

GENERAL SEWER PLAN

Prepared for City of Chelan

August, 2023

CHE 20.0007.10



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City of Chelan

General Sewer Plan

August 2023

Prepared by RH2 Engineering, Inc.

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Note: This General Sewer Plan was completed under the direct supervision of the following Licensed Professional Engineers registered in the State of Washington.

Sincerely,
RH2 ENGINEERING, INC.



Signed:
8/1/2023



Signed:
8/1/2023

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Abbreviation	Definition
°F	degrees fahrenheit
2007 Interceptor Report	2007 Northshore Interceptor Replacement Lift Station Capacity Analysis
AA	average annual
AACE	American Association of Cost Engineers
AMSL	above mean sea level
BOD	biochemical oxygen demand
CC	City Lift Station No. 1
CFU	colony forming units
CFU/100mL	colony forming units per 100 milliliters
Chelan Fruit	Chelan Fruit Cooperative
CIP	Capital Improvement Plan
City	City of Chelan
City Standards	City of Chelan Standards, Section 3 – Sewer Standards; Section 4 – Sewer Designs; Section 10 – Utility Designs
CMC	City of Chelan Municipal Code Title 13 - Water and Sewers
Code	City Municipal Code
County	Chelan County
DI	ductile iron
DMR	discharge monitoring reports
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
EQ	equalization
ERU	equivalent residential unit
ESB	Engrossed Senate Bill
fps	feet per second
GIS	Geographic Information System
GMA	Growth Management Act
gpcd	gallons per capita per day
gpd	gallons per day
gpd/sf	gallons per day per square foot
gpm	gallons per minute
gpy	gallons per year
GSP	General Sewer Plan
HDPE	high-density polyethylene
hp	horsepower
I/I	infiltration and inflow
kW	kilowatts
lb O ₂ /hr	pounds of oxygen per hour
lb/d	pounds per day
LCRD	Lake Chelan Reclamation District
LCSD	Lake Chelan Sewer District
LID	Local Improvement District

LS	Lift Station
mA	milliamps
MCC	motor control center
MD	maximum day
MG	million gallons
mg/L	milligrams per liter
MGD	million gallons per day
MH	Manhole
MHI	median household income
mL	milliliters
MM	maximum month average day
MMF	maximum month flow
NAVD	North American Vertical Datum
NPDES	National Pollutant Discharge Elimination System
NSI	North Shore Interceptor
O&M	operations and maintenance
OFM	Washington State Office of Financial Management
Orange Book	Washington State Department of Ecology Criteria for Sewage Criteria for Sewage Works Design
PARIS	Permitting and Reporting Information System
PH	peak hour
PHF	Peak Hour Flow
ppcd	pounds per capita per day
psi	pounds per square inch
PUD	Public Utility District No. 1 of Chelan County
PVC	polyvinyl chloride
RAS	return activated sludge
RBC	rotating biological contractors
RCW	Revised Code of Washington
RH2	RH2 Engineering, Inc.
SAEP	small area estimates program
SCADA	supervisory control and data acquisition
SCFM	standard cubic feet per minute
SEPA	State Environmental Policy Act
sf	square foot
SR	State Route
SRT	solids retention time
TDH	total dynamic head
TMDL	total maximum daily load
TP	total phosphorus
TSS	total suspended solids
UGA	Urban Growth Area
ULID	Utility Local Improvement District
UV	ultraviolet
uW-sec/cm ²	microwatt seconds per centimeter squared

VFD	variable frequency drive
WAC	Washington Administrative Code
WMAC	Wastewater Management Advisory Committee
WSP	Water System Plan
WWFP	Wastewater Facility Plan
WWTP	wastewater treatment plant

EXECUTIVE SUMMARY

Purpose of the Plan

The City of Chelan (City) owns and operates a sanitary sewer system that, in addition to serving the City limits and Urban Growth Area (UGA), also serves Lake Chelan Reclamation District (LCRD) on the north shore of Lake Chelan and Lake Chelan Sewer District (LCSD) on the south shore of Lake Chelan.

This General Sewer Plan (GSP) is intended to meet the requirements of Washington Administrative Code (WAC) 173-240-050. The GSP analyzes existing system utilization, capacity, and conditions, as well as future improvements to support projected growth, remedy deficiencies, and support regulatory changes and other needs.

Overview of Existing System

Chapter 2 provides a detailed overview of the existing sewer system. The City's system includes 16 lift stations and approximately 38 miles of gravity collection piping and 21 miles of force main piping as shown in **Table ES-1**. These values do not include the infrastructure within the LCSD and LCRD systems.

Table ES-1
City Sewer Collection System Pipe Inventory

Diameter	Length		Portion of System
	ft	miles	
Gravity Collection Pipes			
2	280	0.1	0.1%
4	1,063	0.2	0.5%
6	3,495	0.7	1.7%
8	158,022	29.9	79.1%
10	8,375	1.6	4.2%
12	14,631	2.8	7.3%
15	7,799	1.5	3.9%
16	725	0.1	0.4%
18	2,371	0.4	1.2%
21	3,084	0.6	1.5%
Total	199,844	37.8	100.0%
Force Mains			
2	3,572	0.7	3.3%
2.5	2,260	0.4	2.1%
3	374	0.1	0.3%
4	5,429	1.0	5.0%
6	8,363	1.6	7.7%
8	5,932	1.1	5.5%
10	41,477	7.9	38.2%
12	6,330	1.2	5.8%
14	32,852	6.2	30.3%
16	1,849	0.4	1.7%
Total	108,437	20.5	100.0%

Lengths are approximate as extracted from the SewerCAD hydraulic model.

Land Use and Population

Chapter 3 analyzes existing and projected land use and population trends in the City and UGA for the purposes of estimating impacts to the sewer system. **Table ES-2** shows the existing and projected City and UGA populations. LCRD and LCSD populations are estimated separately.

Table ES-2
Population Trends and Projections

Year	Permanent Population	
	City ¹	City + UGA ²
Historical		
2010	3,890	4,240
2011	3,930	4,286
2012	3,940	4,299
2013	3,955	4,320
2014	4,020	4,387
2015	4,045	4,415
2016	4,115	4,440
2017	4,150	4,465
2018	4,210	4,521
2019	4,265	4,577
Projected³		
2020	4,307	4,634
2021	4,361	4,692
2025	4,582	4,930
2030	4,874	5,244
2037⁴	5,315	5,719
2040	5,516	5,935

1. Historic population within the City limits is estimated from Washington State Office of Financial Management (OFM) Cities and Towns.
2. Historic population within the UGA is estimated from OFM's small area estimates program up to 2014. Estimates for 2015 to 2017 are based on the City's *Comprehensive Plan*.
3. Projected population for both the City and UGA is based on the projected growth rate developed by the City's *Comprehensive Plan*.
4. Year 2037 estimates are shown for consistency with the City's *Comprehensive Plan* estimate.

Flow and Loading

Chapter 4 analyzes existing flow and loading to the sewer collection system and wastewater treatment plant (WWTP) and projects future demands. **Table ES-3** summarizes the existing and projected flow and loading from the City, LCRD, and LCSD based on historical discharges and projected population growth.

Table ES-3
Summary of Existing and Projected Flow and Loading

Parameter	Existing (2019)				2030				2040			
	AA	MM	MD	PH	AA	MM	MD	PH	AA	MM	MD	PH
City												
Flow (MGD)	0.506	0.653	0.961	1.819	0.552	0.839	1.049	1.985	0.677	1.029	1.286	2.434
BOD (lb/d)	-	1,054	1,318	-	-	2,143	2,677	-	-	2,598	3,247	-
TSS (lb/d)	-	1,200	1,499	-	-	2,143	2,677	-	-	2,598	3,247	-
LCRD												
Flow (MGD)	0.201	0.298	0.382	0.724	0.280	0.425	0.531	1.005	0.355	0.540	0.675	1.277
BOD (lb/d)	-	482	602	-	-	1,020	1,275	-	-	1,296	1,619	-
TSS (lb/d)	-	548	685	-	-	1,020	1,275	-	-	1,296	1,619	-
LCSD												
Flow (MGD)	0.040	0.095	0.077	0.145	0.072	0.110	0.138	0.261	0.083	0.126	0.157	0.297
BOD (lb/d)	-	154	192	-	-	283	354	-	-	320	400	-
TSS (lb/d)	-	175	219	-	-	283	354	-	-	320	400	-
Total System												
Flow (MGD)	0.748	1.046	1.421	2.688	0.904	1.375	1.718	3.250	1.115	1.695	2.118	4.008
BOD (lb/d)	-	1,690	2,112	-	-	3,446	4,306	-	-	4,215	5,267	-
TSS (lb/d)	-	1,923	2,403	-	-	3,446	4,306	-	-	4,215	5,267	-

AA – Average Annual; MM – Maximum Month Average Day; MD – Maximum Day

The projected 2040 cumulative maximum month (MM) average day flow is 1.70 million gallons per day (MGD), and the maximum month average biochemical oxygen demand (BOD) and total suspended solids (TSS) loading is 4,215 pounds per day (lb/d) each.

WWTP Analyses

Chapter 6 analyzes the existing WWTP. **Table ES-4** provides the current design criteria for the WWTP. As shown in the table, the 2040 projected flow and loading values do not exceed the rated design criteria. However, improvements to the WWTP will be needed during the planning period based on age, condition, and other factors as described in **Chapter 6**.

Table ES-4
Influent Flow and Loading Design Criteria

Parameter	Design Criteria	2040 Projection
Hydraulic Loading		
Maximum Month Average Daily Flow	2.64 MGD	1.70 MGD
Maximum Day Flow	2.94 MGD	2.12 MGD
Peak Hour Flow	NA	4.01 MGD
Peak Instantaneous Flow	4.32 MGD	4.01 MGD
Solids Loading		
Maximum Month Average Daily BOD	4,986 lb/d	4,215 lb/d
Maximum Month Average Daily TSS	6,315 lb/d	4,215 lb/d

Collection System Analyses

Chapter 6 also analyzed the existing collection system and lift stations. The City's collection system is complex and includes 16 lift stations, 38 miles of gravity collection piping, and 21 miles of force main piping as previously noted. Additionally, the system includes the dual Northshore interceptor system and low-pressure interceptor from LCRD. **Chapter 6** analyzed the hydraulic capacity of the major pipelines and lift stations and provided a basic assessment of the age and conditions of the major components. Various lift station and collection system improvements were identified to rectify specific capacity- and conditions-based needs. Additionally, an allowance for both lift station and collection system improvements was established to budget for other needed improvements that may arise.

Recommended Improvements

The recommended improvements for the planning period were identified in **Chapter 7. Table ES-5** lists the projects and estimated indirect, direct, and total project costs.

Table ES-5
Capital Improvements Plan

CIP No.	Description	Project Cost		
		Indirect	Direct	Total
Lift Station, Force Main and Interceptor Improvements				
LS00	Annual Short-lived Assets Replacement (Project Cost Totalized)	\$0	\$1,710,000	\$1,710,000
LS01	CC 5 and Force Main Improvements	-	-	-
LS02	CC 1 Improvements	\$300,000	\$1,000,000	\$1,300,000
LS03	CC 3 Improvements	\$34,615	\$115,385	\$150,000
LS04	Transfer Lift Station Bypass Valve Replacement	\$9,231	\$30,769	\$40,000
LS05	CC 8 Force Main Replacement	\$46,154	\$153,846	\$200,000
LS06	CC 9 Removal	\$115,385	\$384,615	\$500,000
Collection System Gravity Sewer Main Improvements				
CS00	Annual Pipe Replacement Fund (Project Cost Totalized)	\$1,977,229	\$6,590,763	\$8,568,000
CS01	Golf Course Road Sewer	-	-	-
CS02	SR 150 Mainline near Chelan Fruit	\$87,115	\$290,384	\$377,500
CS03	SR 150 Mainline Upsize	\$376,846	\$1,256,153	\$1,633,000
CS04	Columbia Street Mainline Upsize	\$114,692	\$382,307	\$497,000
CS05	Mainline CC 1/CC 2 to Transfer Lift Station	\$607,384	\$2,024,613	\$2,632,000
CS06	SR 97A Mainline Draining to CC 2	\$178,673	\$595,576	\$774,250
WWTP Projects				
WW01	RBC Air Cup Replacement	-	-	-
WW02	Secondary Treatment System Engineering Report	\$150,000	\$0	\$150,000
WW03	Standby Generator Replacement	\$103,846	\$346,154	\$450,000
WW04	Blower Building MCC Replacement	\$191,538	\$638,461	\$830,000
WW05	Primary Sludge Valves Replacement	\$11,538	\$38,462	\$50,000
WW06	Primary Clarifier Refurbishment	\$53,077	\$176,923	\$230,000
WW07	Secondary Treatment System Replacement	\$1,846,152	\$6,153,840	\$8,000,000
WW08	Secondary Sludge Thickening	\$235,384	\$784,615	\$1,020,000
WW09	Two 35-foot Secondary Clarifier Refurbishments	\$80,769	\$269,231	\$350,000
WW10	50-foot Secondary Clarifier RAS/Scum Pump Improvements	\$9,231	\$30,769	\$40,000
WW11	Digester Mixing/Aeration System Refurbishment	\$129,231	\$430,769	\$560,000
WW12	Dewatering System Replacement	\$223,846	\$746,153	\$970,000
WW13	Membrane Roof Repair (3 Buildings)	\$256,154	\$853,845	\$1,110,000
WW14	Enclose Sludge Bin Storage Area	\$9,231	\$30,769	\$40,000
Miscellaneous Items				
M01	General Sewer Plan (Total for 2 in 2021 dollars)	\$400,000	\$0	\$400,000
M02	Public Works Building (Sewer Portion)	\$0	\$291,262	\$291,262
M03	Sewer Rate Study (Total for 4 in 2021 Dollars)	\$75,472	\$0	\$75,472
M04	Update City Standards	\$25,000	\$0	\$25,000
M05	Northshore Interceptor Analysis	\$50,000	\$20,000	\$70,000
M06	Additional Heated Storage for Maintenance Crews	\$57,692	\$192,308	\$250,000
Totals		\$7,755,484	\$25,537,970	\$33,293,484

RBC = rotating biological contractors

MCC = motor control center

RAS = return activated sludge

Financial Analyses

A financial analysis was completed in **Chapter 9** based on the proposed Capital Improvements Plan (CIP) and project implementation schedule. A detailed rate analysis is expected to be completed separately from this GSP by a financial subconsultant. As such, **Chapter 9** included a brief summary of the financial planning as it relates to funding the projects scheduled in the first 5 years of the CIP. **Table ES-6** provides the project costs, implementation years, and City, LCRD, and LCSD portions of the costs associated with the projects scheduled in the first 5 years of the CIP.

Table ES-6
City Portion of Totalized Project Costs for 5-Year CIP (2022-2026)

			Estimated Total Cost by Improvement Year (Cost Multiplier starting with 3% in 2021)				
CIP No.	LCSD Portion	LCRD Portion	2022 (Yr. 1)	2023 (Yr. 2)	2024 (Yr. 3)	2025 (Yr. 4)	2026 (Yr. 5)
			1.03	1.06	1.09	1.12	1.15
Lift Station, Force Main and Interceptor Improvements							
LS00	0%	0%	\$97,850	\$100,700	\$103,550	\$106,400	\$109,250
LS02	0%	0%	-	\$159,000	\$1,253,500	-	-
LS03	0%	0%	-	-	\$18,865	\$148,615	-
LS04	5%	30%	-	-	-	-	\$29,900
Collection System Gravity Sewer Main Improvements							
CS00	0%	5%	\$53,742	\$479,332	\$492,898	\$506,463	\$520,029
CS02	5%	30%	-	\$30,011	\$236,598	-	-
CS03	0%	0%	-	-	-	\$211,034	\$1,661,262
CS04	0%	0%	-	-	-	\$64,228	\$505,601
WWTP Projects							
WW02	5%	30%	-	-	-	-	\$112,125
WW03	5%	30%	\$34,762	\$274,275	-	-	-
WW04	5%	30%	\$64,117	\$505,884	-	-	-
WW05	5%	30%	-	-	\$35,425	-	-
WW10	5%	30%	-	-	\$28,340	-	-
WW12	5%	30%	\$74,932	\$591,214	-	-	-
Miscellaneous Items							
M02	0%	0%	\$300,000	-	-	-	-
M03	0%	0%	-	\$20,000	-	-	-
M05	0%	50%	\$22,500	-	-	-	-
Totals*			\$648,000	\$2,160,500	\$2,169,200	\$1,036,800	\$2,938,200
5-year Total							\$8,952,700

*Totals are rounded up to nearest \$100.

Table ES-6 provides cash flow projections for the Sewer Capital Fund through 2027 based on the proposed projects in the first 5 years of the CIP.

Table ES-6
Cash Flow Projections for Sewer Capital Fund 2022-2026

Year	2022	2023	2024	2025	2026	2027
Cash on Hand Beginning of Year	\$1,896,916	\$2,169,943	\$1,109,770	\$1,041,604	\$1,065,285	\$2,259,875
Transfer In – Rates Revenue	\$1,035,794	\$1,240,254	\$1,301,635	\$1,366,462	\$1,434,924	\$1,507,220
Other Revenues (GFC, Assessments, Int.)	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
GFC Adjustment (for 2021)	\$200,000	-	-	-	-	-
District Project Reimbursements	\$22,500	\$857,170	\$203,754	\$26,574	\$106,921	-
Revenue Bond Issue	-	-	\$1,000,000	-	\$3,000,000	-
Use of Cash – Debt Service	(\$518,442)	(\$517,359)	(\$516,703)	(\$516,016)	(\$515,298)	(\$514,099)
Use of Cash – Revenue Bonds Projected	-	-	-	(\$89,941)	(\$89,941)	(\$449,705)
Use of Cash – Projects	(\$766,825)	(\$2,940,239)	(\$2,356,853)	(\$1,063,397)	(\$3,042,015)	(\$1,349,567)
Unobligated Cash on Hand at Year End	\$2,169,943	\$1,109,770	\$1,041,604	\$1,065,285	\$2,259,875	\$1,753,724

GFC = General Facilities Charge

Int = Interest

1 | INTRODUCTION

Sewer System Ownership and Management

The City of Chelan (City) owns and operates a sanitary sewer system that serves the City limits and Chelan Urban Growth Area (UGA). Additionally, the system receives wastewater collected from the Lake Chelan Reclamation District (LCRD) on the north shore of Lake Chelan and wastewater collected from the Lake Chelan Sewer District (LCSD) on the south shore. LCRD's system is owned and operated by LCRD, whereas the LCSD system is owned by LCSD but operated the City. The agreements with these districts are discussed in further detail later in this General Sewer Plan (GSP).

Overview of Existing System

Sewage collection and transmission in the system are provided through a conventional gravity collection system and lift stations. The majority of the wastewater collected in the system flows to the City's Transfer Lift Station, at the site of the original wastewater treatment plant (WWTP) on the south end of Lake Chelan. Wastewater is pumped from the Transfer Lift Station to the City's WWTP in Chelan Falls. Treated effluent is discharged to the Columbia River.

A summary of the City's sewer system is provided in **Table 1-1**.

Table 1-1
Sewer System Data (2019 Data)

Description	Data
Population (UGA)	4,577
Population (City)	4,265
Active Accounts (City + LCSD)	2,241
Average Annual Flow (MGD)	0.748 MGD
Maximum Month Average Day Flow (MGD)	1.046 MGD
Number of Lift Stations	16
Current ERU Contribution (Maximum Month)	185 gpd
Planned ERU Contribution (Maximum Month)	200 gpd
Total Length of Gravity Sewer Main (miles)	38
Total Length of Sewer Forced Main (miles)	21

MGD = million gallons per day

ERU = equivalent residential unit

gpd = gallons per day

Authorization and Purpose

The City authorized RH2 Engineering, Inc., (RH2) to prepare a GSP in accordance with Washington Administrative Code (WAC) 173-240-050. The previous GSP was prepared for the City in 2008. In recent years, the City has experienced increasing growth, and in conjunction with the age of the

previous GSP, this has prompted an update to the GSP. The purpose of this updated GSP is as follows:

- To evaluate current sewer flow data and projected future flows and loading.
- To identify areas where additional flow monitoring information is needed.
- To analyze the current sewer system to determine if it meets minimum requirements mandated by the Washington State Department of Ecology (Ecology) and the City's own policies and design criteria.
- To assess infiltration and inflow (I/I) based on metered water usage, precipitation, average daily temperatures, and wastewater flows.
- To determine the overall reliability and vulnerability of the current wastewater lift stations.
- To identify existing and projected land use patterns in and adjacent to the City and their impacts on existing and potential future facilities.
- To identify sewer system improvements that will resolve current system deficiencies and accommodate future system growth or expansion.
- To prepare a schedule of improvements that meets the goals of the City's financial program.

Summary of GSP Contents

A summary of the content of the chapters in this GSP is as follows:

- **Chapter 1** introduces the reader to the City's sewer system, the objectives of the GSP, and the GSP organization.
- **Chapter 2** presents the sewer service area and describes the existing sewer system.
- **Chapter 3** presents related plans, land use, and population characteristics.
- **Chapter 4** identifies existing wastewater flow and loading rates and projects future flow and loading rates.
- **Chapter 5** presents the City's policies and standards related to the sewer utility.
- **Chapter 6** discusses the sewer system analyses and existing system deficiencies.
- **Chapter 7** presents the proposed sewer system improvements, their estimated costs, and a schedule for implementation.
- **Chapter 8** discusses the City's operations and maintenance program.
- **Chapter 9** summarizes the financial status of the sewer utility and presents a plan for funding the sewer improvements.

2 | SEWER SYSTEM OVERVIEW

Introduction

This chapter describes the City's sewer service area, wastewater collection and treatment systems, and lift stations. Analysis of the existing sewer system is presented in **Chapter 4**. The results of the evaluation of the existing sewer system is presented in **Chapter 6**. Included in this chapter is a brief overview of the City's topography, geology, and climate to provide a better understanding of the physical characteristics of the City's sewer service area. A brief description of the City's water system facilities also is presented.

Previous Planning Documents

The previous GSP was completed in 2008. Documents relevant to infrastructure planning prior to 2008 were listed in Chapter 1 of the 2008 GSP. Relevant infrastructure planning work that has been completed since the 2008 GSP includes:

- 2020 LCRD GSP (in progress), RH2;
- 2020 LCSD *Financial Analysis and CIP Review*, RH2;
- 2018 City *Sanitary Sewer Capital Improvements Summary*, Gray & Osborne;
- 2013 City *Lord Acres Infrastructure Planning Report*, RH2;
- 2010 LCSD *Capital Improvement Plan*, RH2;
- 2007 Northshore Interceptor Replacement Lift Station Capacity Analysis, RH2;

Recently Completed Projects

The following list includes the major projects that have been completed within the system since the previous GSP and includes the approximate year of completion. Small collection system improvements and expansion projects are not included in the list.

- Lift Station (CC) 5 and Forcemain Replacement, 2021 (in progress)
- SR 150 No-See-Um Road Intersection Realignment, 2017
- CC 10 Rehabilitation, 2017
- Construction of CC 16, 2017
- Construction of CC 15 and Forcemain, 2016
- Phase II WWTP and Transfer Lift Station Improvements, 2015
- CC 2 Rehabilitation, 2014
- Transfer Lift Station Forcemain and SR 150 Pipeline Upsize, 2013
- SR 150 4" Slipline Project, 2016

Sewer Service Area Description

Sewer Service Area Boundary, City Limits, and UGA

The City is located in North Central Washington on the southeast end of Lake Chelan as shown in **Figure 2-1**.

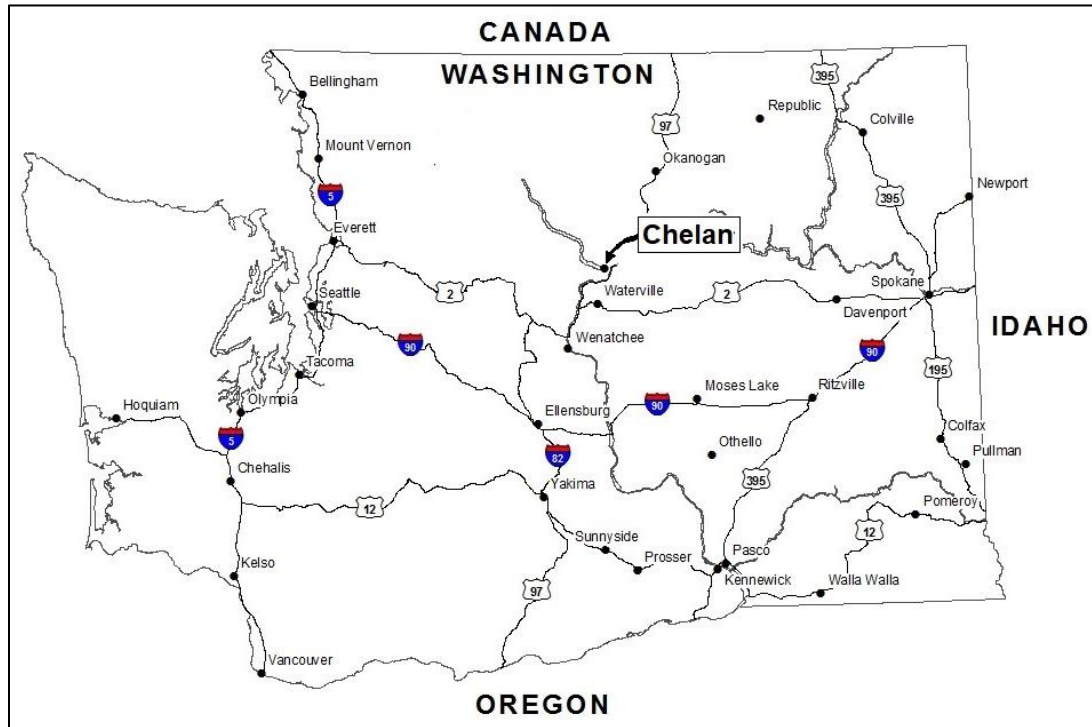


Figure 2-1 Vicinity Map

A general vicinity map of the City limits and Chelan UGA, is shown in **Figure A-1** in **Appendix A**. An overview of the City's sewer system infrastructure is shown in **Figure A-2** in **Appendix A**. Further analysis of land use and planning boundaries is included in **Chapter 3**.

Collection System History

Portions of the sewer collection system date back to 1915. The initial sewer collection system was trunklines and laterals that collected sewer from the present-day downtown area. The original materials of the collection system were vitrified clay pipes and brick manholes. The collection system was expanded in 1948 to include the developed area surrounding the present-day downtown area. At this same time, City Lift Station No. 1 (CC 1) was constructed at the mouth of the Chelan River at Columbia Street. The purpose of CC 1 was to lift sewage from developed areas along the north and south shores of Lake Chelan into the existing sewer collection system.

In 1956, the City annexed the Town of Lakeside. The City's sewer collection system expanded to provide service to this area. During this expansion, concrete pipe was used exclusively. Four new lift stations were built along the south shore of Lake Chelan. These pump stations pumped sewage into the main lift station, and then into the City's sewer collection system. During this time, sewer service was also extended to the north, east, and west.

The sanitary sewer system serves many residences located at elevations lower than the main trunk lines and near the lake. Because of this, sewage pumping is required at many locations throughout the City. There are multiple City-owned lift stations in the City's collection system. Many of these lift stations were constructed in the late 1950s and have been upgraded by the City over the years.

The City's WWTP has evolved many times. A summary of its history is described in the **Wastewater Treatment and Disposal Facilities** section.

There are two neighboring sewer districts that discharge to the City's collection system. LCRD primarily serves the community of Manson on the north shore of the lake. LCSD serves residences and commercial facilities on the south shore of the lake. These systems are described further in the **Adjacent Sewer Systems** section.

Geology

The City is in the eastern foothills of the Cascade Mountains in eastern Chelan County, Washington at the eastern shore of Lake Chelan. The soil is primarily alluvial deposits and glacial drift. Volcanic pumice and ash from the Glacier Peak region is present in the soil in many areas. The mountainous terrain consists largely of rock outcroppings and shallow soils.

In the planning area, the geology is primarily underlying rock formations with a shallow mantle of soils in the valleys, with frequent rock outcroppings in the mountainous areas. The bedrock is igneous in nature throughout much of the planning area, with granite and diorite predominating.

Topography

The topography of the area served by the City varies greatly in elevation. The highest elevation served is approximately 1,700 feet above mean sea level (AMSL). The lowest areas served are located at the eastern edge of the UGA with an approximate elevation of 1,100 feet AMSL. The wastewater treatment plant is outside of the sewer service area by the Columbia River at an approximate elevation of 730 feet AMSL. Most of the sewer infrastructure is built around the shoreline of Lake Chelan. For this reason, many lift stations are required in the sewer system. Elevation contours within the City limits and surrounding UGA are shown in **Figure A-3** in **Appendix A**.

Climate

The climate in the City is typical of the climate in eastern Washington. The summers are hot, dry, and mostly clear. The winters are cold with low precipitation. The City averages only 11 to 12 inches of precipitation per year and has approximately 200 sunny days per year. **Table 2-1** lists the average monthly minimum, average, and maximum temperatures and precipitation for each month from 2010 to 2019.

Table 2-1
Historical Monthly Temperature and Precipitation (Monthly Averages for 2010-2019)

Month	Temperature			Precipitation
	Minimum	Average	Maximum	
	°F	°F	°F	inches
January	26.9	30.1	34.2	1.38
February	28.1	32.9	39.2	0.97
March	36.2	43.1	51.5	1.96
April	42.4	51.2	60.9	0.99
May	50.7	61.2	72.4	0.91
June	56.4	67.0	78.3	0.56
July	63.5	75.0	87.7	0.30
August	63.4	74.5	87.2	0.31
September	54.6	64.3	75.7	0.49
October	44.0	51.2	59.9	1.33
November	34.2	38.8	44.7	0.99
December	27.1	30.3	34.2	1.70
Annual Total	-	-	-	11.88

Data courtesy of WSU AgweatherNet, Chelan S. station

°F = degrees Fahrenheit

Water Bodies and Floodplains

The City is located along the shore of Lake Chelan. Water flows out of Lake Chelan through the Chelan River gorge to the Columbia River, approximately 400 feet below the lake level. The water level of Lake Chelan is controlled by a hydroelectric dam owned and operated by Public Utility District No. 1 of Chelan County.

The presence of the Lake Chelan hydroelectric dam limits the flooding hazard for the collection system along the main lake valley. The possibility of flash flooding is a factor for the many smaller drainages and tributaries at lower elevations in the basin. The presence of numerous hydroelectric dams along the Columbia River also limits flooding of the City's WWTP. The City and its UGA do not contain mapped channel migration zones or floodways; potential areas of 100-year floodplain lie along the Chelan River, where the City applies standards for building and site development to avoid impacts. Refer to **Figure A-4** in **Appendix A** for mapped floodplains in the City's service area.

Critical Areas

The Growth Management Act (GMA) requires designation and protection of critical areas. Critical areas include fish and wildlife habitat, flood zones, aquifer recharge areas, streams, creeks, rivers, lakes, wetlands, and other surface waters, as well as geologic hazard areas such as steep slopes and liquefaction zones. Refer to **Figure A-4** in **Appendix A** for critical areas in the City's service area.

Appendix I contains a State Environmental Policy Act (SEPA) checklist that addresses other environmental concerns.

Summary of Existing Sewer Infrastructure

The City owns, operates, and maintains the wastewater system, which includes the collection system, 15 wastewater lift stations, a wastewater treatment plant, and an effluent outfall to the Columbia River. One of the lift stations is referred to as the Transfer Lift Station, which is located at the site of the old WWTP. This chapter provides a brief summary of existing sewer system infrastructure. A detailed analysis of the existing infrastructure is provided in **Chapter 6**.

Sewer Drainage Basins

The City's existing sewer service area is comprised of 11 sewer drainage basins named Basin A through Basin K, as shown in **Figure A-5** in **Appendix A**. Additionally, individual basin maps are provided as **Figures B-1** through **Figure B-10** in **Appendix A**.

Lift Stations

The City currently owns, operates, and maintains 16 wastewater lift stations. The characteristics of the lift stations are summarized in **Table 2-2**. Further lift station analyses are included in **Chapter 6**.

