTING FACILITIES

Table 7: North Shore Study Area – Population / Flow Projections

Study Area: North Shore	LWWSD Existing (2019)	Whatcom County Projections** Year-2036	LWWSD Projections 20 years – 2039 (@1 ERU/year*)	LWWSD Projections Full build- out***
Equivalent Residential Units ERUs* (Service connections)	391 (366)	Households: 478	411 (386)	553 (528)
Population Estimate (2.55 residents per service)	977	1,239 (@ 2.59persons /household)	1,048	1,410
Projected Average Daily Flow (GPD): Flow Meter Average - 170 GPD per ERU	65,688 GPD	80,304GPD	69,048 GPD	92,904 GPD
Projected Peak Daily Flow (GPM): Flow Meter Average x 4 Peaking Factor	182 GPM	223 GPM	192 GPM	258 GPM

* For all future growth, assume 1 connection = 1 ERU. No large user growth is anticipated.

** Based on Whatcom County Comprehensive Plan Update FEIS (November 2015) Appendix E: Preferred Alternative Allocations by Service Provider. Assumes a 90%/10% split between South Shore and North Shore service areas; does not allocate any households to South Bay.

*** Includes approximately 105 existing developed properties and 20 vacant properties at the east end of Northshore Road.

It should be noted that the population and connection projections used for this report will not exactly match projections made by the City of Bellingham or Whatcom County, primarily because the North Shore sewer service area boundaries are very different than the rural watershed area. In addition, sewer planning analyses typically “round up” when determining potential connections to avoid future capacity issues, while the City’s Annual Build-out Analysis always “rounds down”.

e) Hydraulic Modeling

Hydraulic modeling of the North Shore collection system trunk main was performed for the District’s Comprehensive Sewer Plan - 2014 Update to evaluate capacity during peak hourly wet weather flow conditions. Conditions have not changed and the previous results are still valid.

The following is a summary of the results of the modeling simulations of the North Shore collection system trunk main;

- Existing conditions – modeling indicates adequate capacity,
- Future (build-out) conditions – adequate capacity. However, the existing 4-inch meter and line could become enough of a restriction at high flows (350 gpm) to back up water and cause flooding at two shallow manholes upstream of the meter.

II. EXISTING FACILITIES

B. Pumping Facilities

1. Sudden Valley – Geneva Collection System

The Sudden Valley – Geneva Collection System is equipped with twenty-three (23) sewer pump stations which lift and transport wastewater collected out of Sudden Valley and around Lake Whatcom to the City of Bellingham. Reference Exhibit E-1 through E-3 for flow schematics and system layout of pump stations. District pump stations located in the Sudden Valley – Geneva Collection System are as follows:

- Afternoon Beach
- Airport
- Austin Creek
- Beaver
- Boulevard
- Cable St.
- Camp Firwood
- Euclid St
- Flat Car 2
- Geneva
- Lakewood
- Lake Louise
- Lowe St
- Marina Circle
- North Point
- Par
- Plum
- Ranch House
- Rocky Ridge
- Strawberry Canyon
- Strawberry Point
- Sudden Valley
- The Tomb

2. North Shore Collection System

The North Shore is equipped with three (3) sewer pump stations which lift and transport wastewater collected around Lake Whatcom to the City of Bellingham. Reference Exhibit F for flow schematic and system layout of pump stations. District pump stations located in the North Shore Collection System are as follows:

- Agate Bay
- Dellesta Park
- Edgewater

C. City of Bellingham Wastewater Treatment Plant

1. Wastewater Treatment Agreement

Since 1974, the District has contracted with the City of Bellingham to provide treatment and disposal of all wastewater originating from the District's collection facilities. In 2014, the District and the City negotiated an update to this contract at the request of the State Auditors' office. A copy of the Agreement is included in Exhibit G. Wastewater originating in the Sudden Valley- Geneva Collection System and the North Shore Collection System flow to the City of Bellingham's sewer collection system and then to its Post Point Wastewater Treatment Plant in Bellingham, Washington. The Agreement lists five points of connection to the City sewer system which include the following:

- Whatcom Falls Park (from Lake Louise Road Interceptor)
- Electric Avenue at Flynn Street (from Cable Street and Euclid force mains)