Table 2-2
Lift Station Inventory

Number (Identifier)	Lift Station		Pump						Emergency Storage	Back-up Power
	Type	Wetwell Diameter	Type	Qty.	Manufacturer Model	Capacity (gpm)	TDH (feet)	Size (hp)		
CC LS NO. 1 (Campbell's)	Wet-pit/ Dry-pit	168" ID	Drypit Centrifugal	3	Cornell 4 NNT-VC-25-4	940	73	25	In-wetwell	Permanent generator
CC LS NO. 2 (Grandview)	Wet-pit	144" ID	Submersible Centrifugal	2	Flygt NP 3153	1,360	39	20	In-wetwell	Permanent generator
CC LS NO. 3 (Peterson Condos)	Wet-pit	60" ID	Submersible Centrifugal	2	Hydromatic S4NX150CB	150	15	1.5	In-wetwell	Portable generator
CC LS NO. 4 (Waterslide Dr.)	Wet-pit	120" ID	Submersible Centrifugal	2	Flygt CP3102	300	39	5	In-wetwell	Portable generator
CC LS NO. 5 (Three Fingers)	Wet-pit	120" ID	Submersible Centrifugal	2	Flygt 3153 HT 451	650	60	18	In-wetwell	Permanent generator
CC LS NO. 6 (Green Docks or Water Street)	Wet-pit	96" ID	Submersible Centrifugal	2	Flygt CP3102	175	32	5	In-wetwell	Portable generator
CC LS NO. 7 (Lakeside Park)	Wet-pit	72" ID	Submersible Centrifugal	2	Flygt CP3102	300	39	5	Separate 6,500 gal	Portable generator
CC LS NO. 8 (Spader Bay)	Wet-pit	72" ID	Submersible Centrifugal	2	Flygt CP3152	240	133	23	In-wetwell	Portable generator
CC LS NO. 9 (Fairway)	Wet-pit Top-Mounted	60" ID	Vertical Centrifugal	2	S&L 5K213DP7717A	100	40	3	In-wetwell	Portable generator
CC LS NO. 10 (Chelan Shores)	Wet-pit	60" ID	Submersible Centrifugal	2	Flygt NP 3153	165	175	23	In-wetwell	Portable generator
CC LS NO. 11 (Northshore 4)	Wet-pit	72" ID	Submersible Centrifugal	2	Flygt CP3201	575 (14") 450 (10")	175 (14") 190 (10")	50	Separate ~37,000 gal	Portable generator
CC LS NO. 12 (Public Works)	Wet-pit	48" ID	Submersible Centrifugal	1	Unknown	< 50 (estimated)	Unknown	Unknown	Unknown	Portable generator
CC LS NO. 14 (Key Bay)	Wet-pit	72" ID	Submersible Centrifugal	2	Flygt CP3152	200	140	23	In-wetwell	Portable generator
CC LS NO. 15 (Lord Acres)	Wet-pit	60" ID	Submersible Centrifugal	2	Flygt NP3171	300 (14") 200 (10")	165 (14") 185 (10")	35	Separate 14,000 gal	Portable generator
CC LS NO. 16 (Boat Launch)	Wet-pit	72" ID	Submersible Centrifugal	2	Flygt NP 3102	275	25	5	In-wetwell	Portable generator
Transfer Lift Station (Primary Treatment Plant)	Wet-pit/ Dry-pit	NA	Dry-pit Centrifugal	4	Cornell 6NHTA	(3) 1050 (1) 700	(3) 240 (1) 170	(3) 100 (1) 50	In-wetwell	Permanent generator

Collection Piping

The City has approximately 37.8 miles of sewer piping, including collection sewers and interceptors.

Table 2-3 summarizes the pipe by diameter. **Figure A-5** in **Appendix A** illustrates pipe size and location. Individual basin maps with pipe sizes denoted by color are also provided as **Figures B-1** through **Figure B-10** in **Appendix A**.

Table 2-3
City Sewer Collection System Pipe Inventory

Diameter	Length		Portion of System
	ft	mi	
Gravity Collection Pipes			
2	280	0.1	0.1%
4	1,063	0.2	0.5%
6	3,495	0.7	1.7%
8	158,022	29.9	79.1%
10	8,375	1.6	4.2%
12	14,631	2.8	7.3%
15	7,799	1.5	3.9%
16	725	0.1	0.4%
18	2,371	0.4	1.2%
21	3,084	0.6	1.5%
Total	199,844	37.8	100.0%
Force Mains			
2	3,572	0.7	3.3%
2.5	2,260	0.4	2.1%
3	374	0.1	0.3%
4	5,429	1.0	5.0%
6	8,363	1.6	7.7%
8	5,932	1.1	5.5%
10	41,477	7.9	38.2%
12	6,330	1.2	5.8%
14	32,852	6.2	30.3%
16	1,849	0.4	1.7%
Total	108,437	20.5	100.0%

Lengths are approximate as extracted from the SewerCAD hydraulic model

Wastewater Treatment and Disposal Facilities

A brief history of the City's WWTP is as follows:

- 1948 – A primary treatment plant was constructed ¼ -mile downstream of the Lake Chelan dam on the Chelan River. This plant provided primary treatment of wastewater prior to discharge to the Chelan River and is herein referred to as the “primary treatment plant.”

- 1966 – The primary treatment plant was upgraded to perform additional preliminary treatment and secondary treatment via an activated sludge system to increase capacity and meet new regulatory requirements for discharge to the Chelan River.
- 1976 – The headworks and grit removal portions of the primary treatment plant were upgraded.
- 1986 – A new WWTP to serve the City was constructed at Chelan Falls for treatment and discharge to the Columbia River. The WWTP was designed to provide secondary treatment of wastewater via an attached growth process consisting of rotating biological contactors (RBCs). The WWTP included secondary clarifiers, disinfection via chlorination, and solids handling, including two aerobic digesters. Secondary treatment was removed from the primary treatment plant, resulting in only preliminary and primary treatment occurring at that facility. A lift station was constructed at the primary treatment plant, and a forcemain and gravity transmission mains were constructed to deliver the primary effluent to the WWTP.
- 1994 – A project was completed to eliminate “bottlenecks” that were found to be limiting the hydraulic capacity of the treatment facilities to 0.9 MGD. The headworks, transfer lift station pumps, and chlorine contact chamber were modified, increasing the overall hydraulic capacity of the treatment facilities to 1.47 MGD.
- 2000 – The City’s *Wastewater Facility Plan* (WWFP) was completed by Gray & Osborne Inc., outlining Phase I and Phase II projects to increase the capacity of the treatment facilities.
- 2002 – Phase I WWTP Project was completed. These improvements converted the primary treatment plant to provide only screening, grit removal, and conveyance to the WWTP. All other treatment, including primary, secondary, disinfection, and solids handling, was now performed at the WWTP.
 - The improvements at the primary treatment plant included upgraded pumping facilities
 - The improvements at the WWTP included:
 - A new primary clarifier;
 - A second RBC train with equipment procured from the City of Puyallup;
 - A third secondary clarifier;
 - Two additional aerobic digesters, sludge pumping and dewatering equipment, and in-vessel composting equipment; and
 - Ultraviolet (UV) disinfection.
- 2010 to 2015 – Phase II WWTP Project was completed. These improvements added a Headworks with screening and grit removal at the WWTP. Screening and grit removal was also left in service at the primary treatment plant (hereafter referred to as the Transfer Lift Station), though the primary clarifier at this site was abandoned.
 - The improvements at the transfer lift station included:
 - A backup generator, odor control, and electrical upgrades.
 - The improvements at the WWTP included:

- New headworks building with two rotary grit screens with aerated grit chambers and odor control;
 - A second primary clarifier;
 - A 16-inch influent Parshall flume;
 - The old wash tank was upgraded to a biosolids storage tank with a blower and small air bubble diffusers;
 - A new wasting pump and flow meter at the dewatering building;
 - Operations building improvements; and
 - Other miscellaneous improvements.
- Since 2015
 - The air-operated diaphragm primary sludge and scum pumps were replaced with progressive cavity pumps;
 - The centrifuge bowl and scroll were replaced;

Additional information regarding previous plant upgrades can be found in the fact sheet accompanying the City's National Pollutant Discharge Elimination System (NPDES) permit in **Appendix B**.

The WWTP includes screening and grit removal, primary clarification, secondary treatment, disinfection, and solids handling. The WWTP is shown in **Figure 2-2**.



Figure 2-2 Wastewater Treatment Plant Aerial

Wastewater Characterization

The City's wastewater is primarily residential in nature. The sewer system largely serves residential connections, with normal associated institutional connections (schools, local government buildings, etc.) and commercial connections (restaurants, hotels, etc.) associated with a largely residential

system with a high level of tourism. The only significant industrial discharges come from fruit packing warehouses. The industrial discharges are minimal and do not alter the composition of the wastewater considerably. Further analysis of the system flow and loading is included in **Chapter 4**.

Water Reclamation

There is no known significant reuse of wastewater effluent, other than internal usage as non-potable water within the WWTP.

Adjacent Sewer Systems

WAC 173-240-050 requires a list in the GSP of “any existing domestic or industrial wastewater facilities within twenty miles of the general plan area and within the same topographical drainage basin containing the general plan area.” There are several sewer service systems that are within 20 miles of the City’s sewer service area that are outside of the City’s topographical drainage basin, making regionalization with the City infeasible. There also are industrial wastewater systems that are within a 20-mile radius and the same topographical drainage basin as the City’s system. These are discussed in **Chapter 4**.

The adjacent LCSD and LCRD systems discharge to the City’s system. Both districts serve residential and commercial dischargers. The total flow from each district is metered prior to discharging to the City’s system. The service areas for the LCRD and LCSD systems is shown on **Figure A-1** in **Appendix A**. A summary of the existing and projected flow and loading from these districts is included in **Chapter 4**.

A summary of historical agreements between the City and LCSD and LCRD can be found in the 2008 GSP. A discussion on the policies related to these districts is included in **Chapter 5**.

Other City-Owned and Operated Systems

This section provides a brief overview of other public utilities owned by the City. Further information can be found in each utility’s respective comprehensive plan.

City of Chelan Water System

The City owns and operates a domestic water system. The most recent Water System Plan (WSP) was completed in 2018 by Gray & Osborne.

The City water service area is approximately the same as the UGA. The City’s water system serves customers within an elevation range of approximately 1,100 feet AMSL (North American Vertical Datum (NAVD), 1988) along the shore of Lake Chelan to approximately 1,700 feet AMSL on the hills surrounding the lake. The wide range of elevations requires that the water pressure be increased or reduced to maintain pressures that are safe and sufficient to meet the flow requirements of the system. The City achieves this by dividing the water system into 24 distinct pressure zones.

The City’s water service area contains approximately 36 miles of water main with sizes up to 36 inches. Most of the water mains, approximately 40 percent, within the service area are 8 inches in diameter, and 18 percent of the water main is 10 inches in diameter or larger.

The City's domestic water supply comes from a raw water pump station located in the outfall of Lake Chelan about 300 yards upstream from the dam. The water treatment plant includes filtration and disinfection. The City's water storage consists of 12 reservoirs. In addition to the raw water pump station, the City has 13 booster pump stations.

Currently, the City does not have any interties for domestic water. Prior to 2008 the City supplied the Chelan River Isenhardt Water District with domestic potable water. The City acquired the domestic water system from Isenhardt's Water District in January 2008.

The City has a metered raw water intertie with the Isenhardt Irrigation District. This is metered through a 3-inch pipe to the Washington Street Booster Pump Station.

The WSP provides maps of the water system, including sources, storage, and distribution infrastructure for the system.

3 | LAND USE AND POPULATION

Introduction

This chapter demonstrates the compatibility of the City's GSP with other planning documents, identifies the designated land uses within the existing and future service areas, and presents population projections within the City's planning area.

Compatibility with Relevant Planning Documents

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

- State of Washington's GMA.
- 2017 City *Comprehensive Plan*.
- 2017 Chelan County (County) *Comprehensive Plan*.

The City and County comprehensive plans are developed and updated to meet the requirements of the GMA. The GMA requires, among other things, consistency between land use and utility plans and their implementation.

Growth Management Act

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

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

Urban Growth Area

The GMA requires that the County and City cooperate in designating a UGA. As part of the development of the City's 2017 *Comprehensive Plan* update, the City and County designated a UGA that would accommodate the City's projected population growth and provide resource conservation. According to the City *Comprehensive Plan*, the current UGA is expected to meet the anticipated population growth in the plan's 20-year planning period, ending in 2037.

The current UGA is shown in **Figure A-2** in **Appendix A**.

It should be noted that there are City lands associated with the Lake Chelan Airport on Howard Flats. Discussions regarding a future City water main to the Airport, for the purposes of providing fire flow to allow for commercial and industrial economic expansion in the area, are currently ongoing at the time of this Plan. As part of this planning, discussions regarding the extension of City sewer service to the area have been prompted. A feasibility-level review of a sewer service extension to the Airport, in addition to water service, has shown this to be a non-starter due to

high capital costs. This Plan assumes no sewer service will be extended to the Airport during the planning period.

Consistency

The GMA requires planning consistency from two perspectives. First, it requires consistency of plans among jurisdictions. This means that City and County plans and policies must be consistent (Revised Code of Washington (RCW) 36.70A.100). Second, the GMA requires implementation of the GSP be consistent with the comprehensive plans (RCW 36.70A.120).

Concurrency

Concurrency means that adequate public facilities and services are provided at the time growth occurs. To achieve this objective, the GMA encourages growth in areas already served or readily served by public facilities and services (RCW 36.70A.110). It also requires that when public facilities and services cannot be maintained at an acceptable level of service, new development should be prohibited (RCW 36.70A.110).

City and County Comprehensive Plans

The Chelan County *Comprehensive Plan* and the City *Comprehensive Plan* were each updated in 2017. The Land Use section of these plans include each entity's vision of how growth and development should occur over a 20-year horizon. While the Land Use section goals and policies set forth general standards for locating land uses, the land use map (as reproduced and shown in **Figure A-6 in Appendix A**) indicates geographically where certain types of uses may be appropriate.

The Land Use section considers the general location of land uses, as well as the appropriate intensity and density of land uses given current development trends. The utilities, transportation, and other infrastructure elements ensure that new development will be serviced adequately without compromising existing levels of service. The City's GSP is reviewed and taken into consideration during the development of revisions to the Capital Facilities Plan of each comprehensive plan.

Planning Period

The planning period established by this GSP is defined as the 20-year period starting in 2021 and extending through 2040. As such, this GSP will extend slightly beyond the planning periods proposed by the City and County comprehensive plans, which extend through 2037. The 20-year period proposed in this GSP is established based on historical data analysis terminating with 2019 data for this in this planning effort, the GSP development will occurring in 2020, and agency approval of the GSP occurring in 2021.

Existing and Projected Population

Household Size

The City is primarily a residential community comprised largely of single-family residences. In 2015, the Washington State Office of Financial Management (OFM) estimated that 1,741 housing units within the City limits were single-family residences, approximately 784 housing units were multi-family residences, and approximately 92 were “mobile homes and specials.” Specials include housing units such as additional dwelling units, among others.

OFM data from the 2010 Census indicates an average number of persons per household in the City’s UGA to be 2.38, compared to an average household size of the entire County of 2.56 persons per household. The average household size reported in the Census is based on an average household size for owner-occupied housing units and renter-occupied units combined.

Existing UGA Population

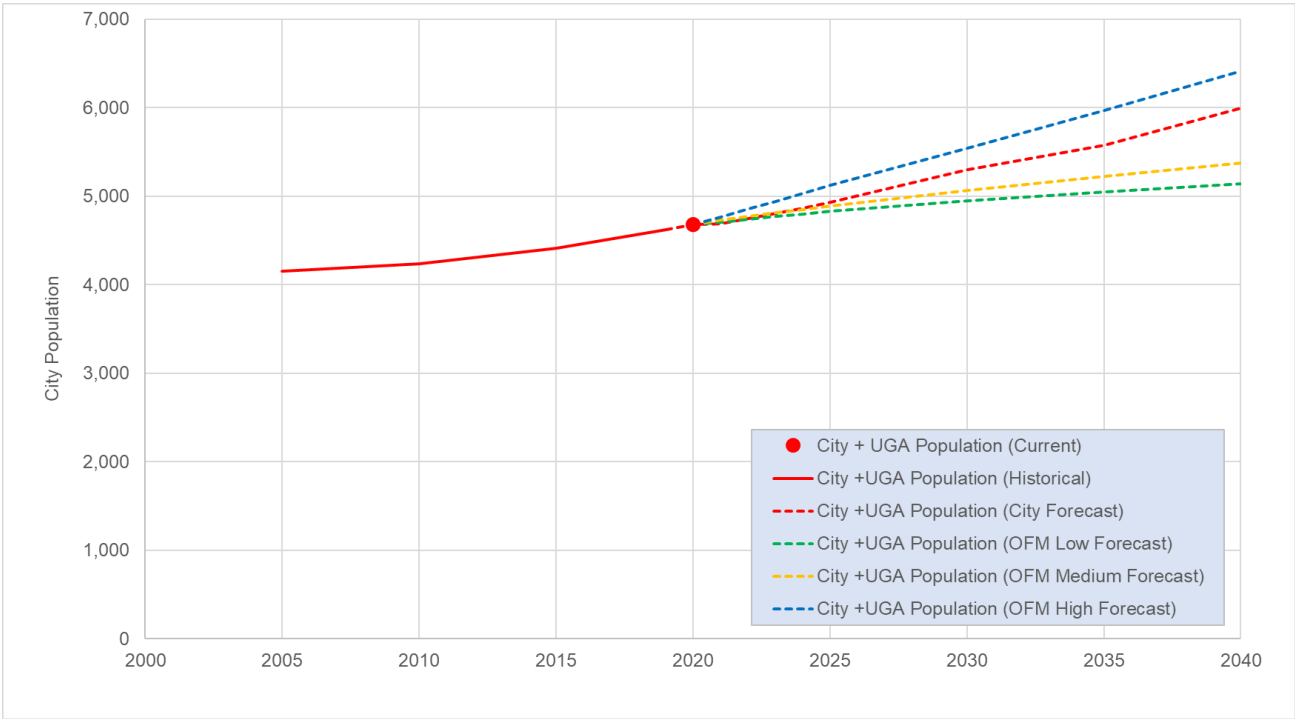
Per the County *Comprehensive Plan*, the year-round permanent population within the City’s UGA in 2017 was estimated at 4,465. However, a large portion of the City’s economy is related to tourism, and as such, the population increases dramatically during the summer months due to the influx of tourists and part-time residents.

The County has experienced relatively high population growth and extensive physical development in recent years. The population of the County increased approximately 17 percent from 2000 to 2019 based on OFM estimates. Within the City limits, the population has increased 12 percent during the same time.

Projected UGA Population

The City *Comprehensive Plan* projected population growth at an annualized rate of 1.24 percent per year. Based on this growth rate, the year-round permanent population within the City’s UGA by 2037 is projected to be 5,719 people. By contrast, the OFM estimates low, medium, and high growth rate projections for urban areas. **Chart 3-1** graphically shows the City projections and the three OFM projections for the UGA population, carried out to 2040. The chart also shows the historical population growth up to the current estimated population in 2020.

Chart 3-1
UGA Population and Projections



As shown, the City’s projected growth rate is slightly below the OFM high growth rate, but higher than the OFM medium and low rates. To be conservative and maintain consistency with the City’s *Comprehensive Plan*, the City’s projected population growth rate is used herein for estimating total projected City and UGA population.

It should be noted that the City is currently experiencing relatively high interest from residential developers. The 2018 Water System Plan provided the approximate size and location of pending developments and provided the forecasted water system usage based on both City growth projections and full buildout of all the potential developments. Full buildout of all potential developments would incur substantially higher system usage than that based on the 20-year City growth projections. However, it is difficult to project the overall likelihood of each development occurring, as well as the timeframe for buildout, and as such, this Plan projects system-wide growth based on the rate established in this chapter. This Plan utilizes the potential development locations to distribute projected growth within the system for the purposes of analyzing the collection system infrastructure in **Chapter 6**. During the planning period, the City should monitor growth trends and developments relative to the population projections and growth distribution provided in this Plan.

Table 3-1 lists the City’s historical population growth since 2000 and projected future growth within the City limits and the UGA using the City’s *Comprehensive Plan* projected population growth rate.

Table 3-1
Population Trends and Projections

Year	Permanent Population	
	City ¹	City + UGA ²
Historical		
2010	3,890	4,240
2011	3,930	4,286
2012	3,940	4,299
2013	3,955	4,320
2014	4,020	4,387
2015	4,045	4,415
2016	4,115	4,440
2017	4,150	4,465
2018	4,210	4,521
2019	4,265	4,577
Projected³		
2020	4,307	4,634
2021	4,361	4,692
2025	4,582	4,930
2030	4,874	5,244
2037⁴	5,315	5,719
2040	5,516	5,935

1. Historic population within the City limits is estimated from OFM Cities and Towns.

2. Historic population within the UGA is estimated from OFM, small area estimates program (SAEP) up to 2014. Estimates for 2015 to 2017 are based on the City's Comprehensive Plan.

3. Projected population for both the City and UGA is based on the projected growth rate developed by the City's Comprehensive Plan.

4. Year 2037 estimates are shown for consistency with the City's Comprehensive Plan estimate.

Land Use

The City limits encompass 4,017 acres, or 6.3 square miles, while the City's UGA encompasses an additional 1,806 acres, or 2.8 square miles, outside of the City limits. The existing sewer customers are within the City limits, with the exception of service to LCRD and LCSD outside of the City limits. There are existing properties within the City limits served by on-site septic systems as discussed in **Chapter 4**. Existing dwellings outside of the City limits also are served by on-site septic systems.

Table 3-2 shows the total area of each land use category within the current City limits and UGA.

Table 3-2
Land Use within the City Limits and UGA

Land Use Type	City Limits		UGA		City + UGA	
	Acres ¹	Percent of Total	Acres ¹	Percent of Total	Acres ¹	Percent of Total
Airport	62	1.1	62	1.1	123	2.1
Downtown Mixed Residential	167	2.9	0	0.0	167	2.9
Downtown Mixed Use	37	0.6	0	0.0	37	0.6
Downtown Public	13	0.2	0	0.0	13	0.2
Downtown Single-Family	11	0.2	0	0.0	11	0.2
Highway Service Commercial	44	0.7	1	0.0	44	0.8
Multi-Family Residential	210	3.6	94	1.6	305	5.2
Other ²	122	2.1	372	6.4	494	8.5
Public Lands and Facilities	306	5.3	52	0.9	359	6.2
Single-Family Residential	1077	18.5	624	10.7	1702	29.2
Special Use District	216	3.7	477	8.2	693	11.9
Tourist Accommodation	1186	20.4	3	0.1	1189	20.4
Tourist Mixed Use	7	0.1	0	0.0	7	0.1
Warehouse and Industrial	529	9.1	121	2.1	650	11.2
Waterfront Commercial	30	0.5	0	0.0	30.2355	0.5
Total	4,017	69.0%	1,806	31.0%	5,823	100.0%

1. The acreage values are based on land use designations within the UGA as taken from the City's GIS.

2. Other includes all land uses not designated but within the UGA. This includes roads and right-of-way.

According to the *City Comprehensive Plan*, approximately 25 percent of the developable land area within the UGA is undeveloped. The City's current UGA is sized to accommodate the projected population through 2037. As such, land availability is not expected to substantially constrain the growth of the sewer service population.

Summary

The planning period for the City's *Comprehensive Plan* (2018 to 2037) closely aligns with the 2021 to 2040 planning period proposed by this GSP. To maintain consistency between the plans and to conservatively project sewer system flow and loading, this GSP assumes that the entire population within the City limits and UGA, less a portion of those currently served by septic systems as discussed in **Chapter 4**, is served by the City's sanitary sewer system by 2040. The residential population served by the existing system, as well as the population equivalents of commercial and industrial customers, is established in **Chapter 4**, and the projected populations are estimated using the growth projections from this chapter.

The locations of proposed developments, topography, and costs associated with extending infrastructure to all portions of the UGA may constrain the actual extents of the future collection system.

4 | FLOW AND LOADING

Introduction

A detailed analysis of flow and loading is crucial to the planning efforts of a sewer service provider. When analyzing a sewer system, the first step is to identify current flow and load values to determine if the existing system can provide adequate service to its existing customers under the most crucial conditions in accordance with federal and state laws. A future sewer system analysis identifies projected flow and loading to determine where the system will need to be improved to satisfy future growth while continuing to meet federal and state laws.

Flow and loading is used to determine the size of gravity collection piping, lift stations, and forcemain piping, and the size and type of treatment facilities needed. This information also is used to develop the sewer service provider's NPDES waste discharge permit, which is required by Ecology for discharge of treated wastewater effluent to surface water. Several different flow and loading scenarios were analyzed in this chapter for both the existing and projected conditions of the City's sewer system, including average annual (AA), maximum month average day (MM), maximum day (MD), and peak hour (PH). An analysis of I/I and the existing and projected service population and ERUs also are presented in this chapter.

System design criteria and standards have been developed in **Chapter 5**. These criteria are compared to the flow and loading determined in this chapter to ensure that a consistent minimum level of service is maintained throughout the City's sewer system. This information is used as part of the hydraulic modeling of the system performed in **Chapter 6** and for use in identifying necessary capital improvements in **Chapter 7**.

Historical Flow and Loading

Data Collection

The total influent flow to the WWTP consists of discharges from residential, commercial, and industrial customers into the City's collection system. The City's existing collection system flow and loading rates were estimated via data from the electronic discharge monitoring reports (DMRs) the City submits to Ecology monthly as a requirement of its WWTP NPDES permit. RH2 was able to collect electronic WWTP influent and effluent DMR data was collected from Ecology's Water Quality Permitting and Reporting Information System (PARIS). The WWTP telemetry system records influent flow rate continuously as measured by a 16-inch Parshall flume. The City collects 24-hour composite influent and effluent samples once per week. The BOD and TSS concentration values from these samples were converted to pounds per day, as used herein, based on total daily flow rate. The term "loading" is used in this section to generally refer to BOD and TSS.

Loading is not directly measured for the LCRD and LCSD discharges to the City's system. For the purposes of this GSP, loading from these districts is estimated as being proportional to each district's cumulative flow discharged to the WWTP.

Historical raw influent and effluent data from the PARIS database is the basis for the historical flow and loading values presented herein.

Historical Flow

The 2015 through 2019 historical AA, MM, and MD WWTP influent flow volumes in MGD are summarized in **Table 4-1**. In 2016, the Chelan Fruit Corporative (Chelan Fruit) reconstructed its fruit packing facility and began discharging to the City’s collection system. Due to this significant addition to the collection system, flow and loading analyses in this chapter primarily focus on the period of 2017 through 2019.

The NPDES permit currently rates the WWTP maximum month average flow capacity at 2.64 MGD. The City’s NPDES permit stipulates that the City shall submit a plan or schedule for continuing to maintain capacity when the flow reaches 85 percent of the permitted flow for 3 consecutive months; 85 percent of the permitted flow is 2.24 MGD. This limitation has not been exceeded by the WWTP, and as **Table 4-1** shows, the current MM flow is approximately 1.046 MGD, or 40 percent of the permitted MM flow.

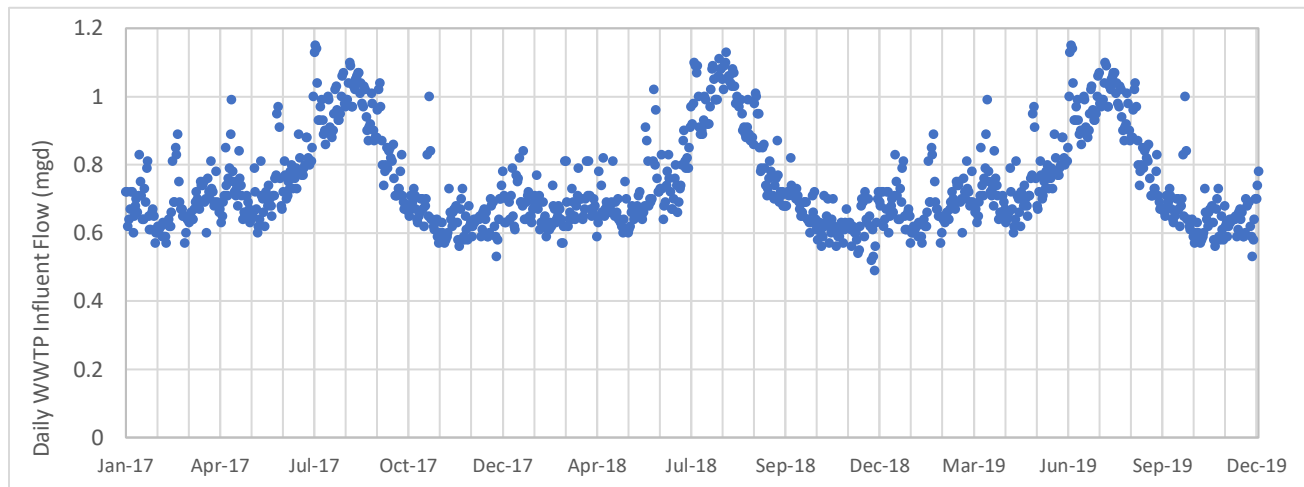
Table 4-1
Historical WWTP Monthly WWTP Influent Flow (2017-2019)

Year	Flow (MGD)			Percent of NPDES Permit Max. Month Design Criteria
	Average Annual	Maximum Month	Maximum Day	
2015	0.653	0.992	1.240	38
2016	0.715	0.986	1.250	37
2017	0.748	1.013	1.150	38
2018	0.741	1.042	1.130	39
2019	0.748	1.046	1.280	40
Average	0.721	1.016	1.210	38
Maximum	0.748	1.046	1.280	40

The City's WWTP is permitted for a maximum month average day influent flow of 2.64 MGD.

Since the addition of Chelan Fruit’s new facility, the average annual influent flow has ranged from 0.741 MGD to 0.748 MGD for 2017 through 2019. The single sample values for influent total daily flow are shown in **Chart 4-1**. Daily flows typically increase beginning in May and peak at 1.1 to 1.2 MGD between July and August before decreasing steadily through September. This trend aligns with the tourism season of May through September. During the offseason for tourism, which generally consists of October through April, total daily flows trend between 0.6 and 0.8 MGD.

Chart 4-1
Historical WWTP Influent Flow Single Sample Values (2017-2019)



The monthly flow values are analyzed in further detail later in this chapter for use in establishing an ERU and per capita basis for flow and loading contribution. **Table 4-2** includes the monthly WWTP influent flow for 2017 through 2019, as well as the maximum 30-day rolling average for each year. The Washington State Department of Ecology Criteria for Sewage Criteria for Sewage Works Design (Orange Book) defines the MM flow as “the largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.” Average month-by-month flow and loading is shown for informational purposes in this chapter, but the MM conditions are based on the peak 30-day rolling average.

Table 4-2
Historical WWTP Monthly WWTP Influent Flow (2017-2019)

	Average Month Flow (MGD)		
	2017	2018	2019
January	0.678	0.693	0.654
February	0.665	0.647	0.626
March	0.695	0.696	0.665
April	0.728	0.675	0.643
May	0.717	0.721	0.725
June	0.782	0.761	0.837
July	0.975	1.002	1.043
August	0.985	0.983	1.002
September	0.795	0.783	0.832
October	0.678	0.682	0.659
November	0.630	0.619	0.621
December	0.643	0.622	0.652
Maximum Month Average Day	1.013	1.042	1.046

The maximum month average day consists of the maximum 30-day rolling average within a calendar year.

The MM flow has ranged from 1.013 to 1.046 MGD over the last 3 years, with 2018 and 2019 being consistent at 1.042 and 1.046 MGD, respectively. To be conservative, the 2019 MM flow, which is the highest in recent years, is used for further analyses in this chapter.

Historical BOD and TSS Loading

The 2015 through 2019 historical AA, MM, and MD BOD and TSS loadings in lb/d are summarized in **Table 4-3** and **Table 4-4**, respectively. The NPDES permit currently rates the WWTP maximum month average BOD₅ and TSS capacity at 4,986 lb/d and 6,315 lb/d, respectively. Similar to the rated flow capacity, the City's NPDES permit stipulates that the City shall submit a plan or schedule for continuing to maintain capacity when the loading reaches 85 percent of the permitted loading for 3 consecutive months; 85 percent of the permitted loading is 4,238 lb/d for BOD₅ and 5,368 lb/d for TSS.

Table 4-3
Historical WWTP Influent BOD₅ Loading

Year	BOD (lb/d)			Percent of NPDES Permit Max. Month Design Criteria
	Average Annual	Maximum Month	Maximum Day	
2015	1,013	1,830	1,957	37
2016	1,177	2,184	2,783	44
2017	1,082	1,507	2,094	30
2018	1,035	1,371	2,192	27
2019	1,188	1,690	2,277	34
Average	1,099	1,716	2,261	34
Maximum	1,188	2,184	2,783	44

Table 4-4
Existing WWTP Influent TSS Loading

Year	TSS (lb/d)			Percent of NPDES Permit Max. Month Design Criteria
	Average Annual	Maximum Month	Maximum Day	
2015	1,153	1,596	2,747	25
2016	1,534	2,230	3,207	35
2017	1,537	2,927	4,871	46
2018	1,086	1,530	2,282	24
2019	1,164	1,923	2,213	30
Average	1,295	2,041	3,064	32
Maximum	1,537	2,927	4,871	46

As shown in the tables, the MM influent BOD loading has ranged from 27 to 44 percent of the rated capacity. Similarly, the MM influent TSS loading has ranged from 24 to 46 percent of rated capacity over the last 5 years. As would be expected, no significant change in loading has occurred due to the new discharge from Chelan Fruit, which is expected to be primarily rinse water that is low in BOD and TSS.

Single sample values for influent total daily BOD₅ and TSS are shown in **Chart 4-2** for 2017 through 2019. Through this period, samples have generally ranged widely between 500 and 2,000 lb/d, with TSS generally trending higher than BOD. Samples are taken once per week by a 24-hour composite influent sampler at the WWTP. The relative infrequency of sampling likely adds to the variability in the single sample values shown in **Chart 4-2**.

Chart 4-2
Historical WWTP Influent BOD and TSS Single Sample Values (2017-2019)

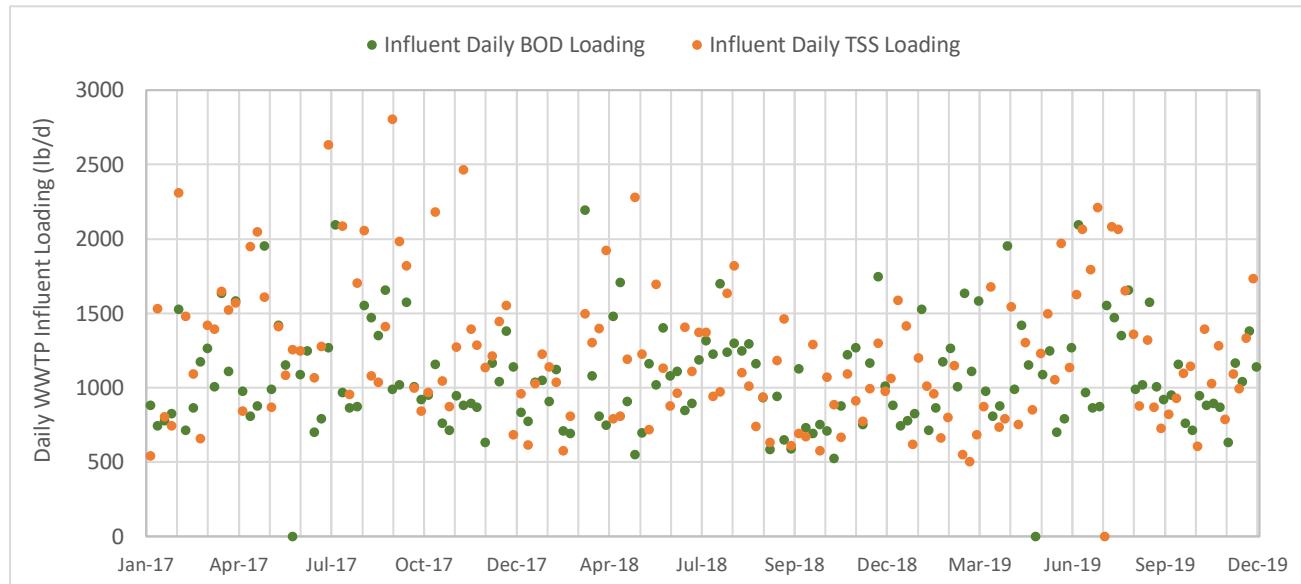


Table 4-5 includes the monthly WWTP influent loading for 2017 through 2019, as well as the AA and MM for each year.

Table 4-5
Historical WWTP Monthly WWTP Influent Loading (2017-2019)

	Average Month BOD ₅ (lb/d)			Average Month TSS (lb/d)		
	2017	2018	2019	2017	2018	2019
January	808	924	1,075	905	957	1,177
February	1,069	859	1,380	1,385	890	858
March	1,319	1,207	996	1,511	1,530	721
April	1,154	1,162	1,506	1,611	1,268	1,019
May	890	1,073	1,201	1,155	1,130	1,137
June	1,020	1,010	1,538	2,202	1,213	1,414
July	1,199	1,370	1,321	2,404	1,230	1,923
August	1,404	1,186	1,352	1,678	1,122	1,431
September	1,129	691	1,149	1,411	972	949
October	895	825	778	1,267	807	920
November	845	920	937	1,510	926	1,122
December	1,181	1,169	1,105	1,224	1,010	1,288
Annual Average	1,076	1,033	1,195	1,522	1,088	1,163
Maximum Month Average Day	1,507	1,371	1,690	2,927	1,530	1,923

The maximum month average day consists of the maximum 30-day rolling average within a calendar year.

The WWTP influent TSS and BOD₅ values shown in **Chart 4-2** and **Table 4-5** do not appear to demonstrate a defined seasonal pattern as is shown with the influent flow data. There could be many reasons for this potential difference, but one reason may be that WWTP BOD and TSS testing occurs once during each work week (Monday through Friday) and is unlikely to capture some of the potentially high loading conditions that are likely to occur on weekends during the peak tourism season. By contrast, flow data is recorded automatically each day. The larger data set of influent flow data, which includes weekend measurements, is likely to be a more reliable data set for use in estimating loading peaking factors as discussed in the **Peaking Factor Analysis** section.

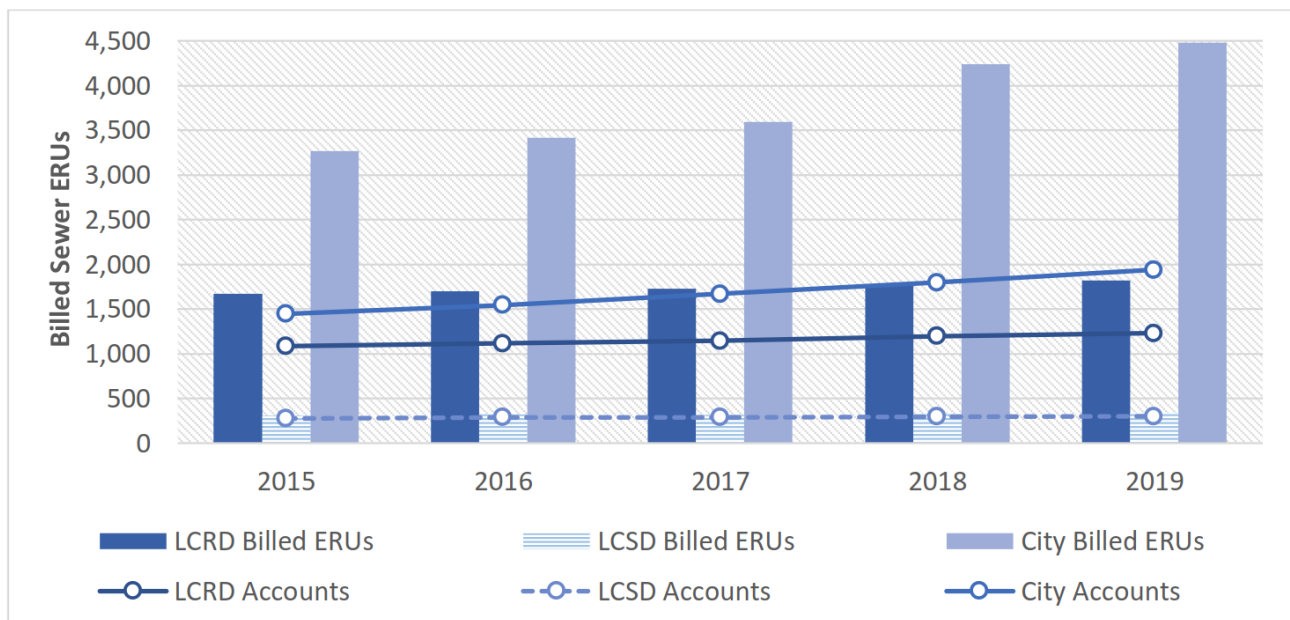
Sewer Service Customers

The City sewer system provides service to residents within the City limits and the City's UGA, as well as to the adjacent districts of LCRD and LCSD. The City and districts have separate billing systems that track sewer service accounts for each connection and approximate an ERU value for each account. The billing ERU value is used to equitably bill each account proportional to the flow and load generated by a single-family residence, which is assumed to equal one ERU. A summary of the City and each district's accounts and billing ERUs is provided in this chapter.

Sewer Service Accounts

Chart 4-3 presents the historical active sewer service accounts and billed ERUs for the City and both districts. These values are based on the City's accounting of City and LCSD customers and LCRD's accounting of LCRD customers.

Chart 4-3
Historical Sewer Billed ERUs and Service Accounts



Inactive City accounts represent accounts that are not currently in use, or billed, and generally represent approximately 10 percent or less of the City's sewer accounts. These accounts typically are related to properties that are vacant at the time at which data is collected. From 2015 through 2019, there has been a general downward trend in inactive accounts and billed ERUs for the City;

combined with system growth, this produces the upward trend in active accounts shown in the City. LCSD and LCRD inactive account information is not available, although active accounts for the districts have remained relatively steady, with a small rising trend over the last 5 years.

The City's and districts' accounting of active sewer accounts and billing ERUs is informational and intended for comparison to the actual ERU determination and flow and loading projections provided later in this chapter.

Customer Categories

A historical breakdown of the sewer accounts and billing ERUs by customer categories for both the City and districts is shown in **Table 4-6**. The City's account includes multiple customer categories, but for the purposes of this GSP, four primary categories are analyzed:

- Single-family residences – typical residential dwelling units;
- Multi-family residences – multi-family units, including apartments, condominiums, duplexes, etc;
- Industrial – Chelan Fruit is the only industrial sewer account in the City; billing ERUs are based on metered discharge to the collection system totalized monthly; and
- Commercial – all other customers, including businesses, institutional facilities, etc.

LCRD provides an account breakdown that is similarly summed into these four primary categories.

LCSD account data only consists of the residential and commercial categories as shown in the table.

Table 4-6
Historical Accounting of Active Sewer Accounts and Billing ERUs by Customer Category

	Accounts					Billed ERUs				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
City										
Single Family Residential	1,098	1,184	1,283	1,392	1,519	1,099	1,190	1,289	1,438	1,567
Multi-Family Residential	137	139	148	155	158	864	891	914	933	953
Commercial	211	220	236	250	262	1,306	1,337	1,393	1,495	1,527
Industrial	0	1	1	1	1	0	Unknown	Unknown	371	434
City Total	1,446	1,544	1,668	1,798	1,940	3,269	3,418	3,596	4,237	4,481
LCRD										
LCRD Total	1,085	1,116	1,144	1,196	1,231	1,669	1,699	1,726	1,773	1,817
LCSD										
Residential	269	280	283	286	292	293	306	302	312	318
Commercial	6	8	9	9	9	16	16	16	16	17
LCSD Total	275	288	291	295	301	309	322	318	328	335
Total Service										
Total	2,806	2,948	3,103	3,289	3,472	5,247	5,439	5,640	6,338	6,633

The single City industrial customer is Chelan Fruit; ERUs based on average monthly billing.

Analysis of Wastewater Generation by Customer Category

An ERU is defined based on the flow and loading from a typical single-family residence within the collection system. For the purposes of this GSP, this determination is based on single-family

residences within the City’s portion of the collection system. As such, the City’s portion of total flow and loading is separated from that of the two districts and then analyzed by customer category. After removal of each district’s portion of flow and load, the City’s combined commercial and residential portion is estimated by subtracting the City’s industrial component, which typically consists of metered sewer discharges. The remaining portion is further broken down by estimating the relative portions of single-family, multi-family, and commercial flow and loading with the assumption that the proportional wastewater discharge from each category is relative to the potable water consumption by each customer category.

This section of the chapter proceeds through this analysis to determine the City’s single-family residential portion of flow and load to define the flow and loading per ERU.

LCRD and LCSD

For the purposes of billing each district, the City totalizes the monthly flow volumes from LCRD and LCSD for comparison to the total influent flow at the WWTP. **Table 4-7** provides these historical flow values on an annual basis.

Table 4-7
Historical LCSD, LCRD, and City Annual Flow Volumes

Year	Annual Flow (gal/year)			
	WWTP Influent	LCSD	LCRD	City Portion
<i>Notes:</i>				
2015	239,010,000	15,620,736	68,580,580	154,808,684
	100%	6.5%	28.7%	64.8%
2016	261,850,000	17,577,073	80,961,170	163,311,757
	100%	6.7%	30.9%	62.4%
2017	273,150,000	13,956,398	84,743,630	174,449,972
	100%	5.1%	31.0%	63.9%
2018	270,590,000	13,899,878	78,325,930	178,364,192
	100%	5.1%	28.9%	65.9%
2019	272,920,000	14,750,672	73,460,690	184,708,638
	100%	5.4%	26.9%	67.7%
Average	263,504,000	15,160,951	77,214,400	171,128,649
	100%	5.8%	29.3%	64.9%

Of the total WWTP influent, LCSD averages 5 to 6 percent, LCRD averages 29 to 30 percent, and the City averages 64 to 65 percent. Both districts serve year-round residential and commercial customers, with flows increasing during the peak tourism months of summer. Additionally, LCRD serves industrial customers. **Chart 4-4** shows the portion of the total WWTP monthly influent volume from the City and each district. It should be noted that while LCSD averages 5 to 6 percent of the total volume annually, its contribution climbs disproportionately to LCRD and the City during June through August, in which it accounts for up to 10 percent of the WWTP influent. This is likely due the south shore experiencing a higher rate of summer tourist influx or second home usage relative to year-round usage. Further, the portion of City flows increase in the winter months, likely due in part to the increased industrial discharge from Chelan Fruit.

Chart 4-4
City, LCRD, and LCSD Portions of WWTP Influent Flow

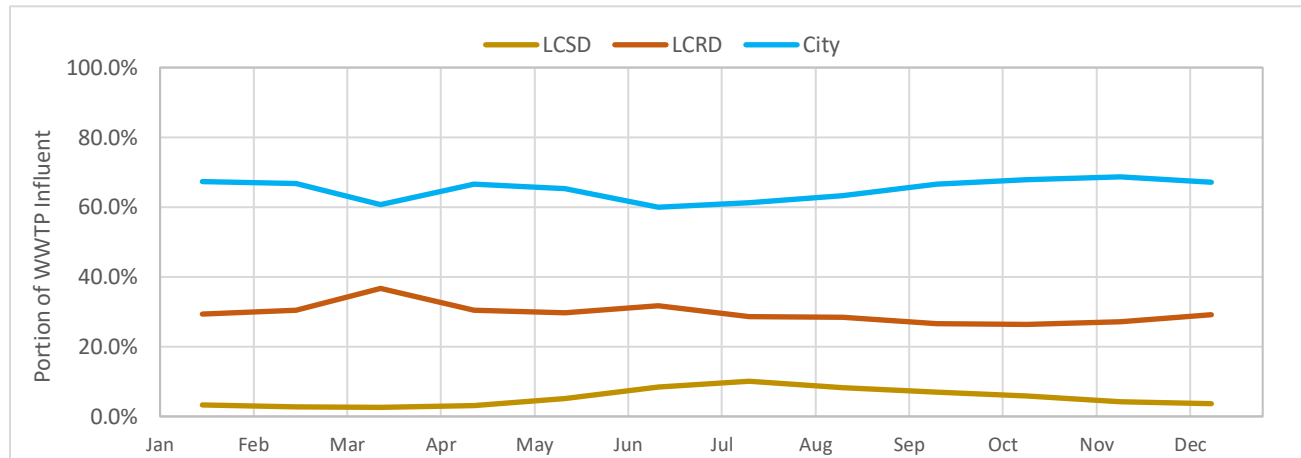


Table 4-8 provides historical monthly flow volumes for both districts and the City.

Table 4-8
Historical LCSD, LCRD, and City Annual Flow Volumes (2017-2019)

Year	LCRD Monthly Flow (MG)			LCSD Monthly Flow (MG)			City Portion Monthly Flow (MG)		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
January	6.132	5.637	5.545	0.784	0.566	0.715	14.103	15.277	14.010
February	5.273	5.490	4.679	0.544	0.548	0.662	12.803	12.082	12.189
March	8.655	7.374	6.400	0.600	0.588	0.692	12.305	13.618	13.527
April	7.261	5.699	4.920	0.636	0.682	0.714	13.943	13.869	13.646
May	6.918	6.698	6.219	1.027	1.003	0.848	14.275	14.639	15.423
June	8.162	7.376	6.282	1.620	1.507	1.814	13.687	13.947	17.004
July	9.009	9.321	9.220	2.704	2.463	2.942	18.498	19.267	20.179
August	9.208	9.673	7.983	2.285	2.742	2.891	19.037	18.045	20.176
September	6.940	5.604	6.776	1.546	1.337	1.455	15.354	16.559	16.739
October	5.459	5.379	5.144	0.908	1.182	0.850	14.642	14.569	14.436
November	5.443	4.819	5.063	0.591	0.677	0.592	12.855	13.084	12.975
December	6.283	5.255	5.230	0.710	0.605	0.575	12.947	13.410	14.405
2019 MM (MG)	9.220			2.942			20.179		
Percent of Total at MMF	28.5%			9.1%			62.4%		

MG = million gallons

The maximum month flow (MMF) for the system typically occurs in July or August. As shown in **Table 4-8**, the City's average portion of the total maximum month flow was 62.4 percent in 2019, which is used for further analyses.

City Industrial Customers

Currently, there are no state waste discharge permits issued by Ecology allowing industries within the City's sewer service area to discharge to the City's WWTP. There is one active industrial facility that discharges to the City's sewer collection system with coverage under the Ecology-issued Fresh Fruit Packing General Permit, as follows:

1. Chelan Fruit Plants 1 and 2 (Permit No. WAG435064) discharge from Outfall 003A to the City's system. The normal period of this discharge is August through March, with a reduced discharge from April through July. The discharge typically consists of a combination of:
 - a. Fruit pre-sizing wastewater with chlorine-based fungicides; and
 - b. Fruit packing wastewater with chlorine-based fungicides.

In 2016, Chelan Fruit reconstructed its facility to begin discharging to the City's system under the requirements of the Fresh Fruit Packer General Permit. Review of available discharge monitoring data from PARIS for Chelan Fruit Cooperative (CFC) Plants 1 and 2 (Permit No. WAG435064) is included in **Table 4-9**.

Table 4-9
Historical Chelan Fruit Plants 1 and 2 Discharge from Outfall 003A to the City's WWTP

Sample Date	Daily Flow (gpd)	Daily BOD Concentration (mg/L)	Calculated Daily BOD (lb/d)	Daily TSS Concentration (mg/L)	Calculated Daily TSS (lb/d)
1/23/2017	80,000	9.22	6	13	9
4/10/2017	60,000	14	7	10	5
9/21/2017	80,000	2.7	2	1	1
10/16/2017	80,000	10	7	3.7	2
1/1/2018	35,000	19.5	6	5	1
6/1/2018	35,000	19.5	6	7	2
10/1/2018	35,000	12	4	4	1
1/1/2019	110,000	58.8	54	5.5	5
4/1/2019	110,000	30	28	6.4	6
6/1/2019	110,000	46.4	43	10.5	10
10/1/2019	110,000	12	11	4	4

The data in **Table 4-9** is based on quarterly sampling events. As is shown in the table, BOD and TSS loading is minimal from Chelan Fruit, as would be expected for a discharge largely consisting of pre-sizing and packing water usage. As such, loading from this industry is excluded from further system loading analyses in this chapter.

The City bills Chelan Fruit for sewer system usage based on metered wastewater discharge to the City's system totalized monthly. **Table 4-10** summarizes the total monthly meter readings and calculates an average daily discharge by month from Chelan Fruit to the City's system.

Table 4-10
Historical Chelan Fruit Plants 1 and 2 Discharge from Outfall 003A to City's WWTP

Month	Monthly Flow (gallons)		Average Daily Flow (gpd)	
	2018	2019	2018	2019
January	2,343,880	4,024,042	75,609	129,808
February	2,992,188	3,373,482	106,864	120,482
March	2,976,073	3,593,402	96,002	115,916
April	2,634,808	3,178,540	87,827	105,951
May	2,681,511	2,421,033	86,500	78,098
June	2,017,727	2,245,748	67,258	74,858
July	1,421,935	1,057,511	45,869	34,113
August	2,020,182	2,349,085	65,167	75,777
September	2,885,141	3,327,022	96,171	110,901
October	3,163,885	2,387,184	102,061	77,006
November	2,864,681	3,727,241	95,489	124,241
December	3,160,993	4,754,031	101,968	153,356
July - August Average	1,721,059	1,703,298	55,518	54,945

The maximum discharge for CFC typically occurs during winter months, where flows can average 120,000 gpd over a month, as evidenced by February 2020. However, the peak flow discharge from Chelan Fruit coincides with the otherwise low-flow season for the City due to the lack of tourist influx during this period. It is necessary to analyze the July and August average daily discharge from Chelan Fruit, as it aligns with the typical maximum month period for the rest of the collection system. For the purposes of the flow analyses, Chelan Fruit is assumed to currently discharge 55,000 gpd on average during the collection system maximum month condition.

City Commercial and Residential Customers

As previously discussed, the relative portions of City residential and commercial wastewater discharge must be estimated based on potable water consumption. The City completed a *Water System Plan Update* in 2018, which included an analysis of domestic water usage by customer category. **Table 4-11** summarizes the City's total domestic water usage by customer category from 2011 to 2017.

Table 4-11
Historical Annual Domestic Water Consumption by City Customer Type (1,000 gallons)

Year	Single-Family Residential	Multi-Family Residential	Commercial/Industrial	Total
2011	224,617	48,900	153,770	427,287
2012	250,063	54,440	171,189	475,692
2013	240,350	52,325	164,540	457,215
2014	257,845	56,134	176,516	490,495
2015	223,812	48,725	178,218	450,755
2016	226,932	51,005	177,748	455,685
2017	241,417	52,071	162,287	455,775
Average	237,862	51,943	169,181	458,986
Portion	52%	11%	37%	100%

Per 2018 Water System Plan.

Table 4-11 shows that these residential portions of consumption have been historically steady on an average annual condition. Consumption increases significantly in summer months due to irrigation usage and tourist influx. There is likely some variation in the proportional consumption throughout the year. The factors that increase consumption in summer months impact all customer classes, and as such, it is assumed that the annual consumption portions are a good approximation of the proportional sewer discharge from each customer class. For the purposes of this GSP, 52 percent, 11 percent, and 37 percent are used to estimate the portions of single-family, multi-family, and commercial portions, respectively, of the City's wastewater generation. As previously noted, during the maximum month, Chelan Fruit constitutes 55,000 gpd of industrial flow as the City's single industrial discharger. City residential and commercial sewer discharge is calculated after removal of the industrial component.

Existing ERU and Equivalent Population Determination

The flow and loading per ERU, as well as the equivalent population, can be determined for various scenarios. Two typical conditions for these determinations are average annual day and maximum month average day. Systems that have relatively constant flow and loading throughout the year are well suited for an average annual analysis. Systems with highly seasonal flow and loading, such as those with high I/I or large population swings, can be better suited for maximum month analyses. The City is well suited for determination of an ERU and equivalent population based on the maximum month condition due to tourism influx in the summer months. The average annual, maximum day, and peak hour scenarios will be used to estimate system-wide flow and loading based peaking factors as described in the **Peaking Factor Analysis** section.

In order to estimate the existing sewer system residential population, the LCRD and LCSD portions of wastewater influent are removed from the total influent values. WWTP influent monthly flow values have been relatively stable and consistent in recent years; therefore, the 2019 maximum month flow of 1.046 MGD is used to estimate the equivalent residential population. The City's portion of the total WWTP influent is approximately 62.4 percent during the maximum month as established in **Table 4-8**, with the remaining portion discharged from LCRD and LCSD. As such, the

estimated City MM flow was 0.653 MGD in 2019. Using the portions of City sewer discharge by customer class as identified in **Table 4-11**, the cumulative discharge associated with each City customer class is estimated in **Table 4-12** for the maximum month in 2019.

Table 4-12
City Portion of WWTP Influent by Customer Type at 2019 Maximum Month

Parameter	2019 Maximum Month	
	MGD	Portion (percent)
Total WWTP Influent	1.046	-
LCRD and LCSD Discharge	0.393	-
City-Only Daily Flow (MGD)	0.653	100
Single-Family Residential Daily Flow (MGD)	0.338	52
Multi-Family Residential Daily Flow (MGD)	0.074	11
Commercial Daily Flow (MGD)	0.186	28
City Industrial Daily Flow (MGD)	0.055	8
Total Residential Daily Flow (MGD)	0.412	63

The portions of City commercial and residential wastewater discharge by class are based on domestic water consumption.

Similarly, **Table 4-13** shows the City's portion of BOD and TSS loading from single-family residential customers during the maximum month.

Table 4-13
Estimated City Single-Family Residential Portion of BOD and TSS Loading

City Portions of Daily Loading ^{1,2}	2019 Maximum Month
WWTP Influent BOD Loading (lb/d)	1,690
City Portion of BOD Loading (lb/d)	1,055
Single Family Residential Portion of BOD Loading (lb/d)	547
WWTP Influent TSS Loading (lb/d)	1,923
City Portion of TSS Loading (lb/d)	1,200
Single-Family Residential Portion of TSS Loading (lb/d)	622

1. Loadings are assumed to be directly proportional to wastewater flow proportion.

2. No loading is assumed to be associated with the industrial discharge from Chelan Fruit.

In 2019, the City billed approximately 1,570 active ERUs for single-family residences. Some of the single-family accounts included additional dwelling units that justified a slightly higher ERU allocation than a typical single-family dwelling unit. Additionally, in 2019 the City billed approximately 950 active ERUs for multi-family residences, including duplexes, condominiums, apartments, etc. In order to determine the per capita and per ERU flow and loading rates, the City's accounting of single-family residential ERUs and multi-family residential ERUs were analyzed to determine the representative quantity of residential dwelling units served by the City's sewer system that exhibit a daily discharge similar to that of a typical single-family residence. A portion of accounts that the City categorizes as multi-family are likely to discharge similarly to single-family

units. An example is a duplex, which may be allocated 2 billing ERUs, but be categorized as “multi-family.” For the purposes of this GSP, those ERUs would be closely representative of 2 single-family units and are categorized as such. Similar analyses yielded approximately 1,830 single-family residential ERUs, which is used in **Table 4-14** to estimate the per capita and per ERU flow and loading rates in the City.

Table 4-14
City ERU and Per Capita Flow and Loading Determination based on Single-Family Residences

City ERU and Per Capita Determinations	2019 Maximum Month
Flow	
Single-Family Residential ERUs	1,830
Average Single-Family Residential Daily Flow (gal)	338,337
Flow per ERU (gpd)	185
Chelan County Capita per Dwelling Unit Estimate (capita/ERU)	2.38
Per Capita Flow Contribution (gpd)	78
BOD	
Single-Family Residential Daily BOD (lb/d)	547
Per ERU BOD Contribution (lb/d)	0.30
Chelan County Capita per Dwelling Unit Estimate (capita/ERU)	2.38
Per Capita BOD Contribution (lb/d)	0.13
TSS	
Single-Family Residential Maximum Month Daily TSS	622
Per ERU TSS Contribution (lb/d)	0.34
Chelan County Capita per Dwelling Unit Estimate (capita/ERU)	2.38
Per Capita TSS Contribution (lb/d)	0.14

In the City, an ERU is estimated to equate to 185 gpd, and 0.30 lb/d BOD, and 0.34 lb/d TSS based on the maximum month analysis in **Table 4-14**. Using the per capita dwelling unit rate of 2.38 in the City’s UGA per **Chapter 3**, the per capita rate is estimated at 78 gpd, 0.13 lb/d BOD, and 0.14 lb/d TSS.

The per capita flow rate is below the typically accepted value of 100 gpd. However, lower values are typical of locations assumed to have relatively high water use efficiency, and/or low I/I, both of which likely pertain to the City, and as such, 78 gpd is likely representative of the actual per-capita flow discharge.

As a point of comparison, the 2020 LCRD GSP also estimates low per capita and per ERU flow contributions for the LCRD system at 75 gpd and 193 gpd, respectively. LCRD residential customers are served separate irrigation water, whereas City residents utilize potable water for irrigation. Although this does not directly affect the residential sewer discharge from each area, it complicates the estimation of per capita sewer discharge and likely lends to the City appearing to have a higher residential sewer discharge of the two areas. However, for a relative comparison, these two systems are similar systems, and as expected, both demonstrate low per capita and per ERU flow rates.

The per capita BOD and TSS loading values are significantly below the typically accepted value of 0.2 lb/d. One possible reason for this could be related to the influent BOD and TSS sampling occurring at the WWTP mid-week, which would not capture the elevated BOD and TSS levels assumed to occur on weekends when the majority population influx occurs. The estimated distribution of ERUs and capita per ERU also could cause a lower than typical estimation of BOD and TSS per capita. However, WWTP influent flow is measured continuously, and the City has a robust flow data set. Since the flow analysis estimation of 78 gpd per person is in-line with the expected values for similar systems, it is not recommended that the estimation of ERUs and equivalent population be further adjusted on the basis of the BOD or TSS per capita loading rates. To conservatively estimate future conditions, future per ERU and per capita rates can be estimated to be more in-line with typical values as discussed in the **Future Per Capita and ERU Flow and Loading Definition** section.

The sewer flow for each customer category can be expressed in terms of equivalent population and ERUs for forecasting and planning purposes. The number of ERUs associated with the City commercial and industrial customers, as well as the two districts, are calculated by dividing the sewer flow of each customer category by the unit demand per capita and per ERU. **Table 4-15** presents the computed equivalent population and ERUs in 2019 for the residential (combined single-family and multi-family), commercial, and industrial customer categories in the City and for each district.

Table 4-15
2019 Sewer Equivalent Population and ERUs

Parameter	Equivalent Population	Equivalent Residential Unit ¹
Per Unit Flow Contribution (gpd)	78	185
City		
Total Residential Daily Flow (gpd)	412,200	
<i>Existing System Residential Population</i>	<i>5,306</i>	<i>2,230</i>
Commercial Daily Flow (gpd)	185,600	
<i>Equivalent Population</i>	<i>2,389</i>	<i>1,004</i>
Industrial Daily Flow (gpd)	55,000	
<i>Equivalent Population</i>	<i>708</i>	<i>297</i>
City Total Equivalent Existing System Population and ERUs	8,403	3,531
LCRD²		
Daily Flow (gpd)	298,300	
<i>Equivalent Population and ERUs</i>	<i>3,840</i>	<i>1,613</i>
LCSD		
Daily Flow (gpd)	95,200	
<i>Equivalent Population and ERUs</i>	<i>1,226</i>	<i>515</i>
Total System Equivalent Population	13,469	5,659

1. ERUs shown are estimated on a flow and loading basis and do not align exactly with currently billed ERUs.

2. The LCRD equivalent population and ERUs shown are estimated based on the City's per capita and per ERU rates.

3. Flow values are rounded to the nearest 1,000 gallons.

The estimated population in the combined City limits and UGA is 4,577 for 2019, as shown in **Table 3-1**. The estimated City residential wastewater collection system population approximately averages 5,300 during the maximum month as shown in **Table 4-15**. This population is not expected to exactly match the City limits or UGA population for the following reasons:

- The existing sewer service area extends beyond the City limits but does not fully cover the entire City UGA.
- A portion of the developed parcels within the City limits and UGA are served by on-site septic systems.
- The summer influx of tourists or residents with vacation homes in the Chelan area increases the effective population during the maximum month compared to winter or average annual conditions.

These factors are further analyzed in the sections that follow.

Septic Systems

There are parcels within the UGA that are currently served by on-site septic systems. As septic systems fail within the UGA, City code requires that the homeowners connect to the City's municipal wastewater system in accordance with certain criteria as discussed in **Chapter 5**. As a

conservative estimate for the purposes of this GSP, it is assumed that the existing septic systems within the UGA will be converted to connections to the City's collection system during the planning period.