II. EXISTING FACILITIES

- Euclid Avenue (from Euclid gravity main)
- Flynn Street (gravity flow from the Mill Wheel Park main)
- Northshore Road Meter (from Northshore Interceptor)

In 1999, the District constructed a 700,000 gallon detention basin adjacent to Sudden Valley Pump Station. Prior to the completion of the Lake Louise Road Interceptor and a general lifting of the sewer connection moratorium, the capacity of the detention basin allowed the District to issue 770 sewer connections in select areas. With the LLRI in service, the detention basin has been used for storing excess flows only during extremely severe storm events. The detention basin may be of use to provide flow equalization on the south shore during heavy storm events to assist the City of Bellingham in mitigating overflows from their sewer system, if the facility's capacity is not needed by the District.

2. Projected 20-Year Wastewater Flows

With the current building trends around Lake Whatcom and the density reduction efforts reducing build-out levels, the projection for 20-year growth is approximately 85% of the build-out values on the south shore and 88% on the north shore. The build-out levels should be revisited prior to 2028. Referencing the wastewater flow projections already outlined for the Sudden Valley - Geneva Collection System and the North Shore Collection System, the 20-year average daily and peak wastewater flows to the City of Bellingham WWTP are projected as follows:

District Wastewater Flows to the Bellingham WWTP - Projected 20-Year Flows

Average Daily Flow:	<u>0.75-0.9 million gallons per day,</u>
Peak Daily Flow:	<u>2.5-2.7 million gallons per day.</u>

District Wastewater Flows to the Bellingham WWTP - Projected Full Build-out Flows

Average Daily Flow:	<u>0.85-1.0 million gallons per day,</u>
Peak Daily Flow:	<u>2.8-3.0 million gallons per day.</u>

D. Industrial Wastewater-Producing Facilities within the District System

There are no existing industrial wastewater-producing facilities within the District's boundaries. At this time, the District's contract with the City prohibits the connection of any industrial wastewater-producing facilities.

III. FUTURE SEWER SERVICE REQUIREMENTS

While the current trend is towards density reduction, it is difficult to predict the rate at which new services will be requested, including how many of the properties restricted for 25 years under ULID 18 will be developed in the future. At this point, though, the District does not anticipate needing additional capacity from the City.

Potential developer extension/ULID facilities are not included in the Capital Improvement Plan (Exhibit K), because their occurrence is more speculative than the infrastructure improvement projects outlined in the future improvements section. Potential projects that the District is aware of are listed below. The District may only provide sewer service where it is legally possible to do so considering applicable County zoning and development regulations.

A. Potential Sewer Service in the Sudden Valley- Geneva Collection System

The District will consider extensions to the existing Sudden Valley-Geneva sewer collection system only on an “as-needed” basis in those areas within the District boundaries not presently served by the gravity sewer collection system (reference Exhibit A). At this time, the potential areas for sewer main extensions within this service area are areas outside of the UGA that have been developed with septic systems (Reference Exhibits J-1 to J-3).

1. Other Developer Extensions / Local Improvement Districts

The area south of the District maintenance facility (1010 Lakeview Street) was developed with septic systems and a common community drainfield. This area has about 20 properties and could potentially be connected to the District’s public sewer. The homeowners would either need to petition for a Local Improvement District or request approval for a Developer Extension Agreement. There are also several properties outside of a UGA or LAMIRD but within 150 feet of the Lake Louise Road Interceptor that could be connected to public sewer if requested or when their septic system has failed.

There are very few properties remaining in this service area that could be subdivided or grouped to create a development. For any new development requiring extension of sewer mains, the property owners will need to enter into a developer extension agreement with the District whereby the owner becomes responsible for all design, construction, and inspection costs associated with the new branch sewer line. At the time the new line goes into operation, the District will be granted ownership of, and operation and maintenance responsibilities for all new sewer facilities associated with the development.

It should be noted that, in accordance with the Interlocal Agreement for Sewer Services with the City of Bellingham, connection of any parcel created since 2005 to the District’s sewer system requires the approval of the City.

III. FUTURE SEWER SERVICE REQUIREMENTS

B. Potential Sewer Service in the North Shore Collection System

The District will consider extensions to the existing North Shore sewer collection system only on an “as-needed” basis in those areas within the District boundaries not presently served by the gravity sewer collection system. At this time, there are no active developer extension projects within this service area. The District has identified one area that has already been developed with on-site septic systems that may be a candidate in the future for a sewer extension (Reference Exhibit J-4 for a map of this extension).

1. **North Shore Road ULID**

There are approximately 105 existing homes on North Shore Road beyond the east end of the District’s sewer system. These homes have on-site septic systems and many are close to Lake Whatcom. These homes are not currently in a UGA or LAMIRD, however providing public sewers to these residences may be a cost-effective means of reducing the phosphorous and bacterial loading to Lake Whatcom. However, Whatcom County Code 20.82.030(4) states that “... Sewer lines shall not be extended to serve lots outside urban growth areas unless such extensions are shown to be necessary to protect basic public health and safety and the environment, and when such services are financially supportable at rural densities and do not permit urban development...” In addition to the normal process of petitioning for a Utility Local Improvement District, a project to extend sewer here would require obtaining a Conditional Use Permit and approval of the Hearing Examiner if allowed under the restrictions set forth in WCC 20.82.030(4). A preliminary investigation about extending the District’s sewer service to this area was performed in 2015. The Technical Memorandum detailing the Northshore System Extension Preliminary Investigation is attached in Exhibit M.

There are very few properties remaining in the area that could be subdivided, or grouped to create a development. For any new development that would require extension of sewer mains, the property owners will be required to enter into a developer extension agreement with the District whereby the owner becomes responsible for all design, construction, and inspection costs associated with the new branch sewer line. At the time the new line goes into operation, the District will be granted ownership of, and operation and maintenance responsibilities for all new sewer facilities associated with the development.

It should be noted that, in accordance with the Interlocal Agreement for Sewer Services with the City of Bellingham, connection of any parcel created since 2005 to the District’s sewer system requires the approval of the City.

C. Potential Sewer Service in the South Bay / Blue Canyon Study Area

The District has no existing sewer facilities in the South Bay / Blue Canyon Study Area. The District will consider extending public sewer on an “as-needed” basis in those areas within the District boundaries. Extensions would be funded by developers requesting such extensions, or by LID/ULID should a petition of the affected population be submitted to the District. A feasibility study was prepared in 2006 that included this Study Area. The feasibility study was incorporated in the District’s 2008 Comprehensive Sewer Plan because it included an area-wide analysis with comprehensive planning information. However, since the details for the

III. FUTURE SEWER SERVICE REQUIREMENTS

implementation of serving this Study Area are not yet defined, facilities to service this area will be addressed in the future. Whatcom County Code 20.82.030(4) states that "... Sewer lines shall not be extended to serve lots outside urban growth areas unless such extensions are shown to be necessary to protect basic public health and safety and the environment, and when such services are financially supportable at rural densities and do not permit urban development ...". A project to extend sewer here would require obtaining a Conditional Use Permit and approval of the Hearing Examiner if allowed under the restrictions set forth in WCC 20.82.030(4). Should a project proceed, additional analyses will be prepared and a facility plan / engineering report will be submitted for the requisite approvals.

IV. SEWER RATE STRUCTURE AND REVENUE PLANNING

A. Requirements for Connection to the District System

Sewer and/or water connections are available on a first come, first served basis where capacity exists. There is overall system capacity when the system as a whole has the capability to serve additional service connections. There may be localized areas in the system that are insufficient in size or are in too poor condition to allow local connections, but the system can still be considered to have overall system capacity.

The District has adopted a detailed policy regarding the requirements for connection to the District system for any new sewer customer or developer extension. This policy is defined in Section 3.4 of the District's Administrative Code. Properties connecting to the District's sewer system must also comply with all applicable County and State regulations including but not limited to building codes and stormwater regulations.

Generally, properties which lie within the District's boundaries are required to connect to the sewer if the property lies within 200 feet of the public sewer and is inside of a UGA or LAMIRD, or within 150 feet of the public sewer and is outside of a UGA or LAMIRD. Properties developed with on-site septic systems that subsequently have public sewer available, have five years to connect to the public sewer from the date when sewer service is available.

Additional sewer connection and service requirements can be found in Section 3.4 of the District's Administrative Code.