In order to estimate the residential population within the UGA that is served by septic systems, domestic water and sewer service coverage of the UGA was analyzed. Residential units that are served domestic water, but not domestic sewer, are assumed to utilize on-site septic systems. In 2019, the City served 453 residential accounts with domestic water but no sanitary sewer. The majority of these accounts are in the Chelan Hills area, with some in the Lord Acres area. There are a few instances of residences in the UGA that were neither served by domestic water nor sanitary sewer, such as the south shore, but these are minimal and are not significant for this analysis.

Based on the 453 residences assumed to have septic systems in the UGA, and using the UGA dwelling unit rate of 2.38 people per dwelling unit, it is estimated that the UGA residential population served by septic systems is approximately 1,100 people. This value is utilized in projecting future sanitary sewer system customers as septic systems fail and residences are converted to sanitary sewer service during the planning period.

Peaking Factor Analysis

In order to establish projected flow scenarios for a sewer system, peaking factors are determined for the existing system that can then be applied to future flow rates. Peaking factors are ratios used to relate high flow conditions to average or low flow conditions. Typically, factors are derived to compare the MM, MD, and PH to the AA condition. These are necessary for the analysis and design of specific system components.

The previous analyses focused on established ERUs on a maximum month basis, as it is critical to understand this condition for the City, where maximum months are driven by an influx of tourists and vacations. This section establishes the peaking factors based on historical flow and loading, with all factors related to the AA condition, as is the standard convention.

Maximum Month and Maximum Day Analysis

Table 4-16 summarizes the historical WWTP AA flow, MM flow, and MD flow on an annual basis for 2015 through 2019. These values are used to establish the MM/AA flow and MD/AA flow peaking factors shown in **Table 4-16**.

Table 4-16
Historical Daily Influent Peaking Factors to the WWTP

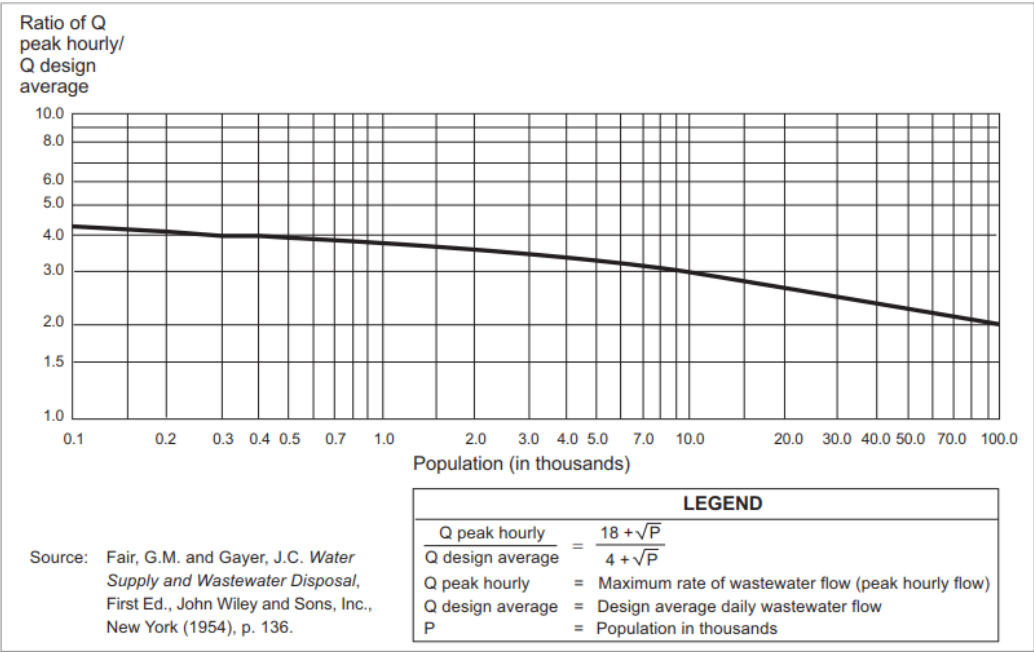
Flow Scenario	Flow	Peaking Factor
	(MGD)	(in terms of AA flow)
2015 Average Annual Flow	0.653	1.00
2015 Maximum Month Average Day Flow	0.992	1.52
2015 Maximum Day Flow	1.240	1.90
2016 Average Annual Flow	0.715	1.00
2016 Maximum Month Average Day Flow	0.986	1.38
2016 Maximum Day Flow	1.250	1.75
2017 Average Annual Flow	0.748	1.00
2017 Maximum Month Average Day Flow	1.013	1.35
2017 Maximum Day Flow	1.150	1.54
2018 Average Annual Flow	0.741	1.00
2018 Maximum Month Average Day Flow	1.042	1.41
2018 Maximum Day Flow	1.130	1.52
2019 Average Annual Flow	0.748	1.00
2019 Maximum Month Average Day Flow	1.046	1.40
2019 Maximum Day Flow	1.280	1.71
MM/AA Flow Peaking Factor		1.52
MD/AA Flow Peaking Factor		1.90

To be conservative, the maximum peaking factor values from 2015 through 2019 are used for the projections in this GSP. This equates to a MM/AA flow peaking factor of 1.52 and a MD/AA flow peaking factor of 1.90.

Peak Hour Analysis

The Orange Book defines the peak hour flow as the largest volume of flow anticipated to occur during a 1-hour period, expressed as a daily or hourly average. Section C1-3.3.2 of the Orange Book requires collection system piping, and subsequently lift stations and forcemains, be designed to pass the projected peak hour flow. For complicated collections systems with multiple lift stations, such as the City, a measured peak hour flow for each basin may not be available or realistic to determine. In such cases, the Orange Book recommends using a standard peaking factor to determine the peak hour flow based on the average design flow, as shown in **Chart 4-5**.

Chart 4-5
Ratio of Peak Hourly Flow to Design Average Flow (Orange Book Figure C1-1)



For small areas similar to the City’s individual collection system basins, a PH factor of 3 to 4 is typical. For larger areas, such as the entire system influent to the WWTP, a smaller peaking factor may be used, though not less than 2.5 per the Orange Book. For the City, the PH flow at the WWTP is determined from actual flow data as shown in **Table 4-17**.

Table 4-17
Top Three Influent WWTP Peak Hour Flow Events (2017-2019)

Parameter	Flow	
	MGD	gpm
2017		
Average Annual Flow	0.748	519
Peak Hour Event: June 14	2.008	1395
Peak Hour Event: July 4	1.958	1360
Peak Hour Event: May 25	1.958	1360
PH/AA Peaking Factor 2.7		
2018		
Average Annual Flow	0.740	514
Peak Hour Event: April 7	2.244	1558
Peak Hour Event: September 2	2.116	1470
Peak Hour Event: April 3	1.881	1306
PH/AA Peaking Factor 3.0		
2019		
Average Annual Flow	0.747	518
Peak Hour Event: July 2	2.688	1,867
Peak Hour Event: August 16	2.350	1,632
Peak Hour Event: July 6	2.001	1,389
PH/AA Peaking Factor 3.6		
Maximum 3-Year PH/AA Peaking Factor 3.6		

As shown in the table, the peak hour condition typically occurs during the peak tourism period between Memorial Day and Labor Day. The range of the three largest peak hour events for each year of 2017 through 2019 is 1,306 to 1,867 gpm, with the maximum PH to AA flow factor being 3.6 at the WWTP. To maintain consistency with existing flow conditions, the PH to AA factor of 3.6 is used to analyze existing system and future conditions.

Hydraulic modeling for collection system capacity analyses at existing and future PH conditions is provided in **Chapter 6**.

Summary of Existing Equivalent Service Area Population and ERUs

The estimated City residential sewer system population during the maximum month is 5,300. The maximum month to AA peaking factor is shown as approximately 1.5. Assuming the per capita sewer system flow and loading rates remain relatively constant throughout the year, the average annual residential sewer system population would be estimated at approximately 3,500.

As a point of comparison, the 2019 estimated population in the combined City and UGA is 4,577, and it is estimated that 1,100 of those people are served by on-site septic systems, leaving approximately 3,477 people to be served year-round by the sewer system.

Both analyses closely align for a year-round City residential sewer system population of 3,500. Based on this, it is recommended that the following rates be used as the basis for existing customers at the maximum month condition:

- Per capita: 78 gpd, 0.13 lb/d BOD, and 0.14 lb/d TSS.
- Per ERU: 185 gpd, 0.30 lb/d BOD, and 0.34 lb/d TSS.

Due to the difficulty in estimating existing per capita and per ERU rates and the potential variability in future rates, more conservative values closer to standard design values can be used for projections of future rates as discussed later in this chapter.

Inflow and Infiltration Analysis

Background

I/I is the combination of groundwater and surface water that enters the sewer system. Infiltration is groundwater entering the sewer system through defects in the sewer system infrastructure, such as fractured pipes and leaking manholes and pipe joints. Inflow is surface water that enters the sewer system from sources such as building roofs, street drains, and leaky manhole covers.

A sanitary sewer system must be able to carry the domestic wastewater generated by utility customers and the extraneous I/I that is a part of every sewer collection system. Excessive I/I in the sewer collection system can lead to serious issues within the collection system that may include wastewater system backups and overflows to accelerating the structural deficiencies of the collection system. Excessive I/I also can inflate capacity requirements of the proposed collection and treatment system infrastructure.

Reducing I/I in a sewer collection system can reduce the risk of sanitary sewer overflows and the cost of treating wastewater. By reducing or eliminating I/I sources, the extraneous water that previously occupied the conveyance and treatment system can now be occupied by sewage flows. This leads to delaying conveyance and treatment projects that were needed because of the extraneous I/I water.

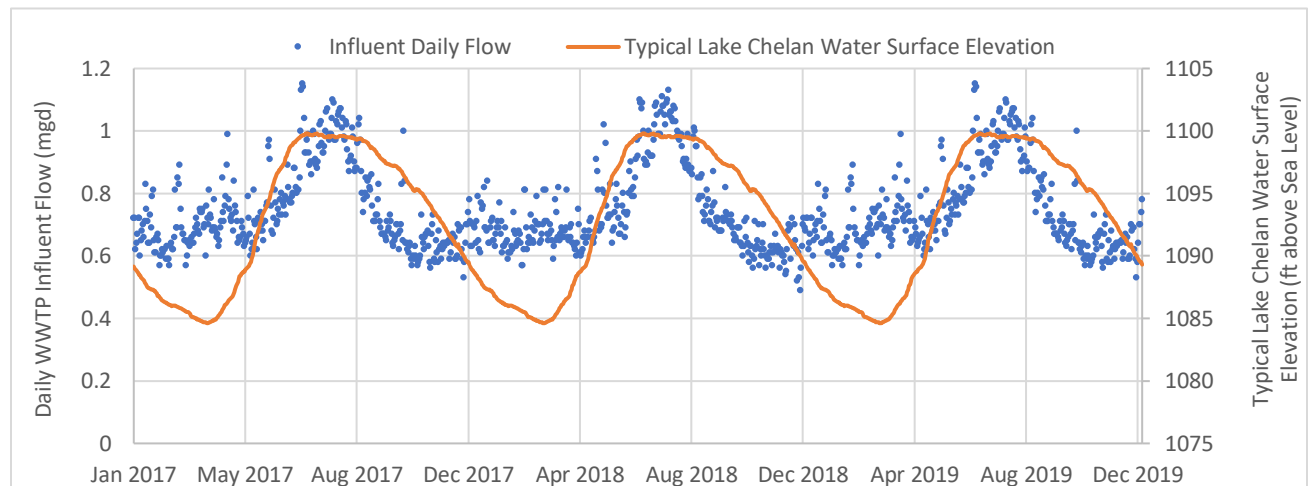
The U.S. Environmental Protection Agency (EPA) published a report in May 1985, *Infiltration/Inflow, I/I Analysis and Project Certification*, which developed guidelines to help determine what amount of I/I is considered to be excessive and what amount can be cost-effectively removed. The report established I/I flow rates that are considered normal or acceptable based on surveys and statistical evaluations of data from hundreds of cities across the nation.

Infiltration

The EPA's guideline for determination of non-excessive infiltration was based on the national average for dry weather flow of 120 gallons per capita per day (gpcd). For infiltration to be considered non-excessive, the average daily flow must be less than 120 gpcd (i.e., a 7- to 14-day average measured during periods of seasonal high groundwater). Significant commercial and industrial customers greater than 50,000 gpd typically are removed from the daily discharge to calculate the per capita dry weather flow.

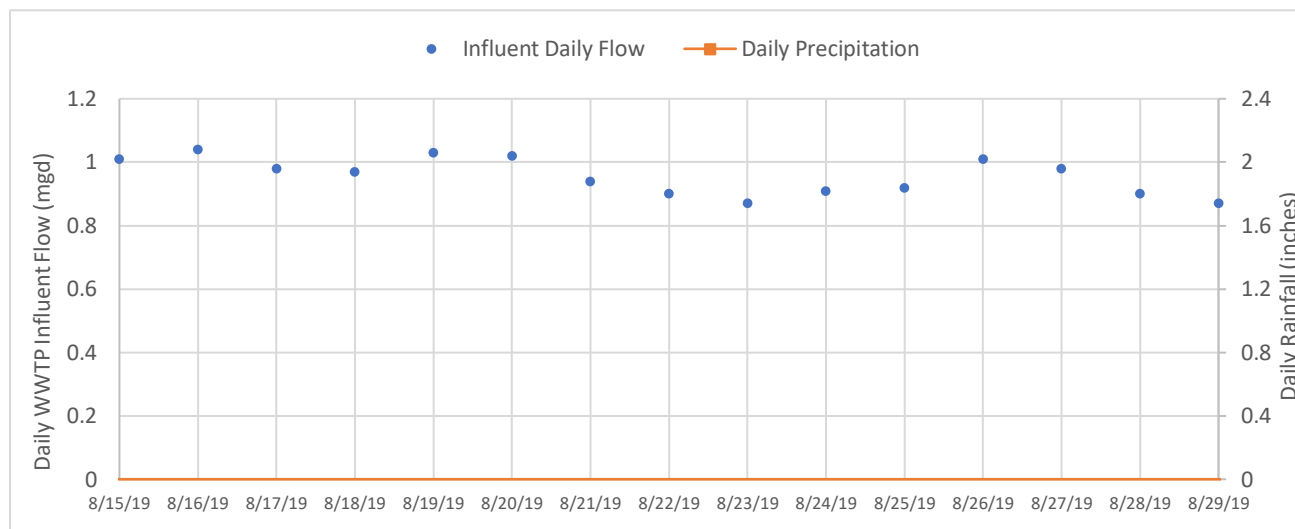
Although it can be difficult to determine how much of the flow is due to I/I, peak inflow will generally occur immediately during or just after a significant rain event, while peak infiltration will occur during high groundwater. The topography of the region, with terrain sloping relatively steeply toward the lake, reduces the likelihood of high groundwater to areas nearest the lake, where groundwater elevations are likely to fluctuate with lake elevation. Public Utility District No. 1 of Chelan County (PUD) operates the Lake Chelan Dam at the outlet of Lake Chelan to manage the lake level for recreation, navigation, and water supply while producing power at a power generation facility that is located in Chelan Falls at the base of the Chelan River gorge. The lake level is maintained at approximately 1,100 feet above mean sea level during the summer months. The PUD releases lake water through the dam each fall, dropping the lake level about 15 feet to allow for the capture of spring snowmelt runoff. **Chart 4-6** shows the average lake level trend compared to the WWTP influent flow single sample values.

Chart 4-6
Daily WWTP Influent Flow and Lake Chelan Water Surface Elevation (2017-2019)



The period when the lake is at its highest level coincides with the peak tourism season, making it difficult to assess the impact of increased lake level on infiltration to the City's system. As shown in **Chart 4-7**, there was no precipitation during the 14-day period from August 15, 2019 to August 29, 2019. During this period, lake level was at its maximum and WWTP influent averaged approximately 1.0 MGD.

Chart 4-7
Daily WWTP Influent Flow and Daily Precipitation (Aug 15, through 29, 2019)



Precipitation data derived from WSU AgWeather databased, Chelan.S station.

Based on **Table 4-8**, the City's portion of flow is approximately 62.4 percent during the maximum month, with the remainder coming from LCRD and LCSD. This equates to approximately 624,000 gpd during the period shown in **Chart 4-7**. Removing 55,000 gpd of industrial discharge from Chelan Fruit, the City's commercial and residential classes contributed approximately 569,000 gpd during this period. Per the **Existing ERU and Equivalent Population Determination** section, the City supports an equivalent peak season residential population of 5,300 people, equating to 107 gpd per person per the EPA's calculation method for infiltration. As such, the City's system is below the EPA's dry weather infiltration threshold of 120 gpd per person, showing that infiltration due to groundwater is not excessive for the City's system.

An infiltration analysis for LCRD was completed as part of the 2020 LCRD GSP and infiltration was deemed to be non-excessive.

As noted in the 2008 GSP, LCSD historically had asbestos concrete forcemains that were a significant source of infiltration. This was alleviated when the forcemains were replaced with in-lake high-density polyethylene (HDPE) pipes. However, it is possible that LCSD still experiences some infiltration. LCSD had a maximum month flow of 0.095 MGD in July 2019 per **Table 4-8**. LCSD serves primarily residential customers, with 335 billed ERUs in 2019 per **Table 4-6**. If the City's UGA capita per dwelling unit rate of 2.38 was applied to all LCSD billed ERUs, the expected population equivalent would be 797. This would equate to a per capita flow rate of 119 gpcd, which is near the threshold for excessive infiltration of 120 gpcd. This increased rate could be related to multiple factors:

- The commercial accounts and ERUs for LCSD are not equitably distributed, which skews the residential per capita flow rate upward. This could be reviewed through further analysis of the flows from commercial dischargers;

- The actual capita per dwelling unit rate is higher than 2.38 on the south shore of Lake Chelan, due to the high influx of vacationers and tourists to the area. It is unlikely that this could be accurately quantified; and
- Some infiltration due to high lake levels could be entering the LCSD in-lake lift stations and/or force mains. Monitoring of lift station levels during low flow periods (such as mid-week nights or early mornings) could provide insight into potential infiltration.

Though the per capita excessive infiltration threshold does not appear to be exceeded by LCSD, it is recommended LCSD's commercial ERU distribution potential infiltration at the lift stations be reviewed outside the scope of this GSP.

Additionally, the 2008 GSP noted the following locations of in-lake or near-lake piping that could be subject to infiltration:

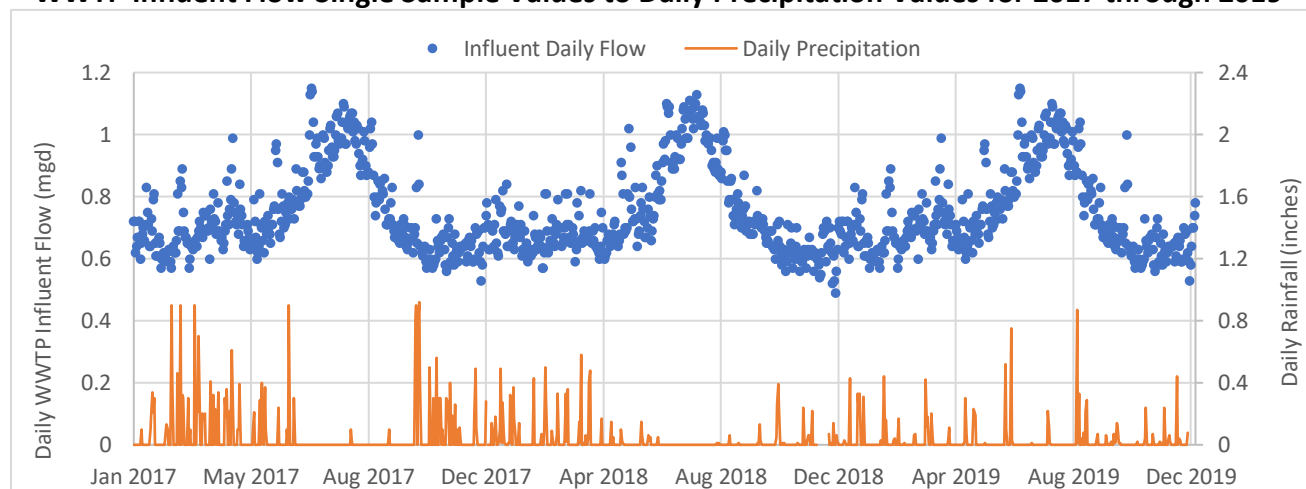
- Submerged pipe crossings between the old commuter and Lift Station No. 1.
- The 6-inch siphon piping on the south end near the Webster Avenue Bridge.
- Two sections of 8-inch collection system piping discharging to Lift Station No. 8.
- Collection system piping near Lift Station No. 3.

The pipes between the old commuter and Lift Station No. 1, as well as the siphon pipe by the Webster Avenue Bridge, have since been abandoned and are no longer a concern for infiltration. The other two locations exhibit elevated potential for infiltration to the system.

Inflow

Chart 4-8 compares WWTP influent flow single sample values to daily precipitation values for 2017 through 2019. As is evidenced by the table, influent flow rate increases inversely to precipitation, due to the influx of tourists during the dry summer months.

Chart 4-8
WWTP Influent Flow Single Sample Values to Daily Precipitation Values for 2017 through 2019



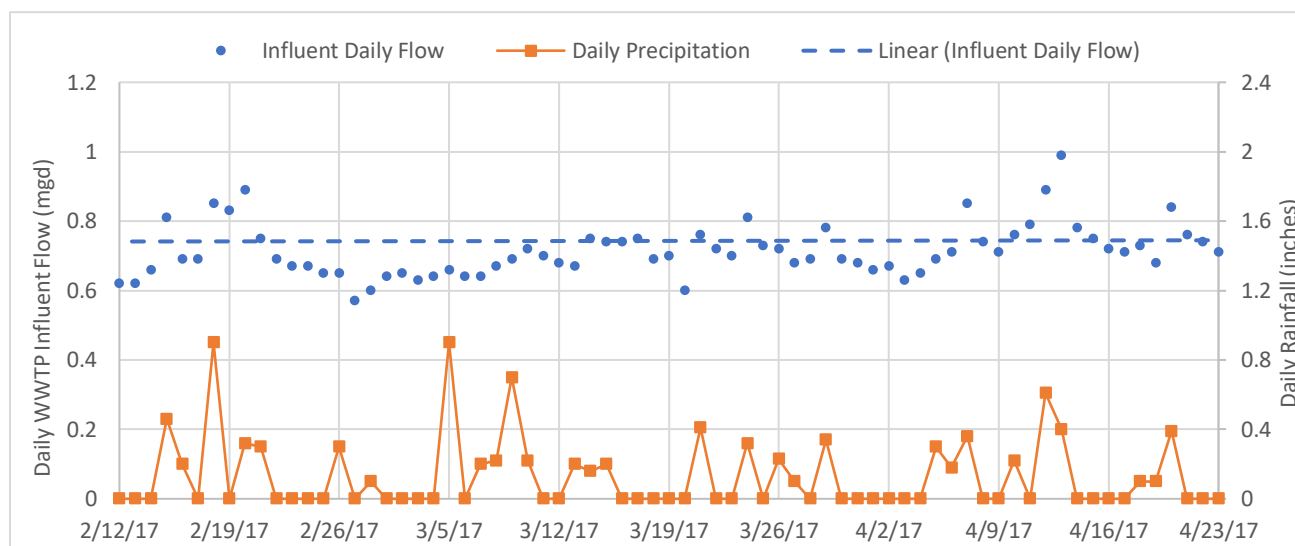
Precipitation data derived from WSU AgWeather databased, Chelan.S station.

The EPA report provides guidelines for determining whether inflow can be classified as non-excessive. Inflow is non-excessive if the average daily flow during periods of heavy rainfall or

spring thaw (i.e., any event that creates surface ponding and surface runoff) does not exceed 275 gpcd. As shown in **Chart 4-8**, the highest precipitation months occur approximately between November and April. Though snow depth data is not readily available for the City, these months also represent the period in which runoff from snow melting occurs. As shown in the **Existing ERU and Equivalent Population Determination** section, the estimated equivalent City residential sewer service population is approximately 5,300 during the maximum month, and the AA sewer service population is estimated at 3,500. Based on the AA population and the threshold of 275 gpcd for excessive inflow, 0.963 MGD would be the threshold for excessive inflow during the highest precipitation months for this population. This threshold is well above the maximum month flow of 0.598 MGD for the City's combined residential and commercial flow as shown in **Table 4-12**. As such, inflow is not considered excessive for the City's collection system.

For reference, **Chart 4-9** shows WWTP influent flow single sample values and daily precipitation values for the period of February 12, 2017 through April 23, 2017.

Chart 4-9
WWTP Influent Flow Single Sample Values to Daily Precipitation Values for February through April 2017



Precipitation data derived from WSU AgWeather databased, Chelan.S station.

There is a minor correlation between precipitation events and increased inflow, as evidenced near February 18, through February 20, 2017 on April 12, through April 14, 2017. These dates show minor excursions in influent flow above the average flow trend for the period but are not excessive. However, these similar trends can be reviewed periodically by the City, especially within individual sewer basins, to determine if there are localized cross connections between stormwater systems to the sewer system that should be rectified if identified.

Though system I/I is non-excessive, the City should be aware of the locations with potential increased I/I. As the system grows and excess capacity is reduced, improvements to target locations with high I/I potential may be worthwhile to the City.

Projected Flow and Loading

With existing flow and loading rates defined, projected flow and loading can be developed for use in analyzing the system performance in future conditions. This information is used to determine the necessary capital improvements as outlined in **Chapter 6**.

Flow and Loading Projection Assumptions

The projected flow at the WWTP, and the flow distribution to the various basins, was developed using the following assumptions:

- The primary per capita and per ERU flow and loading is based on the maximum month condition.
- System-wide and basin-specific flow and loading at AA, MD, and PH conditions are estimated based on the peaking factors previously defined in this chapter, in conjunction with the per capita and per ERU definitions.
- Existing ERUs are assumed to contribute flow and loading to the system at the existing unit rates in future conditions.
- All future ERUs are assumed to contribute flow and loading to the system at the defined future ERU rate.
- Information regarding approved and pending developments, obtained from the City, was used to allocate the projected basin-specific flow rates.

Future Customer Assumptions

The future collection system is assumed to include customers similar to the four primary existing customer categories. For planning purposes, the City's collection system is planned to cover the entire City UGA in 20 years while maintaining service to the customers that exist outside of the UGA (LCRD and LCSD). This is a conservative approximation of future conditions to ensure that the City can adequately plan infrastructure improvements. All customer growth is assumed to occur within these areas.

In order to project growth of system flow and loading, the following basis for growth within each primary customer category is used:

- Residential – growth in flow and loading is based on population growth as established in **Chapter 3**, using the per capita flow and loading rates established in this chapter.
 - Septic system conversions – the City should conservatively plan for new connections to the sewer system to serve septic systems that fail during the planning period and can be connected to the City's system through a reasonable extension of infrastructure. For the purposes of this analysis, it is conservatively assumed that 50 percent of all septic systems within the UGA will be connected to the City's system by the end of the planning period, with connections occurring linearly through the planning period. This equates to approximately 220 septic system conversions of the estimated 435 existing residential septic systems in the UGA.

- Commercial – growth in flow and loading is assumed to be directly proportional to residential growth.
- Industrial – growth of this customer category is extremely difficult to predict, due to the varied flow and loading characteristics by different industries. For planning purposes, the City has decided to allocate 1,000 total ERUs for industrial discharge during the planning period. For projections, is assumed that this allocation will be fully utilized in 20 years, with the allocations occurring linearly throughout the planning period up to the full allocation.

The following sections project growth within the City portion of the sewer service area and LCSD per the assumptions stated. Growth projections for LCRD are based on the LCRD GSP that was in progress during the drafting of this Plan.

Future Per Capita and ERU Flow and Loading Definition

Flow

The typical design value of 100 gpcd is shown in the Orange Book as guidance for system planning when no other data is available to determine the daily per capita sanitary sewer flow contribution. The existing system analyses estimated the current daily per capita flow contribution is 78 gpcd. As noted, it is recommended that future flow contributions be conservatively estimated, although the current per capita flow contribution is indicative of a system with low I/I, high water use efficiency, and other factors that justify a lower projected per capita rate than 100 gpcd. It is recommended that the City use a moderately conservative rate of 85 gpcd for estimating flow from future residents.

Loading

The typical design value of 0.2 lb/d per person is recommended by the Orange Book for estimating daily BOD and TSS loading. The current estimated daily loading of 0.13 lb/d BOD and 0.14 lb/d TSS is low and unlikely to be indicative of future per capita loading rates. It is recommended that the City use the typical design value of 0.2 lb/d per person for estimating BOD and TSS loading from both the existing and any new population at future conditions.

ERU Definition

Based on the projected per capita flow and loading rates, and using the City's UGA rate of 2.38 people per dwelling unit, **Table 4-18** establishes the per capita and per ERU flow and loading basis for future connections to the City's system at various conditions.

Table 4-18
Future Per Capita and ERU Definition

Parameter	ERU Basis							
	Average Annual		Max. Month		Max. Day		Peak Hour	
	Capita	ERU	Capita	ERU	Capita	ERU	Capita	ERU
Peaking Factor (ratio to Average Annual)	1.00		1.52		1.90		4.00	
Flow (gpcd)	56	132	85	200	106	250	-	-
Flow (gpm)	-	-	-	-	-	-	0.16	0.37
BOD Loading (ppcd)	0.20	0.48	0.20	0.48	0.25	0.60	-	-
TSS Loading (ppcd)	0.20	0.48	0.20	0.48	0.25	0.60	-	-

ppcd = pounds per capita per day

1. The value of 200 gpd/ERU at the MM condition is rounded to the nearest 10 gallons.
2. The per capita and per ERU loading rates established should be the same at the MM and AA conditions.
3. Peak hour loading is not a typical design parameter and is not estimated here.
4. The peak hour factor for future ERUs is assumed to be 4.0, whereas it is estimated at 3.6 for existing ERUs.

The AA, MD, and PH flow conditions are projected relative to the AA condition using the associated peaking factor. It is recommended that the future per capita and per ERU BOD and TSS loading rates established for the maximum month condition also be attributed for the AA condition. The MD BOD and TSS loading rates are estimated relative to flow increases between the MD and the maximum month.

PH loading conditions are not estimated as they are not a design or planning value that is typically used.

Projected ERUs and Equivalent Population

Utilizing the growth projection methods previously established for each customer category, **Table 4-19** and **Table 4-20** show the population equivalents and projected ERUs for the 2030 and 2040 conditions, compared to 2019.

Table 4-19
Equivalent Population Projections at Maximum Month

Parameter	2019	2030 (10-Years)		2040 (20-Years)	
		Growth	Total	Growth	Total
City Population	4,265	+ 609	4,874	+ 642	5,516
UGA Population	4,577	+ 667	5,244	+ 691	5,935
City					
Residential	5,306	+ 774	6,080	+ 801	6,881
Septic Conversions	0	+ 262	262	+ 262	524
Commercial (Equivalent)	2,389	+ 348	2,738	+ 361	3,098
Industrial (Equivalent)	708	+ 836	1,544	+ 836	2,380
City Total (Equivalent)	8,403	+ 2,220	10,623	+ 2,259	12,882
LCRD Total (Equivalent)	3,840	+ 1,217	5,058	+ 1,369	6,426
LCSD Total (Equivalent)	1,226	+ 179	1,404	+ 185	1,589
Total System (Equivalent)	13,469	+ 3,616	17,085	+ 3,813	20,898

LCRD and LCSD population equivalents estimated based on the City's ERU definition and the City UGA estimate of 2.38 capita/ERU.

Table 4-20
ERU Projections at Maximum Month

Parameter	2019	2030 (10-Years)		2040 (20-Years)	
		Growth	Total	Growth	Total
City					
Residential	2,230	+ 325	2,555	+ 336	2,891
Septic Conversions	0	+ 110	110	+ 110	220
Commercial	1,004	+ 146	1,150	+ 152	1,302
Industrial	297	+ 351	649	+ 351	1,000
City Total	3,531	+ 933	4,464	+ 949	5,413
LCRD Total	1,613	+ 512	2,125	+ 575	2,700
LCSD Total	515	+ 75	590	+ 78	668
Total System	5,659	+ 1,519	7,179	+ 1,602	8,780

LCRD and LCSD ERUs are estimated based on the City's ERU definition. ERUs shown in this table do not match current billing ERUs.

Projected Flow

Assuming the existing per ERU and per capita flow rate remains at the current level through the planning period, and utilizing the flow rate for future ERUs per **Table 4-18**, the projected system flow is provided in **Table 4-21**.