B. Revenue Planning

The District performs a review of the sewer rate schedule regularly to determine that these charges are sufficient to generate revenue to offset the cost of all necessary operation and maintenance of the District. In the event that this review indicates a necessary revision of user charges, the District promptly amends the rates by formal resolution of the board of commissioners.

In 2014, the District commissioned a water and sewer rate study to examine the District's rate structures. The purpose of the study was to provide recommendations regarding water and sewer rate adjustments aimed at bringing revenues in line with annual operating and capital obligations while utilizing surplus cash reserved in the District's general and capital funds. The District commissioned an update in 2016 and will contract for a full rate study in 2020.

The 2016 rate study update recommended continuing the 2.5% per year increases in the sewer fees for the 5 year analysis period (2017-2021).

In 2017, the District commissioned a separate study to make recommendations regarding the general facilities charge (GFC) to be charged to new customers connecting to the system. The

IV. SEWER RATE STRUCTURE AND REVENUE PLANNING

Board adopted increased GFCs that were based on the study recommendations for implementation in January 2018.

Recommendations from 2014 rate study and the 2016 update were implemented by the District and are reflected in the sewer rate information presented in the next section. The District will be obtaining an updated rate study in 2020.

C. Sewer Rate Structure

The District sewer service rates and charges outlined below shall be subject to change by resolution of the board of directors as conditions warrant.

1. Sewer Service Rates

The District bills bi-monthly for sewer service. The calculation of bi-monthly sewer charges is based on the assigned number of equivalent residential units (ERUs) for a particular customer.

Reference Exhibit I for a tabulation of the sewer rates in the current Master Fees and Charges Schedule for the District. Also included in this resolution are the rate adjustment schedules, through the year 2021, as recommended in the 2016 sewer rate study update commissioned by the District.

The rate increases will assure that the District is adequately recovering the true costs of running the system, including paying back of all existing and anticipated loan and bond funds. By adequately recovering the true costs for system operation and maintenance, the District staff will be able to perform adequate, routine maintenance activities which will add to the service life of the system. Additionally, implementing the recommended rate increases outlined in the rate study will allow the District to maintain the appropriate reserves required for emergencies, if revenues meet regular expenses.

2. General Facilities Connection Fee (GFC)

The 2019 General Facilities Connection Fee for sewer is \$7,919 per ERU (Item 28 of the Master Fees and Charges Schedule). Additional fees such as Latecomer fees may also apply. The District also charges fees for permit processing and inspection in accordance with the current Master Fees and Charges Schedule.

The Master Fees and Charges Schedule is incorporated here by reference. The current schedule is included in Exhibit I.

3. Cost per Service

The District's cost for sewer service recently has ranged from \$3,500,000 to \$4,850,000 and is projected to be \$4,838,000 this coming year (2020 Budget, in progress). This 2020 budget includes \$2,644,000 per year in operation and maintenance costs and debt service costs of \$643,000 per year. It also includes \$1,550,000 in System Reinvestment for capital projects and equipment replacement. Dividing these costs over the District's sewer Equivalent Residential Units (4,359 ERUs projected for 2020) yields the yearly cost per service listed in Table 8 below. Also included for reference are the Cost of Service for 2018 and 2019.

IV. SEWER RATE STRUCTURE AND REVENUE PLANNING

Table 8. Yearly Cost Per Sewer Service

Sewer Utility Cost of Service	2020 Budget Cost per ERU	2019 Projected Cost per ERU	2018 Actuals Cost per ERU
Debt service	\$ 148	\$ 149	\$ 150
O&M	\$ 607	\$ 572	\$ 554
System Reinvestment (Capital Projects, Equipment)	\$ 356	\$ 397	\$ 109
Sewer Utility Total	\$ 1,110	\$ 1,118	\$ 813

V. FUTURE IMPROVEMENT PROJECTS

A. Future Maintenance and Operational Improvements

1. Sewer Flushing Program

As part of the District's ongoing maintenance, certain gravity mains have been identified as requiring routine inspection and/or cleaning. The District utilizes a computer maintenance management system to track maintenance work performed and set automatic recurring tasks at an appropriate interval depending on historical maintenance needs of each main. When a main is re-inspected or maintenance is performed the interval period is refined as needed for the next future task to be automatically generated when due.

The availability of the Sudden Valley Detention Basin and the bypass connection allow the District to reverse the flow in the pressure section of the LWBI and send the majority of the flows to the Sudden Valley PS and then to the LLRI. With the reduced flows the District is able to flush the gravity sections without taking the LWBI off-line.

2. I&I Identification Program

Annual I&I Analyses

The District has an ongoing program to analyze sewer flow meter and pump station run-time data in an effort to isolate potential source locations of I&I so they can be further investigated using sewer video or smoke testing. See Exhibit C for the current I&I analysis report.

Sewer Videoing Program

The District has an ongoing sewer videoing program. As a part of the regular maintenance program for their facilities, the District will continue to video portions of the collector system annually in an effort to identify possible points of inflow and infiltration into the system. Areas to video are targeted based on pump run times (as an indication of I&I severity) and the majority of the video work is performed during the wet season in order to see active leaks. The District is also able to inspect manholes with the camera as they pass through them. If repair work is deemed necessary, the District will perform said work as part of their regular maintenance improvement program.

Targeted Smoke Testing Program

The District recently completed a system-wide smoke testing program within its collection systems to aid in identifying potential sources of inflow and infiltration within the system. As a part of the ongoing maintenance program for their facilities, the District will continue to smoke test targeted basins with higher inflow and infiltration rates looking for non-compliant connections in addition to faulty pipes. In the event that a non-compliant connection is found, the District will notify the property owner of their responsibility to remedy the situation. In the event that a significant, potential I&I source is identified through the smoke testing program, the District will follow-up with a CCTV camera inspection of the subject area to determine if repair work is required. If repair work is deemed necessary, the District will perform said work as part of their regular maintenance improvement program.

V. FUTURE IMPROVEMENT PROJECTS

B. Future Administrative, Financial and Planning Improvements

1. Hazard Mitigation Plan For District Wastewater Facilities

Since 2000, the Federal government has required local communities to have an approved mitigation plan in place to be eligible for the Hazard Mitigation Grant Program (HMGP) funds (44CFR201.6). Jurisdictions without an approved plan will not be eligible for future mitigation financial assistance. One strategy for the plan development is for local communities to work together to create a Multi-jurisdictional Hazard Mitigation Plan. This approach is advantageous and efficient in that a single, comprehensive plan would then address the concerns of all jurisdictions with the same countywide hazards. To that end, the District has, in conjunction with Whatcom County Division of Emergency Management, developed a hazard mitigation plan in compliance with federal requirements.

Adoption of this hazard mitigation plan ensures compliance with federal regulations. In addition, the development and adoption of an approved hazard mitigation plan ensures that the District is eligible for future mitigation financial assistance under the Hazard Mitigation Grant Program.

2. Update Existing Emergency Response Plan

Currently, the District has an existing Emergency Response Plan which outlines District priorities and activities in response to an emergency event such as; natural disasters, vandalism, catastrophic equipment failures, etc. As a part of this activity, the District will update the existing Emergency Response Plan, as necessary, to ensure compliance with applicable federal regulations and the requirements of the Department of Homeland Security. The District will continue to conduct emergency response training exercises and drills with staff to enhance emergency preparedness.

3. Maintenance Management Program Development

In 2002, the District began developing a system-wide Maintenance Management Program to move from reactive maintenance to preventative maintenance, better manage work flow processes, and aid in planning, administration, and operation and maintenance record keeping for the District's facilities. To date, the database and maps includes information regarding pipe size, material and lengths for water and sewer mains; schematic locations of District facilities including mains, manholes, pump stations, PRVs and reservoirs (water). Since 2002, maintenance activities have been logged in to the system as they are completed.