Table 4-21
Projected WWTP Influent Flow (MGD) at Maximum Month

Parameter	2019	2030 (10-Years)		2040 (20-Years)	
		Growth	Total	Growth	Total
City					
Residential	0.412	0.065	0.477	0.067	0.545
Septic Conversions	0.000	0.022	0.022	0.022	0.044
Commercial	0.186	0.029	0.215	0.030	0.245
Industrial	0.055	0.070	0.125	0.070	0.196
City Total	0.653	0.187	0.839	0.190	1.029
LCRD Total	0.298	0.127	0.425	0.115	0.540
LCSD Total	0.095	0.015	0.110	0.016	0.126
Total System	1.046	0.328	1.375	0.320	1.695
WWTP Rating	2.640				
85% of WWTP Rating	2.244				
Portion of WWTP Rating	40%	52%		64%	

Projected BOD and TSS Loading

Assuming the existing per ERU and per capita BOD and TSS rates remain at the current levels through the planning period, and utilizing the loading rates for future ERUs per **Table 4-18**, the projected system BOD and TSS loading is provided in **Table 4-22** and **Table 4-23**.

Table 4-22
Projected WWTP Influent BOD₅ Loading (lb/d) at Maximum Month

Parameter	2019	2030 (10-Years)		2040 (20-Years)	
		Growth	Total	Growth	Total
City					
Residential	666	+ 560	1,226	+ 162	1,388
<i>Septic Conversions</i>	0	+ 53	53	+ 53	106
Commercial	300	+ 252	552	+ 73	625
Industrial	89	+ 223	311	+ 169	480
City Total	1,054	+ 1,088	2,143	+ 456	2,598
LCRD Total	482	+ 538	1,020	+ 276	1,296
LCSD Total	154	+ 129	283	+ 37	320
Total System	1,690	+ 1,756	3,446	+ 769	4,215
WWTP Rating	6,315				
85% of WWTP Rating	5,368				
Portion of WWTP Rating	27%	55%		67%	

Table 4-23
Projected WWTP Influent TSS Loading (lb/d) at Maximum Month

Parameter	2019	2030 (10-Years)		2040 (20-Years)	
		Growth	Total	Growth	Total
City					
Residential	758	+ 469	1,226	+ 162	1,388
Septic Conversions	0	+ 53	53	+ 53	106
Commercial	341	+ 211	552	+ 73	625
Industrial	101	+ 210	311	+ 169	480
City Total	1,200	+ 943	2,143	+ 456	2,598
LCRD Total	548	+ 472	1,020	+ 276	1,296
LCSD Total	175	+ 108	283	+ 37	320
Total System	1,923	+ 1,523	3,446	+ 769	4,215
WWTP Rating	4,986				
85% of WWTP Rating	4,238				
Portion of WWTP Rating	39%	69%		85%	

Summary

The projected flow and loading for each district and the City are summarized in **Table 4-24** for AA, MM, MD, and PH conditions.

Table 4-24
Summary of Existing and Projected Flow and Loading

Parameter	Existing (2019)				2030 (10-Year)				2040 (20-Year)			
	AA	MM	MD	PH	AA	MM	MD	PH	AA	MM	MD	PH
City												
Flow (MGD)	0.506	0.653	0.961	1.819	0.552	0.839	1.049	1.985	0.677	1.029	1.286	2.434
BOD (lb/d)	-	1,054	1,318	-	-	2,143	2,677	-	-	2,598	3,247	-
TSS (lb/d)	-	1,200	1,499	-	-	2,143	2,677	-	-	2,598	3,247	-
LCRD												
Flow (MGD)	0.201	0.298	0.382	0.724	0.280	0.425	0.531	1.005	0.355	0.540	0.675	1.277
BOD (lb/d)	-	482	602	-	-	1,020	1,275	-	-	1,296	1,619	-
TSS (lb/d)	-	548	685	-	-	1,020	1,275	-	-	1,296	1,619	-
LCSD												
Flow (MGD)	0.040	0.095	0.077	0.145	0.072	0.110	0.138	0.261	0.083	0.126	0.157	0.297
BOD (lb/d)	-	154	192	-	-	283	354	-	-	320	400	-
TSS (lb/d)	-	175	219	-	-	283	354	-	-	320	400	-
Total System												
Flow (MGD)	0.748	1.046	1.421	2.688	0.904	1.375	1.718	3.250	1.115	1.695	2.118	4.008
BOD (lb/d)	-	1,690	2,112	-	-	3,446	4,306	-	-	4,215	5,267	-
TSS (lb/d)	-	1,923	2,403	-	-	3,446	4,306	-	-	4,215	5,267	-

Table Note: The peak hour flow rates used in Chapter 6 may exceed the peak hour values shown here to allow for conservative hydraulic modeling of the collection system components. The values shown in this table are intended to provide the relative City, LCRD and LCSD portions of the cumulative projected values.

The system-wide totals are used in **Chapter 6** for the analyses of the transfer lift station and the WWTP. Individual basin totals are used for analysis of collection system components via hydraulic modeling as presented in **Chapter 6**.

5 | POLICIES AND STANDARDS

Introduction

The City provides sanitary sewer service for the City and other customers according to the design criteria, laws, and policies that originate from the EPA and Ecology. These laws, as well as City policies, guide the planning, design, construction, operation, and maintenance of the sewer system. The overall objective is to ensure that the City provides high-quality sewer service at a fair and reasonable cost to its customers and to set the standards the City must meet to ensure that the sewer system is adequate to meet existing and future flow and loading. The system's ability to handle future conditions is detailed in **Chapter 6**, and the recommended improvements necessary to provide an adequate level of service are identified in **Chapter 7**.

The City Council adopts regulations and policies. The City's policies cannot be less stringent or in conflict with those established by federal and state governments. The City's policies take the form of ordinances, memoranda, and operational procedures, many of which are summarized in this chapter. Policies and standards related to the sanitary sewer system are primarily included in the following documents:

- City of Chelan Municipal Code Title 13 – Water and Sewers (CMC).
- City of Chelan Standards, Section 3 – Sewer Standards, Section 4 – Sewer Designs, and Section 10 – Utility Designs (City Standards).

The City also will periodically update this GSP, including the coordinated land use element, so that sufficient sewer system capacity exists or can be efficiently and logically extended to support planned growth.

Policies and standards associated with the following are presented in this chapter.

- Regulations
- Customer Service and Connections
- Collection Systems
- Septic Systems
- Other Sewer Utilities
- Department Organization
- Operations
- Finances

This chapter provides a review of the City's primary sanitary sewer system standards, policies, and criteria as necessary to provide recommendations for any changes or improvements. The details for the existing standards, policies, and criteria can be found in the applicable codes and standards referenced herein.

Regulations

National Pollutant Discharge Elimination System Permit

Wastewater discharged to surface waters of the State shall have an NPDES permit issued by Ecology, as discussed in **Chapter 2**. The permit contains the WWTP influent flow and loading design criteria, effluent quality standards, monitoring requirements, pretreatment requirements, and system maintenance requirements. A copy of the City's NPDES permit is included in **Appendix A**.

Customer Service and Connection Policies

CMC 13.06.010 states that "For the protection of the health and welfare of the citizens of the City ... the policy and goal of the city that all sewage and polluted waters generated within the city and the city's urban growth area shall be ultimately discharged into, and treated by, the city's sewage treatment plant." Further, all new sewer discharges in the area should be connected to the City's system, and as feasible, existing points of discharge also should be connected to the City's system.

Additionally, CMC 13.34.010 states that the City may extend utilities beyond City limits to properties within the UGA in accordance with the City's *Comprehensive Plan* and the GMA, with the further goal that the properties "...to which these utility services are extended ultimately become annexed to the city."

As such, the City must:

- Adequately plan to increase the capacity of the collection system and WWTP as necessary to support increased usage influenced by the City's growth and economic development; and
- Continue the development of City ordinances regulating public use of the City sewer system and update as required.

The City generally intends for the Sewer Service Area to match the City limits wherever feasible. Sewer service may be extended outside of City limits where allowed by City Code or policy.

Chapter 13.06 CMC governs connections to the City's sewer collection system within City limits. The primary policies that relate to future planning and design are as follows:

- Regarding connections within City limits, where public sewer is available:
 - All new construction must connect;
 - Any property with a private on-site sewer system failure located within 200 feet of public sewer must connect; and
 - Any property deemed necessary for connection to protect public health as certified by the local health officer must connect.
- Regarding connections within City limits, where public sewer is not available:
 - Private on-site sewer systems may be employed per the requirements of the Chelan-Douglas Health District and the City; and
 - When public sewer service becomes available (within 200 feet), properties served by on-site sewer systems must connect to the City's sewer collection system and the on-site system must be abandoned.

Chapter 13.34 CMC governs connections to the City’s sewer collection system outside of City limits. The primary policies that relate to future planning and design are as follows.

- Regarding connections within the UGA limits:
 - The City’s policy is to extend infrastructure to properties beyond the City limits but within the UGA if the proposed utility extension aligns with planning and the properties served will be annexed into the City in a timely manner.
- Regarding connections outside the UGA limits:
 - The City’s policy is to allow extension to properties within 0.6 miles of the 1,100-foot shoreline mark for Lake Chelan. This is in accordance with the recommendations of the *Lake Chelan Water Quality Plan* (1991) to minimize on-site sewage disposal systems near the lake. This allowance is contingent upon development outside the UGA being maintained at rural densities and that the utility extension is financially supportable.

General connection requirements for the City’s sanitary sewer system, regardless of connection location, are as follows:

- Stormwater or other unpolluted drainage must be separated from the discharge from any property and not discharged to the sanitary sewer system;
- Substantial amounts of cooling water or industrial process waters shall not be discharged to the sanitary sewer system;
- Discharges may not include constituents (i.e. hydrocarbons) or exhibit parameters (i.e. high temperature) that “may have a deleterious effect upon the sewage works, processes, equipment or receiving waters, or which otherwise create a hazard to life or constitute a public nuisance (CMC 13.06.060);”
- Grease, oil, and sand separators shall be provided for specific discharges as required by the City; and
- Industrial discharges shall be metered for monitoring and billing purposes as required by the City.

For small or simple connections (residences and small businesses), the City typically will review the availability for sewer service and system capacity as part of the sewer service application process. This review generally occurs at the time that application is made for a building permit.

In the case of large or complicated connections (developments and large commercial/industrial customers), the City may require a development review agreement prior to performing analyses related to service availability and capacity. In these instances, the cost of these analyses is borne by the developer.

In all cases, a formal application for sewer service is necessary prior to the City reviewing engineered plans or providing billing or other information related to the connection. Sewer collection system plans must be prepared and stamped by a civil engineer licensed in the State of Washington.

Sewer system extensions, as necessitated by proposed developments, shall be approved by the Department of Public Works and must conform to the City’s GSP, Ecology, and WAC requirements,

the CMC, and the most current City Standards. All costs of the extension shall be borne by the developer or applicant. The current City Standards for sanitary sewer are included in **Appendix C**. Section 3 of these standards provides additional requirements related to connections and sewer extensions.

Recommendations for Customer Service Policies

At a minimum, the following is recommended related to customer service policies.

- Update the City Standards for sanitary sewer systems currently and define an interval (i.e. 5 years) for periodic review and update unless necessitated sooner.

Collection System Policies and Design Criteria

General Criteria

The following outlines the general criteria for sanitary sewer system design.

- Collection system infrastructure improvements shall be approved by the Department of Public Works, must conform to the City's GSP, Ecology, and WAC requirements, and shall be designed and constructed in accordance with the most current City Standards.
- Utility easements shall be in accordance with Section 10 of the City Standards.
- Standards for sewer system facilities are defined by WAC 173-240-050.
- All sewer lines and facilities within the City shall be designed and stamped in accordance with good engineering practice by a professional engineer with the minimum design criteria presented in the most current version of the *Criteria for Sewage Works Design* (Orange Book), prepared by Ecology.

Gravity Sewers Design Criteria

- Except as superseded by more stringent requirements in the City Standards or CMC, gravity sewers shall follow the requirements of Chapter C1 of the Orange Book. This includes standards and guidelines for design considerations (e.g., minimum pipe sizes, pipe slopes, and wastewater velocities), maintenance considerations, estimating wastewater flow rates, manhole locations, leak testing, and separation from other underground utilities. These criteria have been established to ensure that the sanitary sewers convey the sewage and protect the public health and environment. The sewer lines also shall conform to the latest regulatory requirements relating to design.
- The City Standards provide requirements for materials, sizing, construction methods, etc. for mainlines and side sewers.

Lift Station and Force Main Design Criteria

- Except as superseded by more stringent requirements in the City Standards or CMC, lift stations and force mains shall follow the requirements of Chapter C2 of the Orange Book. These facilities also shall conform to the latest regulatory requirements relating to design.

Recommendations for Collection System Policies and Design Criteria

At a minimum, the following is recommended related to collection system policies and design criteria.

- As previously noted, the City Standards for sanitary sewer should be updated currently, and then periodically reviewed and updated in the future. At the time of the drafting of this GSP, Ecology was in the process of updating the Orange Book. City Standards should reflect the changes to the Orange Book once they are adopted.
- The City's sanitary sewer standard details included in Section 4 of the City Standards are limited and should be updated and expanded to include additional details applicable to collection system and pressurized pipe design and construction.
- The City should consider creating a set of lift station standards and details that set forth requirements for developer-designed lift stations intended to be owned and operated by the City in the future.
- The City should consider including policies, and if necessary standard details, related to interceptor connections as the City owns and operates multiple such pipes.
- The City Standards should include the intended design life of collection system elements. The design period is the length of time that a given facility will provide safe, adequate, and reliable service. The design period selected is based on the economic life of a given facility, which is determined by the structural integrity of the facility, the rate of degradation, the replacement cost, the cost of increasing the capacity of the facility, and the projected population growth rate serviced by the facility. For example, the life expectancy for new sanitary sewers, using current design practices, should be in excess of 50 years.

Septic Systems Policies

There are currently parcels both within the City limits and outside City limits but within the UGA using on-site sewage systems. The City's septic system policies are outlined in Section 3 of the City Standards. The primary policies include the following.

- All septic systems in the City and UGA shall be monitored per Chelan-Douglas Health District regulations.
- New septic systems are allowed in unincorporated areas within the UGA but outside the City limits where collection system infrastructure is farther than 750 feet from the property line. For single-family residential properties, the property must be at least 5 acres in size.
- Property owners with septic systems must sign agreements not to protest future City annexation, public sewer extension, and roadway development.

Recommendations for Septic System Policies

According to the GMA, no new on-site septic sewage systems should be allowed in a UGA, as new development is intended to be at urban densities that require sewers. In addition, Chapter 70.118 RCW requires counties to develop and implement management plans for on-site sewage systems. It is recommended that the City's septic system policies be updated, at a minimum, to include the following.

- Any property with a septic system failure, as documented by the Chelan-Douglas Health District, shall be required to connect to the City’s municipal sewer system if inside City limits or outside City limits in the UGA within 750 feet of collection system infrastructure, unless a variance is allowed by the City. Engrossed Senate Bill (ESB) 5871, which became effective on July 24, 2015, requires cities, towns, and counties to offer an administrative appeals process to consider denials of permit applications to repair or replace a septic system where connection to a sewer system is required for single-family residences. The City will review appeals to repair or replace septic systems as they are submitted in accordance with ESB 5871.
- All non-developing properties that annex into the City are encouraged to phase out their septic systems and connect to the City’s municipal sewer system.

Other Sewer Utilities

The City accepts sanitary sewer discharge from two sewer districts outside of the City: LCRD on the north side of the lake, and LCSD on the south side of the lake. This chapter provides an overview of the policies and agreements in place with each of these entities.

LCRD

LCRD provides sanitary sewer collection and conveyance in Manson and the surrounding areas on the north side of the lake, west of the City limits. The original agreement between the City and LCRD for sanitary sewer collection and treatment dates to the 1970s, when the Manson Sewer District (now LCRD) began discharging sewage to the City to avoid the costs associated with implementing a WWTP in Manson. The agreement has since evolved through multiple reviews and is referred to as the North Shore Interceptor (NSI) Agreement. The agreement was most recently updated in 2019. The agreement includes details on ownership extents, cost sharing for operations and maintenance, metering, fees, and other items associated with the NSI, and the conveyance and treatment of sanitary sewage from LCRD.

The NSI system includes dual force mains extending from LCRD Lift Station 2 (LS 2) to the City, where the dual mains discharge into a single 10-inch low pressure interceptor at the transition point (TP) from which flows go to the Transfer Lift Station. The City owns and operates two lift stations (CC 11 and CC 15) that discharge into the dual force mains. An overview of the system is provided in **Figure 5-1** and **Figure 5-2**.

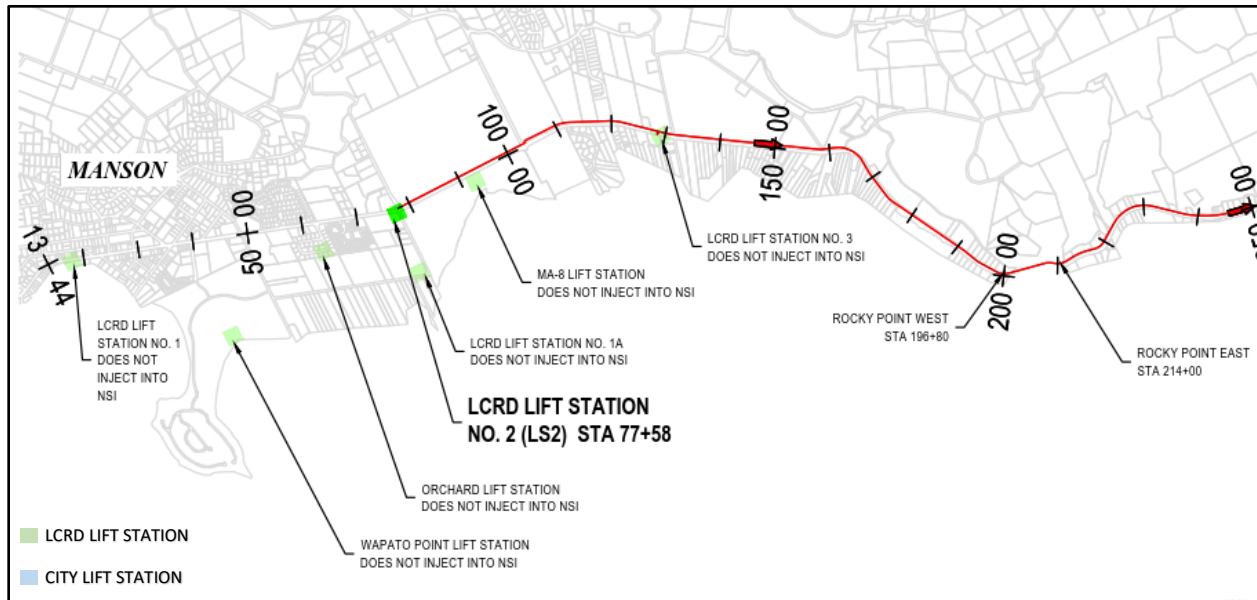


Figure 5-1 NSI Overview, Western Half

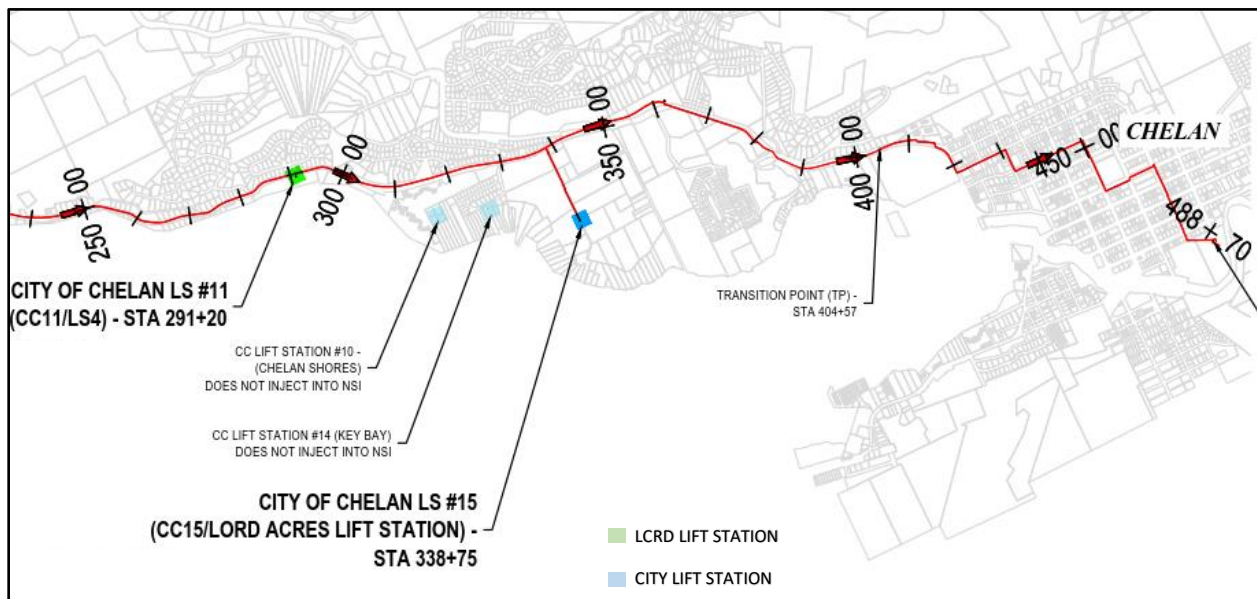


Figure 5-2 NSI Overview, Eastern Half

The following provides an overview of the primary policies contained in the NSI agreement.

Ownership:

- LCRD owns: the dual pipes and appurtenances that comprise the NSI from LS 2 to the TP, as well as all collection facilities and appurtenances from Rocky Point westward.
- The City owns CC 11 and CC 15 and associated force mains and appurtenances, all collection facilities and appurtenances from Rocky Point eastward, the single 10-inch low pressure interceptor to the Transfer Lift Station, and the Transfer Lift Station, WWTP, and associated infrastructure.

Operations and Maintenance:

- LCRD solely operates and maintains LS 2 and all pipe, appurtenances, and facilities related to the NSI west of CC 11.
- LCRD operates and maintains all pipe, appurtenances, and facilities related to the NSI east of CC 11 to the TP, but equitably shares these costs with the City.
- The City operates and maintains all pipe, appurtenances, and facilities downstream of the NSI discharge to the single 10-inch low pressure interceptor, as well as the Transfer Lift Station and other downstream facilities.
- The City solely operates and maintains CC 11 and CC 15 and the associated force mains and appurtenances.

Measurement and Billing for Operations and Maintenance:

- Flow in the NSI is measured by summation of the flow meters at LS 2, CC 11, and CC 15.
- LCRD's portion of flow is estimated by dividing the totalized LS 2 discharge by the totalized discharge from all three lift stations. The City's portion is the remainder. These portions are attributed to the costs of operations and maintenance of the portions of shared NSI infrastructure as described previously.
- Flow totalization is calculated monthly and billing proportions are estimated annually but can be revised more frequently if required. Billing by either party for the other party's portion of shared operations and maintenance (O&M) is invoiced monthly.

Measurement and Billing for Capital Improvements:

- Capital improvement costs related to the dual force mains, and low pressure interceptor, and associated facilities and appurtenances shall be allocated in the same manner as O&M costs for that infrastructure.
- Capital improvement costs related the Transfer Lift Station, the conveyance system between the Transfer Lift Station and the WWTP, and the WWTP shall be allocated equitably by calculating LCRD's portion by dividing the totalized LS 2 discharge by the totalized discharge to the WWTP.

Wastewater Composition:

- Cost allocation is based entirely on hydraulic loading to the NSI and is not related to solids or organic loading. The LCRD is required to enforce pre-treatment, if necessary, to ensure wastewater strength remains similar to normal domestic strength, with BOD and TSS below 300 mg/L.
- Odor control studies, monitoring, and improvements, as required, will be handled as O&M activities related to the NSI.

Other Policies:

- New connections to the NSI can only be made with approval of both the City and LCRD.
- A Wastewater Management Advisory Committee (WMAC) was created with equal representation by both the City and LCRD for the purposes of reviewing operations, maintenance, capital improvements, and other items related to the NSI.

- The NSI Agreement is intended to be reviewed and re-executed annually by both parties.

Recommendations for Policies Related to NSI Agreement

Recommendations for future policies or system changes related to the NSI Agreement are as follows.

- Consider adding flow monitoring at the Transfer Lift Station as part of a future project. Currently, LCRD's cost share related to O&M and capital improvements to the Transfer Lift Station and the conveyance system to the WWTP is calculated based on the LS 2 portion of the totalized flow at the WWTP. The additional totalization of flow at the Transfer Lift Station would allow the gravity flow discharged between the Transfer Lift Station and the WWTP to be better quantified for the purposes of both monitoring and billing.
- The addition of periodic composite sampling at LS 2 should be considered for the monitoring of organic and solids loading from LCRD to the City's system. At a minimum, this would be valuable for better understanding current and future loading to the WWTP, and if necessary, could be incorporated into billing in the future.

LCSD

LCSD provides sanitary sewer collection and conveyance on the south side of the lake, west of the City limits. The LCSD system collects wastewater and pumps it sequentially through six lift stations (numbered LCSD LS 1 through 6) to the City's system in the Lakeside area. The LCSD lift stations are located adjacent to the lake, with the interconnecting force mains generally submerged in the lake or installed adjacent to the lake. An overview of the system is provided in **Figure 5-3** and **Figure 5-4**.

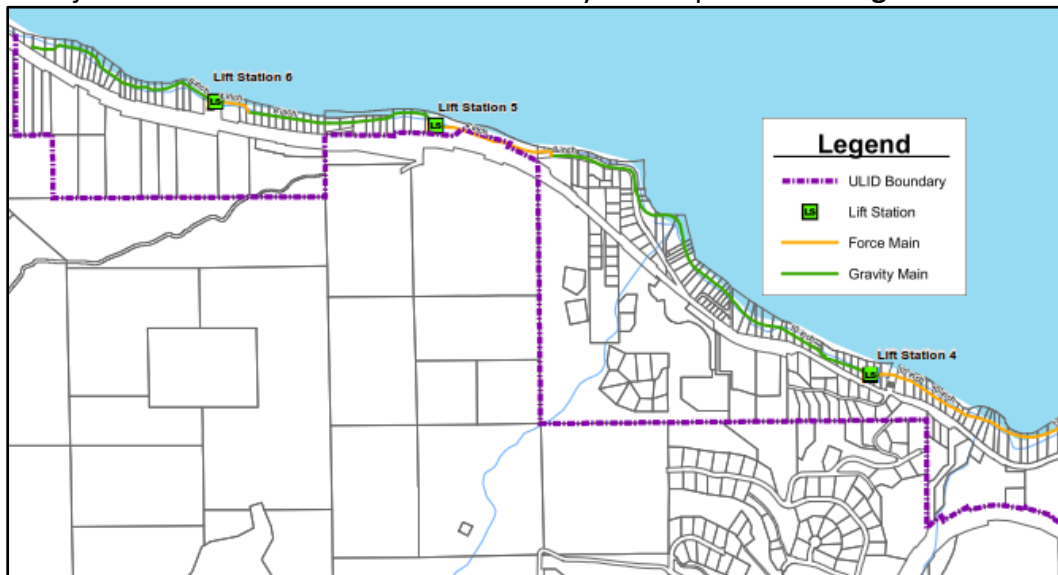


Figure 5-3 LCSD Overview, Western Half

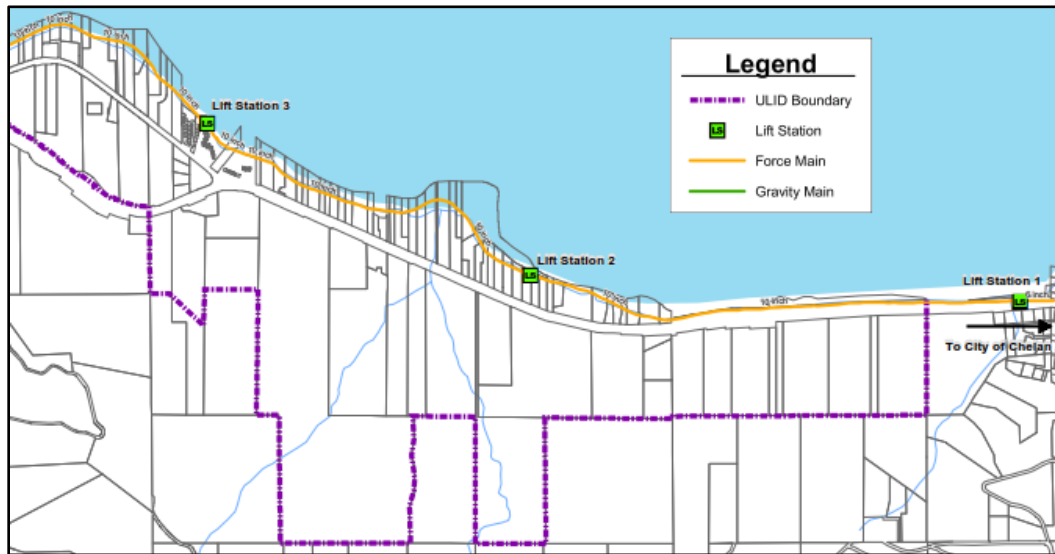


Figure 5-3 LCSD Overview, Eastern Half

Similar to the City's agreement with LCRD, the City's original agreement with LCSD dates to the late 1970s, when LCSD began discharging sewage to the City to avoid the costs associated with implementing a WWTP on the south shore of Lake Chelan. The agreement has since evolved and been updated over the years and includes details on the conditions of LCSD's discharge of sanitary sewer to the City. An updated agreement was being developed at the time of this GSP.

The following provides an overview of the primary policies contained in the current LCSD agreement.

Ownership:

- LCSD owns the infrastructure associated with the LCSD lift stations and force mains.

Operations and Maintenance:

- The City operates and maintains the LCSD-owned infrastructure and bills LCSD directly for the costs incurred for this work, as well as the administrative costs related to billing LCSD accounts and collections.
- The City bills all customers directly for LCSD.
- LCSD is billed for treatment costs proportional to volumes treated at the WWTP.

Measurement and Billing for Capital Improvements:

- Capital improvement costs for infrastructure related to the conveyance and treatment of LCSD flows are set proportional to LCSD usage of the infrastructure, with LCSD flow measured at LCSD LS 1.

Recommendations for Policies Related to LCSD

Recommendations for future policies or system changes related to the LCSD agreement are as follows.

- There does not appear to be wastewater composition requirements related to the LCSD discharge. It is recommended that limitations be placed on the solids and organic loadings

from LCSD such that the discharge is maintained near normal domestic levels. The addition of periodic composite sampling at LCSD LS 1 should be considered for the monitoring of loading from the LCSD system to the City's system. At a minimum, this would be valuable for better understanding current and future loading to the WWTP, and if necessary, could be incorporated into billing in the future.

Historically, there have been discussions by LCSD requesting the City to review the assumption of the LCSD infrastructure into the City system, and a potential dissolution of the LCSD ownership and governance of this separate system. The City currently provides the billing administration and O&M for the system, and a merger may increase the efficiency of the management of these two systems. Items for consideration related to a merger include the following:

- LCSD rates were raised significantly in 2020 to cover the LCSD share of pending City Capital Improvement Plan (CIP) projects as summarized in the 2020 LCSD *Financial Analysis and CIP Review* (RH2). A future merger of LCSD customers into the City would prompt further financial review.
- LCSD infrastructure and customers largely lie outside the City limits and UGA.
- The extent of collection system infrastructure ownership within LCSD is ill-defined. In some locations, pipelines transverse properties and rights-of-way to connect to LCSD infrastructure without apparent easements or defined ownership extents.
- Multiple pipes cross SR 97A with ill-defined ownership. These should be identified, and ownership extents and proper easements secured for each. Where feasible, piping across State Route (SR) 97A should be consolidated.
- During the drafting of this GSP, LCSD was evaluating the billing for multiple commercial customers, primarily wineries. Discharge from these facilities should be well understood and equitably assessed for conveyance and treatment.
- Risk of ownership - the City has concerns about assuming added risk of the LCSD system. Little to no benefit to the City is provided by assuming the District. Assumption of the District may be more palatable with annexation of the District properties into the City. This concept has not been proposed or reviewed to date for feasibility.

At this time, there is not significant momentum toward assumption, but this issue is likely to be revisited during the planning period.

Department Organizational Policies

Staffing requirements are covered in detail in **Chapter 8** of this GSP. This chapter provides a brief overview of organizational policies that govern the sanitary sewer division of the Department of Public Works.

Structure

- The Wastewater Department is a division of the City's Department of Public Works. The Public Works Director is responsible for the management of the Wastewater Department. The Public Works Director is responsible for the financial planning for this department.

- The Department of Public Works is responsible for administration of planning, design, and construction related to sanitary sewer projects.
- The Lead WWTP Operator is responsible for the day to day operations of the sanitary sewer system and WWTP, including O&M, staff management, reporting requirements, etc. to ensure reliable operation of the utility.

Staffing

- Staffing levels for utility departments are established by City Council based on the financial resources of the City and the needs of the sewer utility.
- Personnel certification and training will comply with state established standards.

Relationship with Other Departments

- The Finance Department works in conjunction with the Public Works Director to coordinate all sewer-related financing requirements. The Finance Department is responsible for customer billing and payment collection. The Finance Department collects connection fees, and the Wastewater Department oversees project cost accounting on sewer projects.
- The Water Department is responsible for shutting off water service if a customer does not pay their sewer bill. The Wastewater Department will participate in the implementation of the Water Department's Water Use Efficiency and Cross-Connection Control programs.
- The Human Resources Department is responsible for employee records, union labor negotiations, and salary schedules.
- The Fire Department is responsible for emergency responses to hazardous events at sewer system facilities.
- The Police Department and/or Sewer Department are responsible for enforcing violations of the City's sewer ordinances.

Recommendations of Organizational Policies

This GSP does not recommend any changes to the organization policies related to the Wastewater Department.

Operational Policies

Operations and maintenance requirements are covered in detail in **Chapter 8** of this GSP. This chapter provides a brief overview of the policies that govern City operation and maintenance of the sanitary sewer system.

Maintenance

- Equipment breakdown is given the highest maintenance priority, and repairs should be made as soon as possible.
- Equipment should be replaced when it becomes obsolete.
- Worn parts should be repaired, replaced, or rebuilt before they represent a high failure probability.

- Equipment that is out of service should be returned to service as soon as possible.
- A preventive maintenance schedule shall be established for all facilities, equipment, and processes.
- Spare parts shall be stocked for all equipment items whose failure will impact the ability to meet other policy standards.
- Tools shall be obtained and maintained to repair all items whose failure will impact the ability to meet other policy standards.
- Dry, heated shop space shall be available to all maintenance personnel to maintain facilities.
- Written records and reports will be maintained on each facility and item of equipment showing its operation and maintenance history.

Temporary and Emergency Services

- Compliance with construction standards (not quality standards) may be deferred for temporary sewer service.
- Compliance with all standards may be deferred for emergency sewer service.
- Compliance with all applicable NPDES waste discharge permit requirements must be met at all times.
- Interlocal agreement with LCRD for maintenance assistance on the NSI in case of Emergency.

Reliability

- The City shall invest sufficient resources to ensure that the sewer system is constructed, operated, and maintained to provide consistent and reliable service to its customers.

Recommendations of Operational Policies

This GSP does not recommend any changes to the operational policies related to the Wastewater Department.

Financial Policies

General financial policies related to the management of the sewer utility are included herein.

General

- Chapter 3.74 CMC establishes a sewer fund for the deposit of all sewer-related revenues.
- The City will set rates, charges, and fees to maintain sufficient funds to operate, maintain, and upgrade its sewer system as necessary to provide safe and reliable sewer service to its customers. These rates will comply with state regulations and be evaluated in conjunction with the annual budget process to ensure that forecasted expenses and impacts of regulations are reflected in the rate structure.

- Each lot or parcel of real property required to be connected to the City’s sewer system shall be subjected to a monthly sewer charge whether such lot or parcel of real property is actually connected to the sewer system. This monthly sewer charge will be waived if the property owner can establish, to the satisfaction of the City Engineer, that the lot or parcel is connected to a septic system approved by the Chelan-Douglas Health District.
- The sewer connection charge(s) must be paid prior to issuance of the permit by the City and shall be determined for each individual connection as requested by the applicant in accordance with the City’s Municipal Code.
- The City shall collect sewer extension charges for owners of properties that individually benefit from publicly built sewer extension facilities, except for those property owners who previously paid for their fair share of such an extension through a Local Improvement District (LID) or Utility Local Improvement District (ULID).
- The cost of any modification to the system shall be borne by each property benefiting from such modifications or by the owners of such property.
- If sewer system facilities must be installed or upgraded as a result of a developer’s impacts, the new facilities or upgrades shall conform to the City’s policies, criteria, and standards and shall be accomplished at the developer’s expense. However, the City shall be responsible for any portion of the costs that are attributable to general facilities, such as over-sizing or over-depth requirements, and offer latecomers fees to developers.
- If written application for service is approved by the City, the application shall be considered as a contract in which the applicant agrees to abide by such rates, rules, and regulations in effect at the time of signing the application or as may be adopted thereafter by the City and to pay all charges, rates, and fees promptly.
- In addition to all other user rates and service connection fees required to be paid to the City, service call fees may apply when made at the request of the owner or occupant of the premises for assistance in locating and/or repairing a plugged sanitary sewer drain.
- The City shall manage its income and expenses in a self-supporting manner in compliance with applicable laws and regulations and its own financial policies.
- The City shall establish a CIP that describes the anticipated improvements or modifications to the sewer system, planned replacement of aging facilities, upgrades to existing facilities to provide additional capacity for projected growth, and construction of general facilities to aid growth.
- A working capital reserve will be maintained to cover unanticipated emergencies, bad debts, and fluctuations in cash flow.
- The City will maintain information systems that provide sufficient financial and statistical information to ensure conformance with rate-setting policies and objectives.

Connection Charges

The owners of properties that have not been assessed, charged, or borne an equitable share of the cost of the sewer collection system and WWTP shall pay one or more of the following connection charges prior to connection to a sewer main.

1. Latecomers Fees: Latecomers agreements in accordance with Chapter 12.28 CMC are negotiated with the City, developers, and property owners for the reimbursement of a pro rata portion of the original costs of sewer system extensions and facilities and are documented in a Recovery Contract or City resolution, depending on the application.
2. Connection Charges: Connection charges shall be assessed against any property connecting to the sewer system. This charge is for the major facilities that deliver the sewage to the WWTP and for the facilities to treat and dispose of the sewage. This charge reimburses customers who have paid for the facilities described and for building capacity to accommodate growth.
3. Developer Extension Charges: These charges are for the administration, review, and inspection of a developer extension project.
4. Developer-Funded Improvements: These are costs incurred by a developer to upgrade and increase capacity in the sewer system to accommodate the increase in flow from the proposed development.

6 | EXISTING SYSTEM EVALUATION

Introduction

This chapter presents an analysis of the existing City sewer system infrastructure. Individual sewer system components were analyzed based on:

- Their capacity to pass or treat the current and projected flow and loading established in **Chapter 4**;
- Adherence to policies and design criteria as presented in **Chapter 5**; and
- General conditions assessment, including integrity, age, and useful life.

Potential deficiencies and remedies are identified in this chapter. The capital improvement projects resulting from these analyses are presented in **Chapter 7**.

City Collection System Analysis

Background

A computational model of the existing sewer system was created using the SewerCAD® program, developed by Bentley Systems, Inc., to analyze the hydraulic conditions in the system at the existing and future conditions. The model is used to analyze the peak flow conditions through the collection system, which relate to the ultimate hydraulic capacity of pipes, lift station pumps, and structures. The output from this model was used to evaluate the available existing and future collection system capacity, identify areas of deficiency, and recommend improvements to provide sufficient hydraulic capacity. The model can be updated and maintained for use as a tool to aid in future planning. The SewerCAD entity data is included in **Appendix D**.

Model Configuration

Extent of Analyses

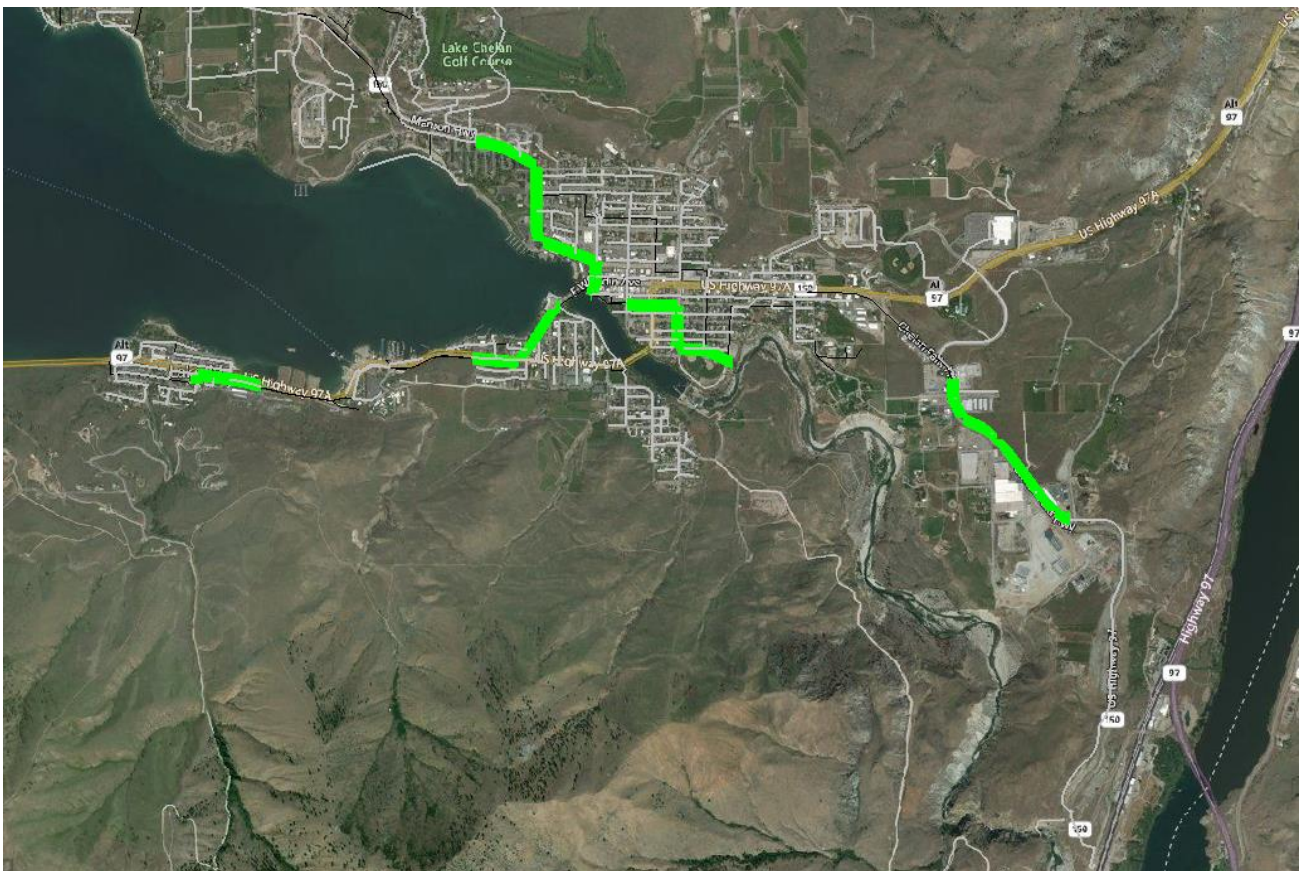
The hydraulic model was used to analyze the capacity of collection system piping. The conditions and capacity of lift stations and force mains are analyzed in a separate section of this chapter, as are the wastewater treatment facilities.

A complete database of as-builts or other mapping of pipe and manhole sizes, invert elevations, and materials did not exist at the beginning of this GSP. To the extent possible, RH2 created a formal mapping database that cataloged the available mapping and referenced these documents in the model data. Documents from future improvements to the collection system should be filed in this database and the model should be updated accordingly.

The hydraulic model was created using the best available information and data provided by the City. Structure locations and connecting pipes were imported into the model from a two-dimensional CAD file provided by the City. As part of this GSP, the location and elevation of structure rims were surveyed, and the model was updated with this information. Not all structures

were found during the survey, and the model data denotes which structures have surveyed data and which have data derived from other sources.

The existing CAD file used to create the model did not include invert elevations for gravity piping, which is needed to generate pipe slopes, and ultimately, analyze pipe capacity. For the purposes of this GSP, RH2 identified areas of analysis that consist of mainlines that serve large portions of City flows and are most likely to be affected by growth and include potential capacity limitations. The sections require accurate model information for pipe elevation, slope data, and pipe material to produce reliable hydraulic model results. Invert elevations were derived from as-builts where available. The City performed measure-downs from manhole rims to establish pipe elevations and visually confirmed pipe size for sections for which as-builts could not be located. The areas of analyses of collection system piping by the current model are identified in green in **Figure 6-1**.



Note: Only analysis areas for gravity collection system pipes are shown here.

Figure 6-1: Primary Areas of Collection System Model Analyses for the GSP

Pipes not updated with invert elevations are included as entities in the model, as shown in gray in **Figure 6-1**. These pipes can be updated later as necessary for future analyses, such as those prompted by potential new developments.

Gravity Collection Loading

As noted in **Chapter 4**, the existing flow data used in this GSP was acquired from the discharge monitoring records and supervisory control and data acquisition (SCADA) data for the WWTP. The total flow in the model was equal to the total system peak hour flow. As shown in **Chapter 4**, the

current and projected 20-year City PHF are 1.819 MGD (1,263 gallons per minute (gpm)) and 2.434 MGD (1,690 gpm), respectively.

Since there is minimal flow monitoring data available within the collection system (limited to certain lift stations), loading related to gravity flow was allocated basin-by-basin for the model. The portion of total flow generated by each basin was estimated based on the number and size of customers within that particular basin. **Table 6-1** provides the existing and projected flow generated by each basin. The allocation of flow at future conditions is based on the estimated distribution of potential development locations within the collection system.

Table 6-1
Model Distribution of Gravity Flow to City Collection System by Basin

Basin	City ERUs				
	Existing		Projected (20-year)		
	ERUs	Portion of City Total	Added ERUs (approximate)	Total ERUs (rounded)	Portion of City Total
A	662	19%	200	860	16%
B	429	12%	200	630	12%
C	684	19%	110	790	15%
D	298	8%	150	450	8%
E	239	7%	275	510	9%
F	356	10%	100	460	8%
H	263	7%	250	510	9%
I	460	13%	350	810	15%
K	141	4%	250	390	7%
Total	3,531	100%	1,885	5,410	100%

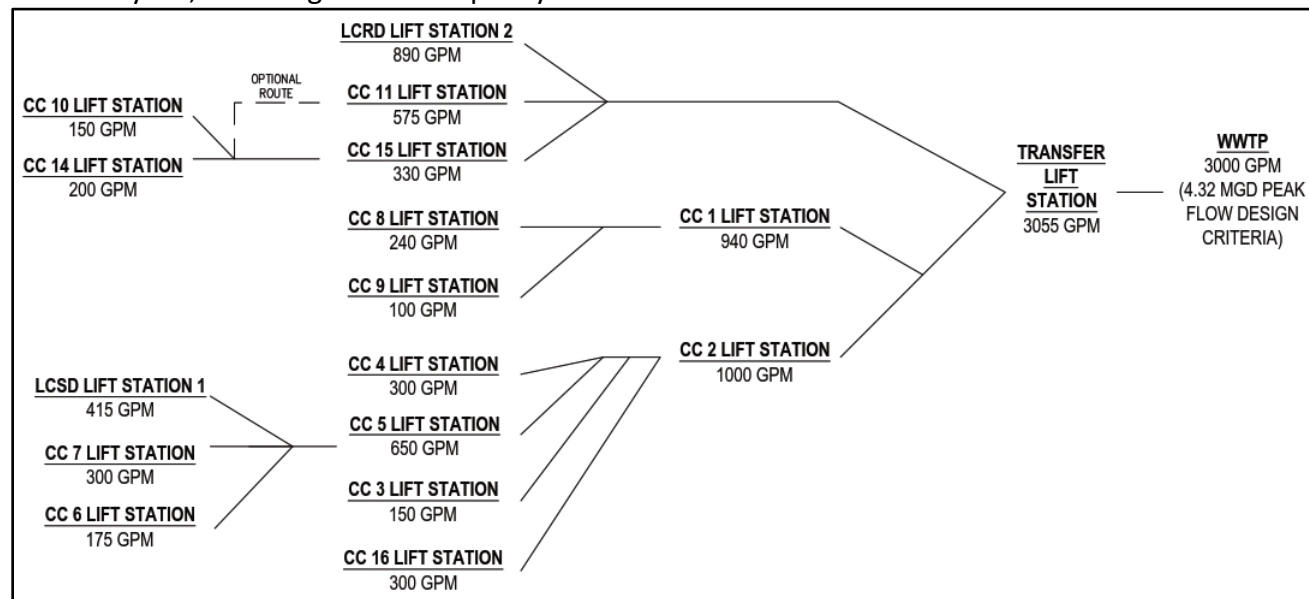
Note: The ERUs per basin are approximate for the purposes of estimating individual basin growth and capacity.

Gravity flow is distributed within each basin through a proportional peak hour flow point load to each manhole in the model to evenly distribute flows within the basins.

Steady-State Analyses

The hydraulic model is analyzed assuming a steady-state condition at the peak hour flow condition. This method assumes that all flows reach all downstream points simultaneously and does not analyze the system over time, in which loading variations and collection system flow attenuation occurs. A dynamic model would be necessary for those purposes. However, for relatively small systems with low I/I and largely domestic flow contribution, a steady-state model provides a cost-effective and conservative analysis of the system. Based on the limited collection system loading data available, a dynamic model of the collection system is not currently feasible or necessary.

In completing steady-state analyses, some mitigation of the point flow sources from lift stations is necessary. Lift stations are included in the hydraulic sewer model to estimate their downstream effects on the gravity collection system. **Figure 6-2** provides a schematic of the collection system lift station layout, including the firm capacity of each lift station.



Note: Lift station firm capacities shown for existing conditions assume discharge to the 14-inch Northshore interceptor, where applicable.

Figure 6-2: Collection System Lift Station Flow Schematic

Many of the lift station pumps operate on across the line starters, meaning the pumps cycle on and off at full speed. The collection system downstream of the lift station receives cycles of full lift station flow, but the time between cycles allows for some flow attenuation. This attenuation is especially likely for some of the City lift stations that have a firm capacity significantly above the peak flow rate, allowing for short and infrequent cycles. Steady-state modeling can over-predict capacity utilization in collection system pipes downstream of lift stations in these instances. It can be further aggravated where multiple lift stations pump in series, typical of the City's system, as shown in **Figure 6-2**. In order to account for attenuation that occurs with lift station cycling, the modeled flow from these pumps is balanced between the firm pump capacity and the predicted pump station flow rate within the model. Lift stations that operate pumps with variable frequency drives are analyzed assuming that the lift station pumps generally flow pace the incoming flow to the lift station. The lift station firm capacities and modeled flow rates are shown in **Table 6-2**.

Table 6-2
Basin by Basin Peak Hour Flow

Lift Station	Existing			Projected (20-Year)		
	Firm Capacity	Modeled Flow	Notes	Firm Capacity	Modeled Flow	Notes
CC 1	940	700	2	1,000	850	2
CC 2	1,360	700	2	1,000	1,000	-
CC 3	150	75	2	150	100	2
CC 4	300	100	2	300	150	2
CC 5	650	450	2, 3	650	650	3
CC 6	175	125	2, 4	175	175	2, 4
CC 7	300	100	2, 4	300	150	2, 4
CC 8	240	200	2	240	240	-
CC 9	100	75	2	100	100	-
CC 10	150	100	2	150	150	-
CC 11	575	300	1	575	400	1, 2
CC 12	< 50	50		< 50	50	
CC 14	200	100		200	100	
CC 15	330	150	1, 2	330	200	1, 2
CC 16	150	150	2	150	150	-
Transfer Lift Station	3,055	3,000	2	3,055	3,055	-
LCRD LS 2	1,200	1,200	1, 2	1,200	1,200	1, 2, 5
LCSD LS 1	415	300	2, 5	450	450	6

Notes:

1. Discharge to 14-inch interceptor is assumed in model as the most conservative flow condition for the downstream collection system.
2. The lift station model flow rate is reduced from the firm capacity to simulate some downstream flow attenuation due to lift station flow being significantly below the lift station capacity.
3. CC 5 will be reconstructed in 2021. The new lift station flow rate is assumed for the existing condition.
4. CC 6 and CC 7 current peak hour flows were analyzed as part of the CC 5 Lift Station Preliminary Design Report.
5. LCRD LS 2 firm capacity approximated assuming 3rd pump to be added to this lift station during the planning period.
6. LCSD LS 1 capacity is expected to increase to approximately 450 gpm once the LCSD LS 1 forcemain is replaced.

Other Assumptions

During the drafting of this GSP, construction of the CC 5 lift station and force main upgrade project was beginning and intended for completion in 2021. For the purposes of this GSP, the model was updated with the assumption that this project was completed for both existing and future conditions. The preferred configuration for these improvements at the time of drafting this GSP was to extend the CC 5 force main to connect with the CC 4 force main, such that both would pump into a common line and not pump in series from CC 5 to CC 4. The model was updated to reflect this update.

Model Limitations

It is important to note that the sewer model was created with the best available information, and the results of the modeling should be considered approximate. Additional investigations, such as field surveys and flow monitoring, may be warranted at some locations prior to design and construction of proposed improvements. For the purposes of planning and analysis, the model represents a tool for making conservative approximations of the capacity of primary system components.

Results of Hydraulic Analyses

Hydraulic analyses were performed based on the existing flow rates and projected flow rates for the 20-year condition. The capacities listed in the following sections were calculated with the assumption that the 100-percent capacity condition occurs when the ratio of flow depth to pipe diameter is 0.85.

A discussion of the primary areas of analyses is included herein for both existing and future conditions. The recommended improvement projects outlined in this section are summarized in **Chapter 7**.

Existing City Collection System

For each analysis, a figure is provided with the analysis area outlined in a yellow dashed line. For additional information about the infrastructure in each area, refer to the basin maps in **Appendix A**.

Analysis Area 1 – Mainline from LCSD LS 1 Discharge to CC 5

The LCSD LS 1 force main discharges to the collection system along Evergreen Avenue, flowing through 8-inch pipe north to the collection system piping along US Highway 97A. The pipe segments along the highway are 10-inch and 15-inch diameter. **Figure 6-3** shows the sections analyzed as part of this GSP.

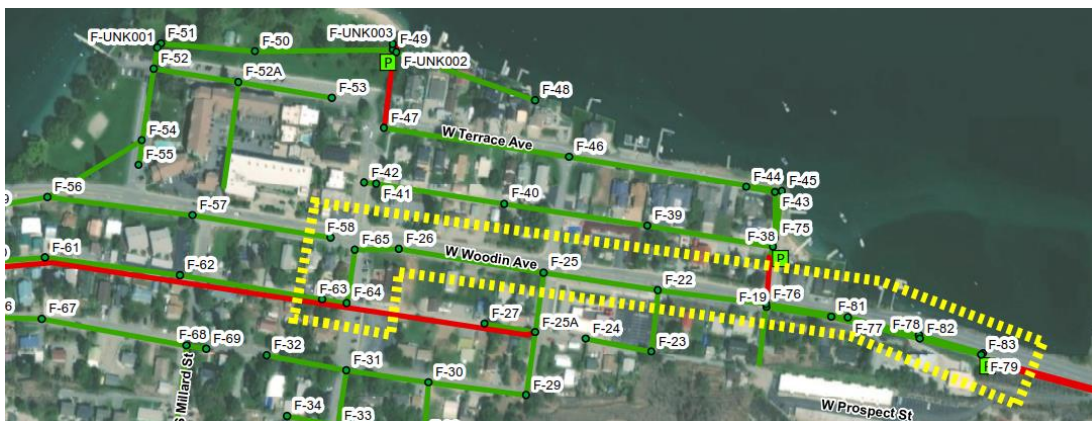


Figure 6-3: Analysis Area 1 – Mainline from LCSD LS 1 Discharge to CC 5

Based on hydraulic modeling at the existing conditions, there is adequate capacity in these pipes, with the estimated capacity at 60 percent or less for the segments in this area. There is not a capacity-driven need to replace these pipes based on the current modeled flow.

Analysis Area 2 – Mainline from CC 4 and CC 5 Discharge to CC 2

Once the CC 5 project is completed in 2021, CC 4 and CC 5 will pump into common force mains discharging to the collection system along Highway 97A, west of Woodin Avenue at Manhole (MH) E-23. The collection system downstream of these manholes consists of 12-inch pipe along Highway 97A, transitioning to 15-inch pipe along Woodin Avenue to CC 2. **Figure 6-4** shows the sections analyzed as part of this GSP.



Figure 6-4: Analysis Area 2 – Mainline from CC 4 and CC 5 Discharge to CC 2

This portion of the collection system model shows that there is generally adequate capacity in these pipes, with the estimated capacity at 60 percent or less for most segments in this area. One pipe segment downstream of MH E-4 shows approximately 70-percent capacity in use currently. However, this is a conservative approximation, and as such, it appears there is adequate capacity in this area at the existing condition and near-term future.

Analysis Area 3 – Mainline from No-See-Um Road to CC 1

The infrastructure along SR 150 collects wastewater from the western portion of the gravity collection system and delivers it to CC 1. The infrastructure along this alignment from Highland Avenue south to CC 1 was constructed in approximately 1948. The concrete pipes and brick manholes show signs of degradation and should be planned for replacement or rehabilitation in the near-term. The 2008 GSP recommended complete replacement of the infrastructure along this

alignment from Highland Avenue to CC 1 with larger, 15-inch pipe. The portion north of Highland Avenue to the No-See-Um Road area was installed in approximately 1965.

Currently, projected growth upstream of these sections has prompted a renewed look at the capacity of this infrastructure. **Figure 6-5** shows the sections analyzed as part of this GSP.

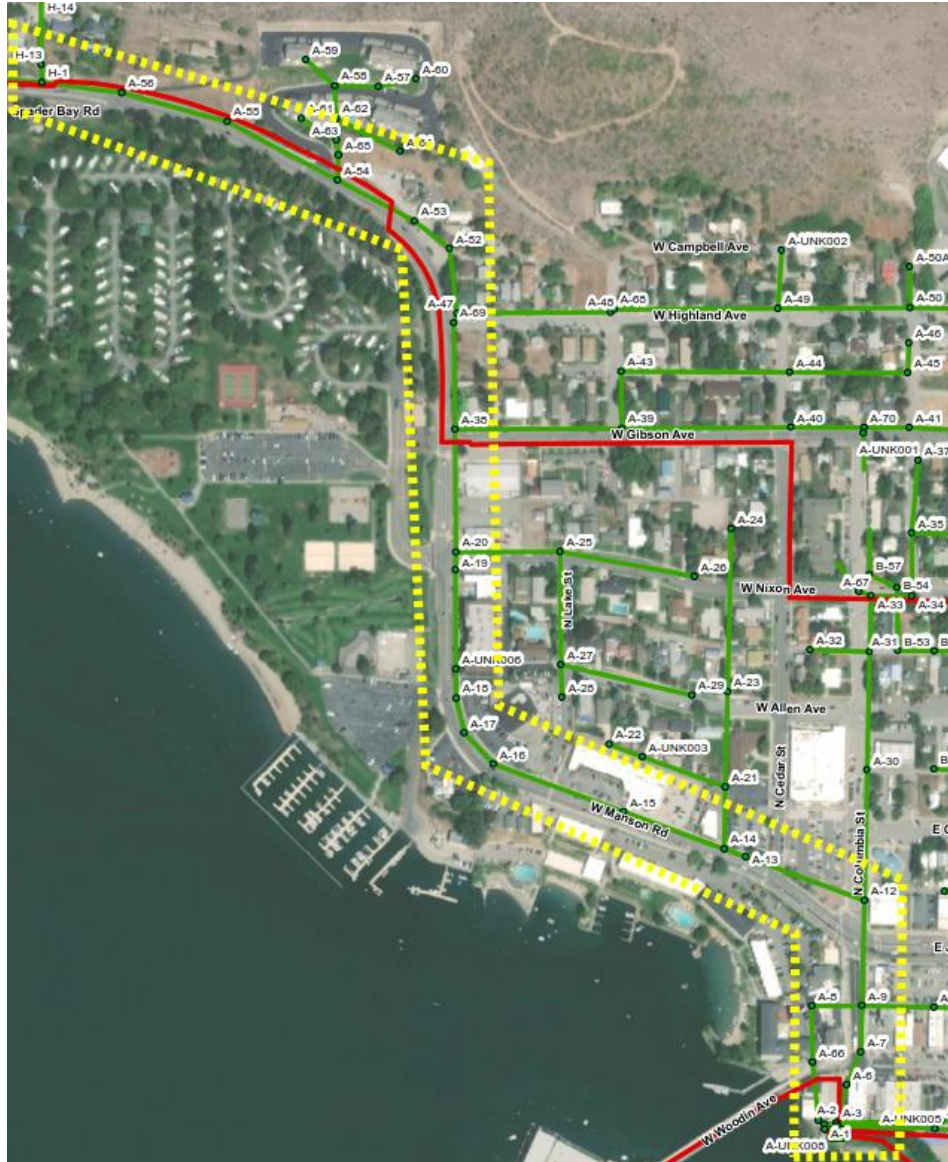


Figure 6-5: Analysis Area 3 – Mainline from No-See-Um Road to CC 1

At the current flow conditions, the pipes north of Highland Avenue are steeper and do not exhibit capacity constraints. The pipes south of Highland Avenue show capacity limitations. The 8-inch and 10-inch pipes between MH A-69 and MH A-12 generally are estimated to flow ranging from 80- to 100-percent capacity at the current peak hour flow. The 12-inch pipes from MH A-12 to CC 1 are steeper and show adequate capacity, although one segment between MH A-6 and MH A-7 appears to be relatively flat and may have limited capacity. Further, all of these pipes are likely more than 50 years old and should be considered for replacement or rehabilitation based on age and integrity.

Developers of parcels near the Golf Course are looking to connect to this infrastructure in the near-term, which will further utilize the limited capacity available. The primary options that exist for rectifying the current capacity and integrity issues, as well as providing for future discharges, are as follows:

- Open-cut replacement with larger pipe: This will represent a significant undertaking due to the existing alignment being located along SR 150, which is heavily traveled, especially during the summer months. Open-cut replacement of this infrastructure will cause significant disturbance to this area and incur substantial restoration costs. These improvements will allow more flow to be discharged to CC 1; however, this should not be of concern as this lift station is planned for near-term replacement as discussed in the **Lift Station, Force Main, and Interceptor Analyses** section of this chapter. This will increase discharge to the collection system between CC 1 and the Transfer Lift Station, which shows capacity limitations as discussed further in this chapter.
- In-place rehabilitation: This approach would include cured-in-place pipe, pipe bursting, or another trenchless rehabilitation method for this infrastructure. While this approach likely would have a reduced capital cost relative to open-cut replacement, it would not allow for the substantial increase in pipe capacity that would be afforded by the installation of significantly larger pipe. This approach would require future flows, and possibly a portion of existing flow, to be routed elsewhere through the system. A small portion may be able to be routed to the existing collection system draining to the Transfer Lift Station, although the existing pipe sizes and slopes likely would limit this approach. Another option that could be explored is the discharge of flows from higher elevations (such as around the Golf Course) directly to the existing low pressure interceptor from the Northshore. As discussed in its respective section of this chapter, this interceptor necessitates analysis early in the planning period, and as part of this work, consideration could be given to the addition of high elevation gravity discharge to this pipe.

For this GSP, it is assumed the section of infrastructure between Highland Avenue and CC 1 will be replaced with open-cut installation of 15-inch pipe. This represents the highest capital cost approach; therefore, it is the most conservative budgeting approach. Pending the outcome of future analyses of the low pressure interceptor from the Northshore, the opportunity may exist to reduce existing and future flow to the SR 150 gravity alignment and potentially allow for in-place rehabilitation of this infrastructure.

Analysis Area 4 – Mainline from CC 1 and CC 2 Discharge to Transfer Lift Station

The force mains from CC 1 and CC 2 discharge into a common gravity collection pipe near the intersection of Wapato Avenue and Emerson Street. This pipe flows to the Transfer Lift Station along the alignment shown in **Figure 6-6**.