The District has completed adding the watershed boundary, customer billing information, and facility specifications. All sewer assets have installation dates and the District has completed inspections, mapping and overall condition index (OCI) determinations for most facilities in the Geneva and North Shore areas. As a part of this ongoing development program, the District will continue to augment and update the Maintenance Management program to include the following:

- a. parcel maps (working with Whatcom County),
- b. updated aerial photo layers (from Whatcom County),
- c. archival operation and maintenance record information, 80%complete
- d. link sewer main video inspections

V. FUTURE IMPROVEMENT PROJECTS

- e. facility inspections (manholes, sewer pump stations) - Sudden Valley
- f. mapping-grade GPS facility locations - Sudden Valley
- g. facility overall condition index (OCI) for manholes, mains, pump stations - Sudden Valley

4. Lake Whatcom Watershed Committee (WRIA 1)

As a part of this planning project, the District's Manager will participate in a steering and planning committee to look at watershed-wide issues affecting water quality for people and fish. The Committee will plan cooperative actions which will address the watershed water quality. This group process will result in more collaborative planning approach to water issues, including drinking water sources, and storm water runoff.

Water quality management planning under the Federal Water Pollution Control Act as amended for this area has taken the form of the identification of the TMDLs for Lake Whatcom and the water quality implementation strategy outlined in the Lake Whatcom Watershed Total Phosphorus and Bacteria Total Maximum Daily Loads: Volume 2. Water Quality Improvement Report and Implementation Strategy report, as approved by the EPA in April, 2016.

LWWSD does not discharge to Lake Whatcom so does not have a wasteload allocation. The District does have an interest in the effective implementation of the plan and works with the city of Bellingham and Whatcom County on the TMDL implementation strategy.

5. Sewer Service Rate Increases

The District contracts with a financial consultant about every 5 years to prepare a comprehensive rate study, with interim updates every 2 to 3 years, and implements the recommended incremental rate increases. The last rate study update was completed in 2016, with the next comprehensive rate study scheduled to begin 2020.

C. Future Capital Improvement Projects

1. Pump Station Upgrades – Ongoing

As mentioned above, the District has completed several pump station replacements and upgrades in the last six years (see Table 2). The District plans to continue replacing and/or upgrading one or two pump stations per year as needed. The proposed schedule for these replacements or upgrades are included in the District's Capital Improvement Plan (see Exhibit K).

Replacement of the aged control, telemetry and pump equipment will result in increased reliability, reduced emergency operator call-outs, reduced equipment operation costs and prevention of sewage overflows. Each pump station will be evaluated to determine the specific upgrades required but at least will normally include new pumps, new controls and new telemetry equipment.

2. Miscellaneous Sewer Line Replacement and Repair

The original District collection and force main systems are almost fifty years old. As a part of ongoing regular maintenance on the system, the District monitors the existing underground

V. FUTURE IMPROVEMENT PROJECTS

sewer lines for signs of leakage and/or failure. As a part of this project, the District will perform sewer repair and/or replacement work as necessary to ensure a functional and environmentally safe system. The line repairs include both trenchless spot repairs as well as repairs that require excavation.

3. Manhole Rehabilitation

The District has a disproportionately high number of manholes due to the extreme topography of its service areas. Many of these manholes are located in roadways and are heavily impacted by traffic. Staff has observed inflow and infiltration that appears to originate in the manholes. The District has been inspecting manholes for deterioration and leaks as part of their ongoing sewer videoing program and developed a priority list of manholes in need of rehabilitation. This Manhole Rehabilitation program and the Miscellaneous Sewer Line Replacement and Repair program above constitute the District's Capacity, Management, Operations and Maintenance (CMOM) Program, and has an annual budget of about \$165,000.

4. Repair/Replace Lake Whatcom Boulevard Mains

The hydraulic modeling has identified several segments of the Lake Whatcom Boulevard Interceptor that are potentially undersized for future flows even when flow from the North Point pump station is redirected to the Lake Louise Interceptor. The District has also identified several segments that are in poor condition and will need to be rehabilitated or replaced. This project will confirm the pipe sizes needed for buildout, and undertake the appropriate measures to repair and/or replace the pipe segments identified as deficient.

VI. DOCUMENTS INCORPORATED BY REFERENCE

The District maintains several documents that are relevant to this Comprehensive Sewer Plan that are hereby incorporated by reference. Since the nature of these documents requires them to be updated more frequently than the Comprehensive Sewer Plan, they have not been integrated into this Plan.

The documents incorporated by reference include:

- District Design and Construction Standards
- Developer Extension Agreement - Master Form
- Capital Improvement Plan
- Master Fees and Charges Schedule (current version is attached in Exhibit I)
- Comprehensive Water System Plan
- District Administrative Code