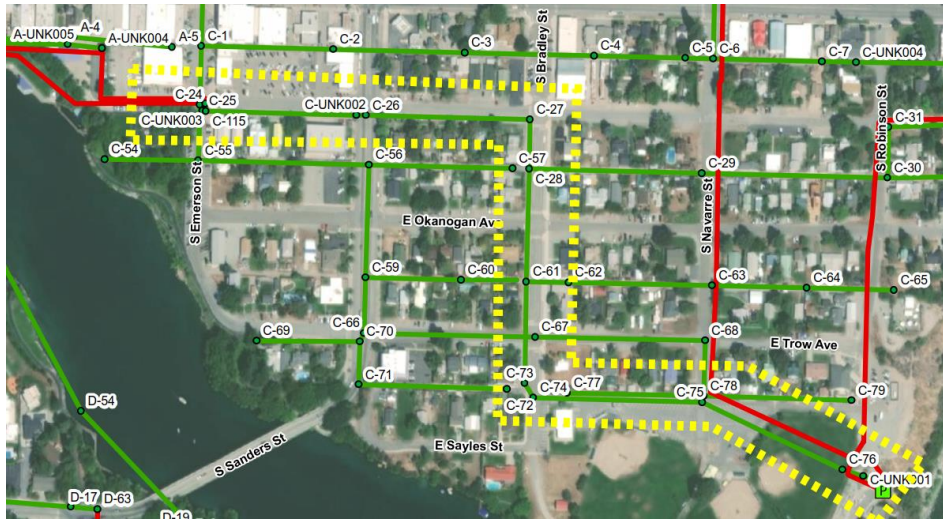


Figure 6-6: Analysis Area 4 – Mainline from CC 1 and CC 2 Discharge to Transfer Lift Station

The section of pipe between MH C-115 and the Transfer Lift Station was identified for replacement with larger pipe as part of the 2008 GSP due to capacity limitations at the peak hour. Currently, the portion of this alignment between MH C-115 and MH C-73 exhibits 70- to 80-percent capacity at existing peak hour flows. The sections between MH C-73 and C-75 show 80- to 90-percent capacity in use. Between MH C-75 and the Transfer Lift Station, less than 70-percent capacity appears to be in use. These pipes also are approximately 40 years old, and the integrity of the pipes currently is unknown.

Most of the flow to these pipes is discharged from CC 1 and CC 2. The hydraulic model assumes that both lift stations operate simultaneously. The near-term replacement of CC 1 will allow for new pumps operated on variable frequency drives (VFD), making the lift station better able to flow pace the influent. Once the CC 1 project is complete, flow pacing should mitigate some of the impacts to the downstream infrastructure.

CC 2 was constructed in approximately 2016 and the pumps are operated on VFDs, which should allow for flow pacing. Additionally, adding some equalization volume to CC 1 and providing interlocking controls between CC 1 and CC 2 could allow for the discharge from these two lift stations to be coordinated, which could further mitigate the downstream effects of this discharge.

Due to age and known capacity limitations of the collection system infrastructure between the CC 1 and CC 2 discharge and the Transfer Lift Station, this GSP should prudently budget for replacement of these sections during the planning period with larger diameter pipes ranging from 24-inch to 30-inch diameter along the alignment. Should the integrity of these pipes prove adequate from a visual inspection, then the replacement of CC 1 and coordination of discharge between CC 1 and CC 2 could extend the useful life of this infrastructure, allowing for replacement later in the planning period.

Analysis Area 5 – Mainline from Transfer Lift Station Discharge to Low Pressure Interceptor to WWTP

The Transfer Lift Station force main discharges to gravity collection system piping along SR 150 east of the City. This force main and a portion of the collection system piping between MH K-UNK006

and MH K-78 was replaced and upsized in approximately 2013. The remaining pipe in this area was installed in approximately 1984. This area is shown in **Figure 6-7**.



Figure 6-7: Analysis Area 5 – Transfer Lift Station Discharge to Low Pressure Interceptor to WWTP

The collection system pipes in this area are adequately sized for current conditions and generally exhibit capacity of less than 70 percent. However, the original 16-inch ductile iron (DI) pipe that is laid on a curve between MH K-77 and K-78 exhibits exceedance of capacity at current flows in the model. This aligns with anecdotal information from City operators, who have witnessed a back up of flow at the transition between the newer 21-inch pipe and the older 15- and 16-inch pipes. As such, this section of pipe should be replaced and upsized down to the low pressure interceptor that flows along SR 150 to the WWTP.

City Collection System 20-Year Projections

Analysis Area 1 – Mainline from LCSD LS 1 Discharge to CC 5

It is assumed that the LCSD LS 1 force main will be upsized during the planning period, as necessitated by the existing force main condition, which should allow LCSD LS 1 to discharge 450 gpm to the City's collection system. However, modeling at the 20-year condition does not show a significant impact on the gravity pipe capacity between the LCSD LS 1 force main discharge and CC 5. Pipe capacity is unlikely to be a driver for replacement of these pipes during the planning period.

The pipes between MH F-25A and MH F-76 are believed to have been installed during the 1950s and their integrity is unknown. These pipes should be inspected and considered for replacement in conjunction with the replacement of the LCSD LS 1 force main. A separate CIP project has not been allocated for these pipes; if deemed necessary for replacement, funding is expected to come from the normal annual pipe replacement budget.

Analysis Area 2 – Mainline from CC 4 and CC 5 Discharge to CC 2

At the 20-year condition, the 12-inch pipe sections between MH E-23 and MH E-8 generally show less than 60-percent capacity in use. These pipe sections are relatively steep and show sufficient capacity for the planning period. The 15-inch pipe sections between MH E-8 and CC 2 generally show greater than 90-percent pipe capacity in use in 20 years. These pipes have relatively shallow slopes and should be planned for replacement with approximately 21-inch pipe late in the planning period. This replacement may not be necessary if the planned growth does not materialize and the pipe integrity allows for continued use. Additionally, the need for this replacement could be accelerated if substantial development occurs above the predicted level of growth, in which case developer(s) may be required to proportionally pay to upsize this pipeline.

Analysis Area 3 – Mainline from No-See-Um Road to CC 1

As previously noted, this section needs to be replaced with larger pipe or rehabilitated in place by diverting flow elsewhere in the system. For the purposes of this GSP, the section of pipe between Highland Avenue and CC 1 is assumed to be upsized during the planning period. Once this is completed, no further capacity limitations on this section are expected during the planning period.

Analysis Area 4 – Mainline from CC 1 and CC2 Discharge to Transfer Lift Station

As discussed in the existing condition analyses, portions of this infrastructure need to be budgeted for replacement during the planning period. It is assumed this work will be completed in 20 years, and as such, the hydraulic modeling assumes new infrastructure at the future condition. Once this work is complete, there should not be significant additional improvements required during the planning period.

Analysis Area 5 – Mainline from Transfer Lift Station Discharge to Low Pressure Interceptor to WWTP

As previously noted, this pipeline needs to be upsized for the existing condition. Once this is completed, there should not be significant additional improvements required during the planning period.

General System Considerations – Annual Pipe Replacement Program

A significant portion of the small diameter collection system piping within the City's system is aging. While most of these pipes have not been modeled and are unlikely to be limited in capacity, periodic replacement is needed due to issues with integrity and other factors. The City will allocate a total of \$10,000,000 dollars (in 2021 dollars) for total annual pipe replacements during the 20-year planning period. This value will be used to establish an annual pipe replacement budget to complete improvements that are unknown at this time. The annual pipe replacements budget item is included in the CIP in **Chapter 7**.

Additionally, the City has identified several minor improvement projects related to rerouting or replacing small diameter pipes in the collection system that are problematic to the City. These projects are summarized in **Appendix E**, and these improvements are summarized in **Chapter 7**. The exact schedule of these improvements is unknown at this time. It is assumed that these projects will be completed, as needed, by utilizing the annual pipe replacement budget included in the CIP in **Chapter 7**.

Lift Station, Force Main, and Interceptor Analyses

The available information for each lift station, such as pump capacity, total dynamic head, horsepower, wet well diameter, wet well depth, and force main diameter, is included in the model. For simplicity, lift stations are modeled at fixed flow rates for analyzing impacts to the downstream collection system. Separate lift station and force main analyses are included in this section. The Transfer Lift Station analyses are included in the **Treatment Facility Analysis** section. A discussion of all lift station backup power systems is included in the **Lift Station Backup Power Systems** section.

For multiple lift stations, minor improvements are noted as potentially being necessary during the planning period. For the purpose of lift station short-lived asset replacement, the City will allocate a total of \$2,000,000 dollars (in 2021 dollars) for improvements during the 20-year planning period. This value will be used to establish an annual lift station short-lived asset budget. This budget item is included in the CIP in **Chapter 7**.

CC 1

Basic Condition Assessment

The original construction date for the existing CC 1 wet well is unknown. The lift station was rehabilitated in approximately 1985. The lift station includes a below-grade circular concrete structure split to provide a wet well and a dry well in which three centrifugal pumps are installed. A building sits on top of the concrete structure containing electrical equipment and an emergency generator, each in separate rooms. All pumping equipment and piping is below grade.

The existing pumps and electrical equipment have exceeded the expected useful life and are recommended for replacement early in the planning period. Additionally, the lift station presents multiple operational challenges, largely due to the small footprint of the lift station, the confined space of the dry well, and the building above the lift station. Retrofitting this lift station was identified in the 2008 GSP, with the preferred approach being a conversion of the lift station to a submersible pump-style lift station. This approach is still recommended for completion early within the planning period.

Capacity Analysis

CC 1 has level data recorded through the telemetry system, but no flow data is available through the telemetry system. By analyzing recent level trends for the lift station by using the cross-sectional area of the wet well, the estimated flow rates for the lift station appear to be

approximately 450 to 460 gpm per pump. This aligns with the estimated firm lift station capacity of approximately 940 gpm with two pumps operating and one pump for redundancy.

Since historical instantaneous flow data is not available for this lift station, recent telemetry data for the lift station liquid level was analyzed to estimate the magnitude of recent peak hour flow events. Based on this analysis, the previous 3 years of peak hour flow events into this lift station are approximated as follows:

- May 29, 2020 – 460 gpm
- July 2, 2019 – 450 gpm
- August 21, 2018 – 620 gpm

Based on these analyses, less than 65 percent of the firm capacity of the lift station currently is used during the peak hour. Based on the projected system growth, the 20-year peak hour flow to CC 1 is estimated at approximately 800 gpm, which is inclusive of both gravity flow from the collection system and other lift stations pumping to CC1. The new lift station will be sized with capacity in excess of this projected value.

Key Findings

The CC 1 lift station should be upgraded to a submersible pump and wet well style lift station early in the planning period to alleviate O&M issues and other deficiencies. The complexity of rehabilitating this lift station while maintaining its operation warrants a thorough predesign for the project. Additionally, as suggested in the **City Collection System Analysis**, consideration should be given to coordinating the discharges of CC 1 and CC 2 to mitigate the impacts to the downstream infrastructure. Improvements necessary to accomplish this goal should be considered in the CC 1 project. This work should commence as soon as feasible for the City.

CC 2

Basic Condition Assessment

The original comminutor and inverted siphons at this location were replaced with a new lift station and 16-inch force main in 2014. The lift station consists of a below-grade concrete wet well with two submersible sewage pumps discharging to the force main that crosses the Woodin Avenue Bridge into downtown Chelan. The lift station electrical equipment is exterior rated and mounted above grade, adjacent to the wet well. The lift station structure and piping are expected to have an indefinite useful life beyond the planning period. The pumps and electrical/control equipment will nominally exceed 20 years of age during the planning period and may require rehabilitation or replacement. However, these replacements are likely to represent fairly simple, in-kind replacements that could be completed by City staff. Budgetary estimates for these replacements have been included in the short-lived assets replacement item in the CIP.

Capacity Analysis

Based on analysis of 2019 and 2020 trends from the telemetry system, a single lift station pump operates at a significantly reduced speed while adequately pacing influent flow during the peak hour. It appears that a single lift station pump operates at less than 30 percent of its firm capacity

during the peak hour. As such, system growth and lift station capacity are not expected to prompt improvements to this lift station during the planning period.

Key Findings

No significant improvements are planned for this lift station during the planning period, due to the relatively new condition of the lift station and available capacity. As discussed in the collection system and CC 1 analyses, automatic control to allow the discharges of CC 1 and CC 2 to be coordinated should be explored as part of the CC 1 project.

CC 3

Basic Condition Assessment

The exact age of this lift station is unknown. This lift station presents operational challenges due to its location and configuration, per the operators. It serves a relatively small collection system area between Highway 97A and Lake Chelan. It is likely that some rehabilitation of this lift station will be required during the planning period due to age and operational issues. The operators have expressed interest in either removing this lift station and extending the gravity collection system to the area, or converting the current customers to private grinder-style pumps.

Capacity Analysis

The basin for this lift station is built out with no potential for significant additional flow generation without substantial redevelopment. Based on an analysis for ERUs in this basin relative to the lift station design capacity of 150 gpm, there are no capacity concerns for this lift station during the planning period. For the purposes of conservative collection system modeling, the lift station was assumed to remain in place and discharge at its firm capacity in the projected 20-year hydraulic model.

Key Findings

A small planning effort is recommended to analyze the alternatives for removal, replacement, or refurbishment of this lift station during the planning period. While the recommended approach for this lift station is unknown at this time, it is prudent to budget for refurbishment of this lift station's pumping, mechanical, and electrical equipment near the end of the planning period. The analysis of other alternatives for this lift station can be included in this budget estimate, and if a different alternative is preferred, the budgeted funds can be reallocated.

CC 4

Basic Condition Assessment

The original lift station consisted of a wet-pit/dry-pit configuration in a below-grade concrete structure. The lift station was converted in approximately 1985 to be a submersible pump-style lift station in the existing structure, with two submersible sewage pumps. The primary operational issue with this lift station is the location: the below-grade wet well and valve vaults are located

within a northbound driving lane of Waterslide Drive, near the intersection with Highway 97A. Relocation should be considered as part of any future significant project for this lift station.

The pumps and electrical equipment may require rehabilitation or replacement during the planning period. However, these replacements are likely to represent simple, in-kind replacements that could be completed by City staff as part of the normal operating budget.

Capacity Analysis

Replacement of the CC 5 lift station and force main will occur in 2021 and as part of the project, the new force main will tie into the CC 4 force mains. This will free up significant capacity for CC 4, as flows from CC 5 will no longer discharge to this lift station. This lift station should have substantial available capacity for the planning period.

Key Findings

Should future unforeseen development or other factors necessitate significant improvements to this lift station, it should be considered for relocation outside of the roadway.

CC 5

Basic Condition Assessment

This lift station is in the process of being reconstructed during the drafting of this GSP and is expected to be completed in 2021. No significant improvements are expected for this lift station during the planning period. The costs for minor replacement of items necessary for this lift station during the planning period are expected to be covered through the normal operations and maintenance budget for the collection system.

Capacity Analysis

The station is being reconstructed within the existing wet well with new, larger dual submersible pumps. The CC 5 force main also is being extended to tie into the CC 4 force mains, allowing for flow to bypass CC 4 and free up capacity in that lift station. The new CC 5 pumps are sized to convey flow in excess of the projected 20-year flow rates. Therefore, this lift should not require further improvements during the planning period.

Key Findings

No significant improvements are planned for this lift station during the planning period, due to the relatively new condition of the lift station and available capacity.

CC 6

Basic Condition Assessment

No significant issues are known of the integrity of this lift station. The pumps and electrical equipment may require rehabilitation or replacement during the planning period. However, these

replacements are likely to represent simple, in-kind replacements that could be completed by City staff as part of the normal operating budget.

Capacity Analysis

The basin for this lift station is built out with no potential for significant additional flow generation without substantial redevelopment. Based on an analysis for ERUs in this basin relative to the lift station design capacity of 175 gpm, there are no capacity concerns for this lift station during the planning period.

Key Findings

No significant improvements are planned for this lift station during the planning period.

CC 7

Basic Condition Assessment

No significant issues are known of the integrity of CC 7. The pumps and electrical equipment may require rehabilitation or replacement during the planning period. However, these replacements are likely to represent simple, in-kind replacements that could be completed by City staff as part of the normal operating budget.

Capacity Analysis

The basin for this lift station is built out with no potential for significant additional flow generation without substantial redevelopment. Based on an analysis for ERUs in this basin relative to the lift station design capacity of 300 gpm, there are no capacity concerns for this lift station during the planning period.

Key Findings

No significant improvements are planned for this lift station during the planning period.

CC 8 (Spader Bay)

Basic Condition Assessment

No significant issues are known of the integrity of this lift station. The pumps and electrical equipment may require rehabilitation or replacement during the planning period. However, these replacements are likely to represent simple, in-kind replacements that could be completed by City staff as part of the normal operating budget. The existing forcemain is aging and should be planned for rehabilitation or replacement during the planning period. During this work, consideration should be given to connecting this lift station directly to the Northshore interceptors to reduce flow to the gravity collection system along SR 150, which has limited capacity.

Capacity Analysis

The basin for this lift station is built out with no potential for significant additional flow generation without substantial redevelopment. Based on an analysis for ERUs in this basin relative to the lift

station design capacity of 2,400 gpm, there are no capacity concerns for this lift station during the planning period.

Key Findings

No significant improvements are planned for this lift station during the planning period.

CC 9

Basic Condition Assessment

No significant issues are known of the integrity of this lift station. The City has noted a desire to extend the gravity collection system from CC 15 to this location to remove this lift station. This is not likely to occur until further development pushes collection infrastructure closer to the lift station; however, it is expected that this will occur during the 20-year planning period.

Capacity Analysis

The basin for this lift station is built out with no potential for significant additional flow generation without substantial redevelopment. Based on an analysis for ERUs in this basin relative to the lift station design capacity of 100 gpm, there are no capacity concerns for this lift station during the planning period.

Key Findings

Ideally, this lift station will be removed during the planning period and converted to gravity discharge to a new collection system extended via future developments from the CC 15 basin.

CC 10 (Chelan Shores)

Basic Condition Assessment

CC 10 was refurbished in 2016 by converting the previous vacuum-primed system to a submersible pump/wet well configuration. The lift station is in good operating condition with no significant known operational issues. Any improvements to this lift station during the planning period are likely to be minor and are assumed to be covered by the City's normal operating budget.

Capacity Analysis

Based on an analysis of 2020 peak hour flow events from the telemetry system, it appears that the lift station pumps operate less than 10 percent of the time during the peak hour, with one to two pump starts per hour. The basin for this lift station is built out with no potential for significant additional flow generation without substantial redevelopment; therefore, no further capacity analysis is warranted at this time.

Key Findings

Should significant improvements be made to this lift station in the future, consideration should be given to connecting this lift station directly to the dual Northshore interceptors to eliminate the

re-pumping of this wastewater by CC 11 or CC 15. Any implications from this improvement would need to be thoroughly reviewed prior to the connection being made.

CC 11 (Northshore 4)

Basic Condition Assessment

This lift station was originally part of the LCRD system and was numbered LCRD LS 4 (also referred to as “Northshore 4”). The basin draining to this lift station has been largely incorporated into the City, and as such, this lift station is now part of the City's system. CC 11 is nearing 15 years of operation and is in good condition, with no known major operational issues. However, it is recommended that one new pump be budgeted for purchase for this lift station during the planning period. These are large and relatively expensive pumps, so it is prudent to plan to purchase an additional pump as a CIP item. The pump can either replace one of the existing pumps or be a shelf spare. There are no other known integrity issues that will prompt improvements to this lift station during the planning period beyond normal repairs that are assumed to be covered by the City's normal operating budget.

Capacity Analysis

Based on an analysis of 2020 peak hour flow events from the telemetry system, it appears the lift station pumps operate less than 40 percent of the time during the peak hour, with approximately three pump runs per hour. The trends also indicate this condition occurs when CC 11 is discharging simultaneously to the same interceptor as LCRD LS 2, as flows from CC 11 are below 200 gpm. If additional capacity is needed in the future, it is likely that CC 11 could be isolated to the 10-inch interceptor, separate from LCRD LS 2, and achieve a discharge rate of 400 gpm as noted in the 2007 *Northshore Interceptor Replacement Lift Station Capacity Analysis* (2007 Interceptor Report) by RH2. The flexibility of the dual Northshore interceptors should prohibit any significant capacity issues at CC 11 during the planning period and beyond.

Key Findings

One new pump should be budgeted for purchase for this lift station during the planning period. It is assumed this will be paid for out of the annual short-lived assets replacement budget item for lift stations. Additionally, as flows increase to the lift stations that discharge to the dual Northshore interceptors, consideration should be given to operating both interceptors in parallel.

CC 14 (Key Bay)

Basic Condition Assessment

No significant issues are known about the integrity of this lift station. The pumps and electrical equipment may require rehabilitation or replacement during the planning period. However, these replacements are likely to represent simple, in-kind replacements that could be completed by City staff as part of the normal operating budget.

Capacity Analysis

Based on an analysis for current ERUs in this basin, the flow to the lift station is substantially below the design capacity of 200 gpm; therefore, improvements are not currently necessary based on capacity. There is vacant land to the northeast of this lift station that could be developed in the future. Should developers show interest in this land, a detailed review of the lift station capacity should be funded by the developer at that time.

Key Findings

Any significant future improvements to this lift station are likely to be necessitated by significant development and would be paid for by the developer. As such, improvements are not budgeted for this lift station at this time. Similar to CC 10, should significant improvements be made to this lift station in the future, consideration should be given to connecting this lift station directly to the dual Northshore interceptors to eliminate the re-pumping of this wastewater by CC 11 or CC 15. Any implications from this improvement would need to be thoroughly reviewed prior to the connection being made.

CC 15 (Lord Acres)

Basic Condition Assessment

CC 15 was constructed in 2016 and is in good operating condition. The lift station structure and piping are expected to have an indefinite useful life beyond the planning period. The pumps and electrical/control equipment will nominally exceed 20 years of age during the planning period and may require rehabilitation or replacement. However, these replacements are likely to represent fairly simple, in-kind replacements that could be completed by City staff. Budgetary estimates for these replacements have been included in the short-lived assets replacement item in the CIP.

Capacity Analysis

Based on an analysis of recent trends from the telemetry system, each lift station pump discharges approximately 330 gpm during the peak season, during which the lift station is discharging to the 14-inch interceptor. Based on a review of peak hour flow events in 2020, it appears the lift station pumps operate less than 20 percent of the time during the peak hour, with approximately two starts per pump per hour. As such, system growth and lift station capacity are not expected to prompt improvements to this lift station during the planning period.

Key Findings

No significant improvements are planned for this station during the planning period due to the relatively new condition of the lift station and its available capacity.

CC 16

Basic Condition Assessment

CC 16 was constructed in approximately 2016 to replace a siphon on the south shore of Lake Chelan. The lift station structure and piping are expected to have an indefinite useful life beyond the planning period. The pumps and electrical equipment may require rehabilitation or replacement during the planning period. However, these replacements are likely to represent simple, in-kind replacements that could be completed by City staff as part of the normal operating budget.

Capacity Analysis

Based on an analysis of recent trends from the telemetry system, each lift station pump discharges approximately 150 gpm. Based on a review of peak hour flow events in 2020, it appears the lift station pumps operate less than 20 percent of the time during the peak hour, with approximately two starts per pump per hour. Lift station capacity is not expected to be the primary driver for improvements during the planning period.

Key Findings

No significant improvements are planned for this lift station during the planning period, due to the relatively new condition of the lift station and available capacity.

Lift Station Backup Power Systems

The Transfer Lift Station has a permanent standby generator for lift station operation during power outages. The City maintains permanent generators at large, critical lift stations as discussed as follows. Lift stations without a permanent generator rely on on-site storage and mobile generators for operation during extended power outages. In August 2015, a severe wildfire complex developed around the City that caused power system failures. The City utilized mobile generators to operate multiple lift stations for an extended period without a spillage of sewage. This technique works well for the City due to the relatively close proximity of the lift stations. A summary of the standby power system is included in the following sections.

City Northshore

CC 1 has a permanent standby generator for lift station operation during power outages. The remaining lift stations rely on storage volume and mobile generators. The two largest lift stations, CC 11 and CC 15, discharge directly to the Transfer Lift Station, which has a permanent standby generator for operation. Currently, no significant changes are recommended to this system.

LCRD

LCRD LS 2 includes on-site emergency storage volume to collect flow during a power outage. During an extended outage, the lift station could discharge to the City if LCRD utilized a mobile generator. This flow would discharge directly to the Transfer Lift Station, which has a permanent standby generator for operation.

City Southshore

CC 2 and CC 5 (as part of the recent CC 5 improvements project) have permanent standby generators for lift station operation during power outages. The remaining lift stations rely on storage volume and mobile generators. There are no significant changes recommended for this system at this time.

LCSD

None of the LCSD lift stations have permanent standby generators. However, LCSD LS 1 through LCSD LS 4 have equalization storage within the wet well structures. Should a backup occur within any of these wet wells, an overflow exists within each wet well to allow wastewater to flow upstream through the force main and discharge to the lift station wet well immediately upstream. These four lift stations would need to be completely full before a spill of sewage could occur. The substantial cumulative storage volume offered by these wet wells makes the event of a spill very unlikely. Storage volume is included with the LCSD LS 5 and LCSD LS 6 wet wells and is sufficient to store the low peak influent flow for these lift stations. Due to the available storage volume, LCSD does not need to discharge to the City during a power outage.

Other Lift Station Improvements

Many of the small lift stations within the system transmit minimal data to the collection system SCADA system. It is recommended that as electrical equipment is replaced or upgraded at lift stations as part of normal maintenance, the remote monitoring of lift station parameters be expanded where feasible. This would ideally include monitoring of pump voltage and current draw, wet well level, and flow rate at a minimum, in addition to normal alarming. The trending data derived is useful in diagnostics, monitoring, and emergency operations.

Dual Northshore Interceptor System

The dual Northshore interceptors offer significant capacity and operational flexibility for both the City and the LCRD. At a velocity of less than 8 feet per second (fps), the 10-inch and 14-inch interceptors offer nominal capacities of 1,500 and 2,500 gpm, respectively. The HDPE interceptors are less than 20 years old and should have an indefinite life. There will be no need to upsize or replace the interceptors based on capacity or pipe condition during the planning period.

The current capacity of the interceptors is limited by the three lift stations that discharge to these pipes: LCRD LS 2, CC 11, and CC 15. While the nominal capacity of each lift station was discussed previously in this chapter, this section also gives a brief review of the coordinated operation of these lift stations and interceptors.

Typically, the 10-inch interceptor is operated during the winter months to reduce the hydraulic retention time of the wastewater, especially during the low flow, non-tourist period of the year. The 14-inch interceptor typically is operated during the summer months. The operation of LCRD LS 2, CC 11, and both interceptors was analyzed as part of the (2007 Interceptor Report). One primary limitation noted by that report was that when LCRD LS 2 and CC 11 are both discharging to the same force main, the flow rate from CC 11 is significantly limited. As part of the CC 15 project, a valve was installed in the old 8-inch interceptor draining to CC 11, near the intersection of SR 150

and Riviera Drive. This valve was closed to direct flows from CC 10 and CC 14 uphill to the east, through the old 8-inch interceptor, to discharge to CC 15. This effectively freed up capacity in CC 11 and reduced the periods in which LCRD LS 2 and CC 11 pump simultaneously. In the future, growth in the CC 15 basin may necessitate flows from CC 10 and CC 14 to be returned to CC 11. In this case, two options exist to minimize concurrent pump runs in the interceptors:

- Both interceptors could be operated in tandem. For example, LCRD LS 2 and CC 15 could discharge to the 14-inch interceptor and CC 11 could discharge to the 10-inch interceptor. The wastewater hydraulic residence time and potential for odor generation must be considered but likely could be mitigated to allow for this operation; or
- Telemetry may be able to be used to better coordinate pump runs between the three lift stations discharging to the Northshore interceptors. With programming modifications, the lift stations potentially could be operated to stage the lift station pump runs in a manner that minimizes concurrent lift station operation or reduces the LCRD LS 2 discharge rate during periods of CC 11 operation. This system work needs to be coordinated between the City and the LCRD but may offer some ability to better distribute lift station discharges to the interceptors.

The dual interceptors offer sufficient capacity and operational flexibility for both the City and LCRD, and no major improvements are necessary during the planning period. Should future flows warrant parallel operation of the interceptors, further review of that configuration should be analyzed at that time. Similarly, future telemetry upgrades to any lift station should allow for control by a master SCADA system that could allow for the coordinated operation of multiple lift stations.

Low Pressure Interceptor from Northshore

The dual Northshore interceptors discharge into a single 10-inch polyvinyl chloride (PVC) pipe along SR 150 near the intersection with No-See-Um Road. This pipe was installed in 1975 as part of the original Northshore interceptor system. This pipe is routed through the City to the Transfer Lift Station and rises over multiple highpoints along its route. Due to these high points, this pipe flows full for sections, acting as a low pressure pipe.

The condition of this pipe is unknown, and it is nearing 50 years of service. During discharges from the dual interceptors, this low pressure interceptor experiences backups due to the high points and friction losses in the pipe. The dual Northshore interceptors were extended further east as part of the recent No-See-Um Road project in 2015, which removed some of the existing low pressure interceptor and tightlined the connection between these pipes. These improvements should provide for some buffering capacity by allowing backups to be contained within the dual interceptor pipe volume. The low points of the interceptor experience the greatest pressure increases due to these backups, but the extent to which this occurs is unknown.

This pipe is a critical piece of infrastructure that connects the Northshore interceptors to the Transfer Lift Station. Should a portion of this pipe fail, it would require an immediate emergency replacement of the failed section as there currently is no other readily available pathway to transmit this flow. Therefore, this system needs to be thoroughly analyzed soon, including dynamic modeling and field testing for verification of results. At a minimum, this work should include:

- Verification of pipe condition at multiple locations along the pipe to analyze pipe wall erosion, etc.;
- Installation of pressure monitoring equipment at critical points along the pipeline for use in calibrating a hydraulic model of this pipe;
- Completion of a dynamic model for this pipeline capable of modeling peak diurnal flow cycles from the Northshore interceptors through this pipeline;
- Consideration of future flow additions to this pipeline from the dual Northshore interceptors or other areas; and
- Recommendation of operating strategies, necessary repairs, potential replacement, or contingency plans for this piece of infrastructure pending the findings of the analyses.

It should be noted that the existing gravity collection system within the City does not have adequate capacity to convey flows from the Northshore, and as such, abandonment of this low pressure interceptor and reliance on existing gravity collection infrastructure in the area should not be considered. The primary options likely to be considered for improvement to this infrastructure are:

- Leave the pipe in place if the condition warrants, formulate adequate contingency plans should a failure occur, and make repairs as needed;
- Replace, upsize, or re-route portions of this pipeline; or
- Install a completely new interceptor near the existing or on a separate alignment entirely.

Northshore Low Pressure Collector (Old Northshore Interceptor)

The original PVC interceptor between Manson and the City was left in place during the construction of the new dual Northshore interceptors during the early 2000s. This pipe collects wastewater from private grinder pumps at numerous properties along SR 150. The pipe was reconfigured to collect wastewater from these locations and discharge to the nearest lift station (LCRD LS 2, LCRD LS 3, and CC 11). As mentioned previously, this pipe also directs flow from CC 10 and CC 14 to CC 15. The remaining section of this pipe delivers the dual Northshore interceptor flow through the City to the Transfer Lift Station, discussed in the **Low Pressure Interceptor from Northshore** section. This collector pipe is PVC and was installed in approximately 1975. The integrity of the pipe is unknown. However, most of this pipe is believed to transmit low flow at minimal pressures from residential grinder pumps. At this time, no significant improvements to this collector are planned.

Other Considerations

LCSD Projects

The 2020 LCSD *Financial Analysis and CIP Review* (RH2, 2020) summarizes LCSD CIP projects. Of note, the LCSD LS 1 force main is expected to be replaced with a larger pipe, likely in the existing location, during the planning period. This will allow additional flow to be discharged from this lift station, as the existing 6-inch force main limits the current discharge. The projected 20-year model assumes the increased discharge to be 450 gpm, which is in excess of the 20-year projected peak

hour flow from the LCRD, as projected in the *CC 5 Lift Station Preliminary Design Report* (RH2 2020).

LCRD Projects

LCRD may add a third pump to LCRD LS 2 to increase capacity to meet future flow demands. However, this lift station generally paces influent flow, and it is assumed that future discharge from LCRD LS 2 will match the projected PHF from LCRD. As such, the addition of a third pump to LCRD LS 2 should not significantly impact capacity of the interceptors or Transfer Lift Station beyond the capacity usage predicted by growth.

Lake Chelan Airport

As previously noted in **Chapter 2**, this GSP assumes no sewer service will be extended to the Lake Chelan Airport during the planning period.

Treatment Facility Analysis

Facility Overview

The current NPDES Permit No. WA0020605 issued by Ecology for the City's WWTP became effective on February 1, 2017 and is effective for 5 years. The WWTP permitted influent design criteria and the projected 20-year influent loading, as established in **Chapter 4**, is included in **Table 6-3**.

Table 6-3
Influent Flow and Loading Design Criteria

Parameter	Design Criteria	20-Year Projection
Hydraulic Loading		
Maximum Month Average Daily Flow	2.64 MGD	1.70 MGD
Maximum Day Flow	2.94 MGD	2.12 MGD
Peak Hour Flow	NA	4.01 MGD
Peak Instantaneous Flow	4.32 MGD	4.01 MGD
Solids Loading		
Maximum Month Average Daily BOD	4,986 ppd	4,215 ppd
Maximum Month Average Daily TSS	6,315 ppd	4,215 ppd

Note: Due to the majority of influent flow to the WWTP coming via the Transfer Lift Station, which is sized for the peak hour condition, it is assumed that the 20-year PHF and peak instantaneous flow at the WWTP will be approximately equivalent.

As shown in the table, the WWTP has nominal ratings for flow and loading in excess of the 20-year projections.

Historical Performance

Table 6-4 includes NPDES effluent permit limits for the current WWTP permit.

Table 6-4
NPDES Effluent Limitations

Parameter	Average (mg/L)		Monthly Average (ppd)	Weekly Average (ppd)
	Monthly	Weekly		
BOD ₅	30	45	661	991
TSS	30	45	661	991
Total Residual Chlorine	0.5	0.75	NA	
pH	Minimum of 6.0 and maximum of 9.0 standard units			
Parameter	Monthly Geometric Mean		Weekly Geometric Mean	
Fecal Coliform Bacteria	100 CFU per 100 ml		200 CFU per 100 ml	

Total residual chlorine is no longer measured now that UV disinfection is utilized at the WWTP.

Tables 6-5, 6-6, and 6-7 provide single sample values for WWTP effluent discharge for 2017 through 2019 at Outfall 001. The single sample values are compared to the average effluent limits. The data was collected from the electronically available data from Ecology's PARIS database. The data shows minor single sample excursions, although the WWTP continually and reliably has met the permit limits.

Table 6-5
WWTP Effluent BOD and TSS Values (2017-2019)

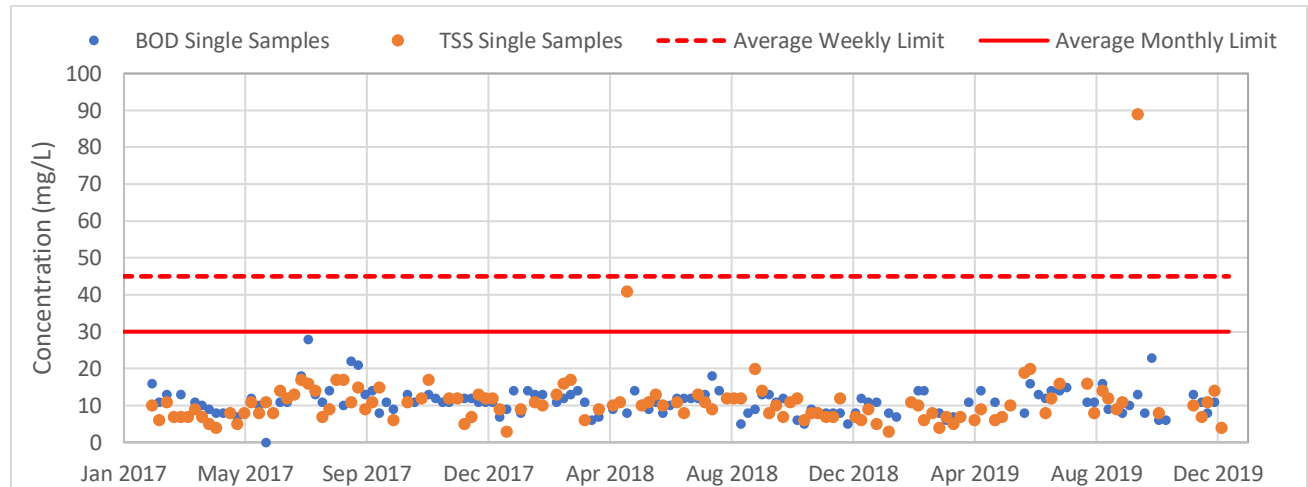


Table 6-6
WWTP Effluent pH Values (2017-2019)

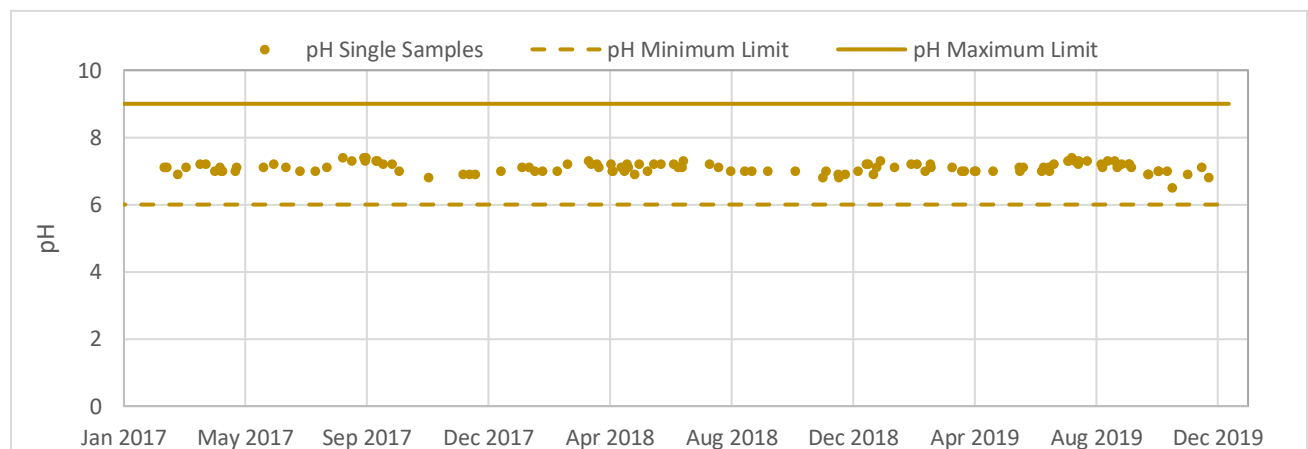
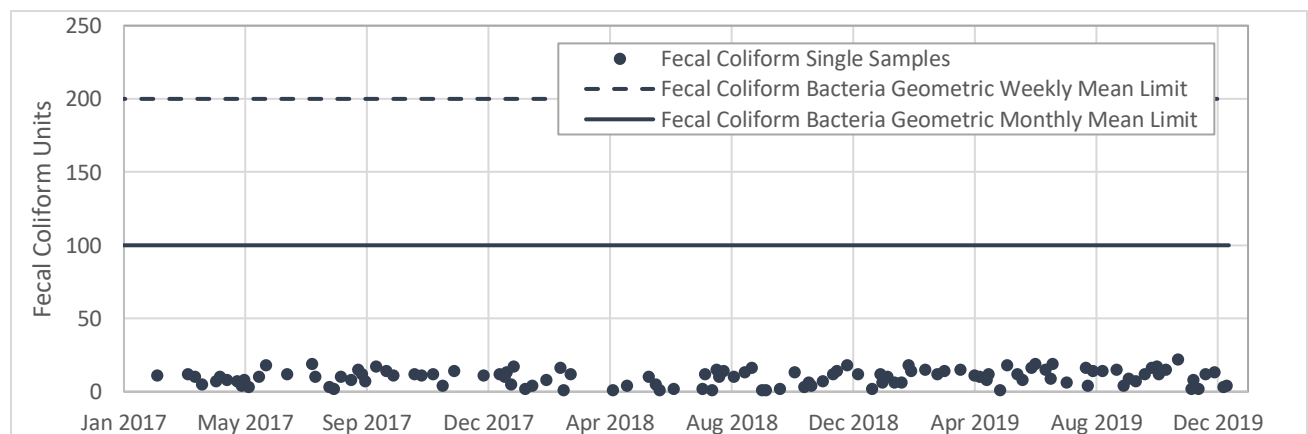


Table 6-7
WWTP Effluent Fecal Coliform Values (2017-2019)



Review of Treatment Facility Adequacy

WAC 173-240-050(3)(h) requires that a general sewer plan include “A statement regarding provisions for treatment and discussion of the adequacy of the treatment.” This section meets this requirement by summarizing the primary design criteria, capacity, potential operational deficiencies, and overall adequacy of each process or area of the WWTP.

The existing WWTP design criteria, process schematic, hydraulic profile, and site plan is included in **Appendix F**. The WWTP includes preliminary treatment via fine screening and grit removal, primary treatment via primary clarifiers, secondary biological treatment by fixed film RBCs, and effluent disinfection via a UV disinfection system followed by surface water discharge to the Columbia River. The solids treatment facilities include aerobic digesters and centrifuge dewatering designed to provide Class B biosolids for land application. In addition to the WWTP, the existing Transfer Lift Station provides additional screening and grit removal of the majority of the WWTP influent flow. The Transfer Lift Station also is analyzed in this section.

Major issues with any WWTP process are identified and summarized in this section for use in budgeting for necessary capital improvements as described in **Chapter 7**. Potential WWTP projects that impact unit processes or plant capacity are understood to require a separate engineering report submittal per WAC 173-240-060 for Ecology’s review prior to development of plans and specifications.

Transfer Lift Station

The Transfer Lift Station is at the site of the original primary WWTP. Currently, screenings and grit removal are performed prior to pumping wastewater at this location. With the 2014 Phase 2 WWTP Project, a new headworks with screenings and grit removal was constructed at the WWTP as a portion of influent flows to the WWTP do not pass through the Transfer Lift Station.

Capacity Evaluation

The original design criteria for the existing process components at the Transfer Lift Station are included in **Table 6-8**.

Table 6-8
Transfer Lift Station Equipment – Summary of Original Design Criteria

Parameter	Value	Units
Influent Screening		
Age	Greater than 20 years	
Configuration	In-channel fine screen	
Screen Type	Perforated plate	
Screen Quantity	2	
Screen Opening Size	0.25	in
Hydraulic Capacity	4.00	MGD
Grit Removal		
Age	Greater than 20 years	
Configuration	Aerated degritting basins	
Quantity	2	
Dimensions (per basin)	14x14x10	ft (LxWxSWD)
Volume (per basin)	15,000	gal
Grit Washing System		
Age	Greater than 20 years	
Configuration	Cyclone/classifier	
Quantity	2 pumps and 1 cyclone/classifier	
Pump Capacity (each)	325 gpm @ 22 ft TDH	
Cyclone/Classifier Size	205 gpm/12-inch	
Transfer Pumps		
Age	Greater than 20 years	
Configuration	Dry-pit	
Quantity	4	
Pump Capacity (each)	3 @ 1,500 gpm, 1 @ 700 gpm	

TDH = total dynamic head

The 2008 GSP/FP noted that the existing grit basins have adequate capacity for the planned Phase 2 peak hour flow of 4.30 MGD. The 2008 GSP noted that the existing Transfer Lift Station influent screens have a combined capacity of 4.00 MGD, which is less than the WWTP design peak hourly flow of 4.32 MGD. However, a portion of the WWTP influent is expected to be discharged by gravity to the WWTP, bypassing the Transfer Lift Station. As such, the Transfer Lift Station nominal screen capacity of 4.00 MGD is sufficient for the design peak hourly flow for the WWTP.

The 2008 GSP noted that the Transfer Lift Station pumping capacity was limited to 3.0 MGD, by the operating pressure of the single 12-inch force main from the lift station. A new 16-inch force main was installed in 2013, in addition to upsizing the 15-inch gravity pipeline downstream of the force main to 21 inches. However, the City has noted surcharging of flow at the outlet of the new 21-inch pipe. This is analyzed as part of the **City Collection System Analysis** section. Aside from the collection system issue, there are no known capacity constraints that would limit the Transfer Lift Station from passing the projected 20-year peak hour flow.

The 2008 GSP also noted the need for a permanent standby generator at the Transfer Lift Station. This lift station historically had relied on 300,000 gallons of influent storage in the event of a power outage which remains available for use. However, a permanent 300-kilowatt (kW) generator has been added to the lift station since the previous plan.

Conditions Assessment

The operator's primary concern with conditions at the Transfer Lift Station is related to the mechanical fine screens, which appear to be nearing the end of their useful life. However, it may be possible for both grit and screening removal systems to be eliminated from this lift station now that the WWTP includes screening. The City will investigate this possibility; at this time, new screens are not planned for this lift station. The other equipment at this lift station will require normal maintenance and incremental replacements during the planning period, but this is expected to be completed with the normal operating budget.

The operators noted that an existing below-grade valve used to bypass influent from the wet well to the equalization (EQ) basins is no longer operable. This valve is necessary to isolate the wet well for cleaning and should be planned for replacement during the planning period.

Should a future larger project be undertaken at the Transfer Lift Station, adding flow monitoring at this facility also would be a worthwhile consideration for the purposes of remote monitoring, pump diagnostics, etc.

Headworks

Influent from the collection system flows by gravity into the WWTP through enclosed piping. Influent enters the headworks and flows through a Parshall flume before discharging to the dual screening channels. Screened influent flows through a single channel to the dual degritting basins. Screened and degritted influent flows into a structure for diversion between two primary clarifiers.

Capacity Evaluation

The original design criteria for the headworks is included in **Table 6-9**.

Table 6-9
Existing Headworks – Summary of Original Design Criteria

Parameter	Value	Units
Influent Flow Measurement		
Age	Commissioned in 2014	
Meter Type	Parshall flume	
Meter Size	12 in	
Meter Peak Flow Capacity	10.56 MGD	
Influent Screening		
Age	Commissioned in 2014	
Configuration	In-channel drum screen	
Screen Type	Perforated plate fine screen	
Screen Quantity	2	
Screen Opening Size	0.25 in	
System Minimum Capacity	4.32 MGD	
Grit Removal		
Age	Commissioned in 2014	
Configuration	Aerated degritting basins	
Quantity	2	
Dimensions (per basin)	8x26.33x10.75 ft (LxWxSWD)	
Volume (per basin)	17,000 gal	
Collection Mechanisms	Aerated settling and 12-inch auger	
Grit Tank Blowers		
Quantity	2	
Type	Positive displacement	
Capacity (each)	80 SCFM @ 7 psi	
Motor Size	2 @ 5 hp	
Grit Washing System		
Age	Commissioned in 2014	
Configuration	Cyclone/classifier	
Quantity	2 pumps and 1 cyclone/classifier	
Pump Capacity (each)	220 gpm @ 32 ft TDH	
Cyclone/Classifier Size	250 gpm/12-inch	

psi = pounds per square inch

The existing screening and grit removal system was designed with a hydraulic capacity of 4.32 MGD. The influent flow meter has a nominal capacity greater than 10 MGD. As such, there are no known major limitations to capacity during the planning period related to the existing headworks facility.

Conditions Assessment

The headworks was constructed as part of the 2014 Phase 2 WWTP Project, and the structural and mechanical elements are generally in good condition. Some blinding of the screens has periodically

occurred, but is not a major issue. The City will investigate the washwater pressure to make sure it is adequate for screen cleaning. One grit mechanism has had a bearing failure due to binding. The mechanisms have had repeated over-torque instances in which shear pins have broken. It is recommended the City add additional torque sensing devices to protect this equipment. The City also has witnessed some grit accumulation in the digesters, but this is not a significant issue. It is recommended the City install a pressure gauge on the inlet to the hydrocyclone to ensure adequate pressure is available for proper grit separation prior to the classifier. These items are minor and represent small improvements that the City can undertake as part of normal O&M.

The mechanical equipment at the headworks, such as the influent screening and grit removal equipment, is typically planned for a useful life of 20 years. This period will be exceeded during the second half of the planning period. However, the useful life of such equipment can vary widely based on the adherence to a proper preventative maintenance schedule. Assuming the equipment will be properly cared for and incremental replacements will be made as needed through the normal O&M budget, full replacement of the equipment is not budgeted as part of this GSP.

Primary Clarifiers and Primary Sludge Pump Station

All screened and dewatered influent flows enter a diversion structure with manual gates for directing flow to either or both primary clarifiers.

Capacity Evaluation

The original design criteria for the primary clarifiers is included in **Table 6-10**.

Table 6-10
Existing Primary Clarifiers – Summary of Original Design Criteria

Parameter	Value	Units
Primary Clarifiers		
Age	(1) in 2002; (1) in 2014	
Quantity	2	
Configuration	Circular, cast-in-place concrete	
Diameter	53	ft
Side Water Depth	10	ft
Surface Area (each)	2,205	sf
Primary Sludge Pumps		
Type	Progressive cavity	
Quantity	2 dedicated (1 scum pump serves as a backup)	

A second primary clarifier was added to the WWTP as part of the 2014 Phase 2 WWTP Project. Currently, the operators use one primary clarifier in the winter and both in the summer months. The operators noted that primary sludge concentration normally ranges between 3 and 6 percent. In the summer months, the concentration can drop below 2 percent during periods of high influent flow. In addition to operating both primary clarifiers, alum is used as a settling aid. The decrease in primary sludge concentration could be related to the current practice of returning solids from the secondary clarifiers to the primaries. The operators will investigate other options for handling these secondary waste solids, such as pumping directly to the digesters. Once this change occurs, the

primary clarifiers should be able to handle the average design surface overflow rates of 800 to 1,200 gallons per day per square foot (gpd/sf) and a peak rate of 2,000 to 3,000 gpd/sf as recommended by the Orange Book for primary clarifiers with primary sludge only. To meet the reliability and redundancy requirements for a Class II facility, the WWTP must be able to treat 50 percent of the design flow with the largest primary clarifier out of service. Based on these loading rates, a single primary clarifier should be able to treat in excess of 50 percent of the MM design flow of 2.64 MGD and the peak instantaneous design flow of 4.32 MGD. As such, the two primary clarifiers provide adequate capacity for the projected flow and loading during the planning period.

The previous air-operated diaphragm primary sludge pumps have since been replaced with progressive cavity pumps. There is a single pump dedicated per clarifier, and an identical third pump used from scum, which can serve as a backup to either primary sludge pump. The primary sludge pumps are cycled to avoid coning of the sludge blanket. The operators believe these pumps function adequately and are unlikely to pose an issue with capacity during the planning period.

Condition Assessment

The concrete tank for both primary clarifiers is believed to be in good condition. The primary clarifier installed in 2014 is unlikely to need significant improvement during the planning period. The older primary clarifier mechanism is showing signs of wear and corrosion. It should be planned for refurbishment, likely later in the planning period, including recoating of the mechanism and replacing or refurbishing the gear drive.

Approximately twelve 6-inch plug valves in the primary sludge pump station need to be replaced due to age and inoperability. Currently, the valves cannot be opened to the sludge transfer pump. This work will be budgeted as a CIP item, although City staff may replace some or all of the valves if desired.

Rotating Biological Contactors

Primary effluent flows by gravity into the secondary treatment system, which consists of two trains of RBCs followed by three secondary clarifiers. RBCs are an attached growth system in which microbial populations grow the media of each RBC. A portion of the biomass is continually sluffed off into the main flow and passes through to the secondary clarifiers, where the sluffed solids are separated by gravity sedimentation from the effluent.

Capacity Evaluation

The original design criteria for the RBCs is included in **Table 6-11**.

Table 6-11
Existing RBCs – Summary of Original Design Criteria

Parameter	Value	Units
Rotating Biological Contactors		
Age	<i>Greater than 20 years</i>	
Quantity of Basins	4 basins, 4 RBCs per basin	
Qty of Standard Density RBCs	4	
Media Area per Standard RBC	110,000	<i>sf</i>
Quantity of High Density RBCs	4	
Media Area per High Density RBC	140,000	<i>sf</i>
Total Media Area	2,000,000	<i>sf</i>
RBC Configuration		
First Stage Area	880,000	<i>sf</i>
Second and Third Stage Area	1,120,000	<i>sf</i>
RBC Blowers		
Age	<i>(2) in 1986; (1) in 2002</i>	
Quantity	3	
Type	Centrifugal	
Capacity (each at 4.4 psi)	(1) @ 2,200 SCFM, (1) @ 1,450, (1) @ 2,200	
Motor Size	(1) @ 75 hp, (2) @ 50 hp, (1) @ 60 hp	

The 2008 GSP states the expanded RBC system has a capacity to treat 3,800 ppd of BOD. Based on the typical primary clarifier BOD removal rate of 35 ppd, the RBC design criteria equates to a maximum month design loading of 5,790 ppd BOD for the WWTP. While there are other issues noted in this GSP that may reduce the realistic BOD loading capacity of the WWTP, the stated maximum month design loading is in excess of current loading (1,690 ppd BOD) and the 20-year projected loading (4,215 ppd BOD) at the maximum month. As such, current and projected loading to the WWTP are not as significant of a driver in potential replacement of the RBCs as other items noted in the WWTP conditions assessment.

Conditions Assessment

The original train of RBCs was installed in approximately 1986, consisting of two basins containing four RBCs each. In the 2002 Phase 1 WWTP Project, a second train that is dimensionally identical to the first train was installed with RBCs that were procured secondhand from the City of Puyallup's WWTP. Additionally, this project added a solids recirculation stream from the clarifiers to the RBCs. This addition intended to convert the system from being an entirely attached-growth system to a hybrid attached-growth and suspended growth system. The intent of this addition was likely to increase system capacity and possibly facilitate nitrification by increasing the system solids retention time.

The RBCs are air driven, in which air cups on the outside of each RBC collect air discharged through a submerged sparger, causing the RBCs to continually rotate. This type of RBC is no longer manufactured and has not been supported since approximately 2006. Manufacturers only offer complete replacement of the RBCs with new, mechanically driven units.

The existing air cups have been degrading, causing problems that lead to intermittent rotation of some of the RBCs. The City is in the process of working with a plastics manufacturer to replace air cups as needed. Additionally, rotation detection devices should be replaced or retrofitted on each RBC.

In addition to age, the RBCs pose some significant challenges and process implications that need to be compared to replacing this equipment in-kind. A future engineering report, at a minimum, should review the following issues related to the RBCs:

1. The RBCs are proprietary equipment that require the City to work with the vendor for service and support.
2. The RBC tankage cannot be reused easily for other treatment technologies due to its shallow depth.
3. Proper rotation and scouring of the RBCs is critical to avoid biomass densification on the media and subsequent anaerobic conditions forming within the biomass. This is difficult to control, especially as the units wear and the rotation becomes intermittent as witnessed by the operators.
4. The RBCs require the use of primary clarifiers, which is not necessary with some of the other secondary treatment options. The resultant primary sludge is difficult to digest with the existing aerobic digesters. Anaerobic digesters typically are used to stabilize primary sludge, but would be cost prohibitive for a WWTP of the City's size. The existing aerobic digesters are more apt to stabilize secondary sludge.
5. The current combination of primary and secondary sludge at the City's WWTP complicates solids handling. Secondary solids produced by the RBCs are wasted from the solids recirculation stream. These solids require thickening prior to digestion to maintain the design solids retention time for the digesters. The current practice is to return these solids to the primary clarifiers for co-thickening with the primary sludge. However, the secondary solids do not settle and compact as well as primary sludge. The operators have noted settling issues in the primary clarifiers at flows above 1.2 MGD with both primary clarifiers in operation. With primary sludge only, the existing two primary clarifiers should handle flows to the design MM flow of 2.64 MGD. As such, the secondary solids need to be handled separately from the primary sludge. The existing aerobic digester design assumed an average feed concentration of 4-percent solids. This cannot be achieved by compaction of the secondary solids in the secondary clarifiers, especially with the continual recirculation of solids to the RBCs. If the RBCs remain for the long term, separate thickening of the secondary solids likely will be necessary.
6. The RBCs will not provide effective nitrogen removal as configured and cannot do enhanced biological phosphorus removal if necessary in the future.

Additionally, two of the RBC blowers will exceed 20 years of age during the planning period and should be considered for replacement in conjunction with either an RBC replacement or secondary treatment system upgrade.

The City intends to incrementally refurbish the RBCs and make process adjustments to improve the handling of secondary solids. It is the City's intent to utilize the current secondary treatment

system as long as possible. This will allow an engineering report to be completed to review other treatment alternatives compared to the in-kind replacement of the RBCs.

At a minimum, this GSP should budget for the following items related to the secondary treatment system:

- Engineering report;
- RBC rotation sensors – it is assumed this work will be completed as part of the normal plant maintenance and a capital project is not included for this work;
- Secondary treatment system replacement to be determined by the engineering report. For the purposes of this GSP, this cost is estimated based on the complete in-kind replacement of the RBCs; and
- Thickening mechanism for the secondary sludge if the RBCs are to be maintained beyond the near-term.

Secondary Clarifiers

Effluent from the RBCs discharges by gravity to the three secondary clarifiers. This stream includes solids recirculation from each clarifier, which returns settled solids to the RBCs. A secondary waste stream removes solids from the solids recirculation stream.

Capacity Evaluation

The original design criteria for the secondary clarifiers is included in **Table 6-12**.

Table 6-12
Existing Secondary Clarifiers – Summary of Original Design Criteria

Parameter	Value	Units
Secondary Clarifiers		
Age	(2) small clarifiers in 1986; (1) large in 2002	
Quantity	3 total, (2) 35 ft, (1) 50 ft	
Configuration	Circular, center feed, peripheral outfall	
Diameter	35; 50 ft	
Sidewater Depth	10 ft	
Nominal Area	(2) 952; (1) 1,963 sf	
35-ft Clarifier Recirculation Pumps		
Age	Commissioned in 2002	
Pump Type	Screw centrifugal (dry pit)	
Pump Quantity	2	
Pump Capacity	300 gpm @ 24 ft TDH	
50-ft Clarifier Recirculation Pump		
Age	Commissioned in 2002	
Pump Type	Submersible centrifugal	
Pump Quantity	1	
Pump Capacity	600 gpm @ 20 ft TDH	
35-ft Clarifier Scum Pump		
Age	Greater than 20 years	
Pump Type	Air-operated diaphragm	
Pump Quantity	1	
Pump Capacity	152 gpm	
50-ft Clarifier Scum Pumps		
Age	Commissioned in 2002	
Pump Type	Submersible centrifugal	
Pump Quantity	1	
Pump Capacity	150 gpm @ 17 ft TDH	
Secondary Sludge (WAS) Pump		
Age	Commissioned in 2002	
Pump Type	Air-operated diaphragm	
Pump Quantity	1	
Pump Capacity	152 gpm	

To meet the reliability and redundancy requirements for a Class II Facility, the WWTP must be able to treat 50 percent of the design flow with the largest secondary clarifier out of service. The Orange Book recommends a peak overflow rate of 1,200 gpd/sf for secondary clarifiers with conventional activated sludge. This may be conservative criteria for the City's WWTP, in which the solids produced by the RBCs are likely to have somewhat better settling characteristics than activated sludge. The two smaller clarifiers can pass the peak flow of approximately 2.2 MGD, which is greater than 50 percent of the design peak instantaneous flow of 4.32 MGD. As such, there is not an immediate need to construct a fourth clarifier. Additionally, future improvements to the secondary treatment system may change the timing for a fourth clarifier. This should be reviewed as part of the engineering report dedicated to the secondary treatment system planning.

Conditions Assessment

This GSP includes a conditions-based assessment for improvements that are likely to be needed for the secondary clarifiers during the planning period, regardless of a future change to the secondary treatment system.

The older two 35-foot secondary clarifiers were installed in 1986. The clarifier mechanisms are showing signs of corrosion and should be planned for refurbishment during the planning period. This should include recoating and replacing or refurbishing the gear drive. The clarifier tankage is believed to be in good condition.

The tank and mechanism for the newer 50-foot secondary clarifier is in good condition, and no improvements are planned for these items during the planning period. However, the return activated sludge (RAS) and scum pump stations for this clarifier appear to be restricted by headloss and cannot adequately pump as designed. Additionally, the scum pump for this clarifier is manually controlled and preferably would be automatically controlled. These items should be rectified early during the planning period.

An engineering report that reviews future secondary treatment options will include a coordinated review and evaluation of the secondary clarifiers.

Disinfection System

Secondary effluent from the secondary clarifiers flows by gravity to the disinfection system. The existing chlorine contact channels were converted to dual UV light disinfection channels as part of the 2002 Phase 1 WWTP Project. A non-potable water pump draws disinfected effluent for reuse throughout the WWTP.

Capacity Evaluation

The original design criteria for the disinfection system is included in **Table 6-13**.

Table 6-13
Existing Disinfection System – Summary of Original Design Criteria

Parameter	Value	Units
Effluent Disinfection		
Age	<i>(3) modules in 2002, (2) in 2014</i>	
Configuration	Vertical lamps, open channel	
Type	Low pressure, low intensity UV	
Channel Quantity	2	
Modules per Channel	5	
Lamps per Module	40	
Total Lamps	400	
UV Transmittance	55	%
Minimum Dose at Design MM	60,200	$\mu W\text{-sec}/\text{cm}^2$
Effluent Limit (Monthly Avg)	200	CFU/100mL
Design Peak Hour Capacity	4.4	MGD
Effluent Flow Measurement		
Age	<i>Commissioned in 2002</i>	
Meter Type	Parshall flume	
Meter Size	12 in	
Meter Peak Flow Capacity	10.56	MGD

$\mu W\text{-sec}/\text{cm}^2$ = microwatt seconds per centimeter squared

CFU/100mL = colony forming units per 100 milliliters

The UV disinfection system was expanded as part of the 2014 Phase 2 WWTP Project to provide capacity for the WWTP peak design flow of 4.32 MGD; therefore, this system should have adequate capacity for the planning period.

Conditions Assessment

The system is in good condition with no significant issues noted by the operators. This equipment is typically planned for a useful life of 20 years. This period will be exceeded during the planning period. However, the useful life of such equipment can vary widely based on the adherence to a proper preventative maintenance schedule. Assuming that the equipment will be properly cared for and incremental replacements will be made as needed through the normal O&M budget, full replacement of the equipment is not budgeted as part of this GSP; however, it should be reviewed as part of an upcoming engineering report.

Outfall

The existing submerged outfall was inspected by divers in December 2020, with no major issues noted. The outfall is not expected to require significant improvements during the planning period.

Aerobic Digesters

The solids handling system stabilizes both primary and secondary sludge with four aerobic digesters.

Capacity Evaluation

The original design criteria for the aerobic digesters is included in **Table 6-14**.

Table 6-14
Existing Aerobic Digesters – Summary of Original Design Criteria

Parameter	Value	Units
Digesters		
Age	(2) 118,000 gal commissioned in approximately 1986; (2) 63,000 gal commissioned in 2002	
Quantity	4	
Dimensions	(2) - 24x24x15 ft; (2) - 38x19x22 ft	
Volume	(2) - 63,000 gal; (2) - 118,000 gal	
Total Volume	364,000 gal	
Primary Loading at Design	4,100 ppd	
Secondary Loading at Design	1,400 ppd	
Total Sludge Loading at Design	5,500 ppd	
Design SRT	40 days at 20 deg C	
Overall Standard Oxygen Requirement	370 lb O ₂ /hr	
Aeration System Coarse bubble diffusers		
Digester Mixers (Previously Submerged Turbine Aerators – Small Digesters Only)		
Age	Greater than 20 years	
Quantity	2	
Motor Size	15 hp	
Digester Blowers		
Age	20 hp greater than 20 years old; 30 hp in 2002, 40 hp in 2014	
Quantity	6 total; (3) 20 hp for small digesters and (2) 30 hp and (1) 40 hp for large digesters	
Type	Positive displacement	
Capacity	(3) 400 @ 6 psi, (3) 400 @ 10 psi	
Motor Size	(3) 20 hp, (2) 30 hp, (1) 40 hp	
Digested Sludge Transfer Pump		
Age	Commissioned in 2014	
Pump Type	Screw centrifugal	
Pump Quantity	1	
Pump Capacity	300 gpm	

lb O₂/hr = pounds of oxygen per hour

At the maximum month design loading condition, the 2014 Phase 2 design criteria included a total daily design loading of 5,500 ppd (combined primary and secondary solids) to the existing digesters with a design feed concentration stated at 4.8 percent. The total digester capacity is 364,000 gallons. At the design loading rate and concentration, the sludge yield is 13,700 gpd, which corresponds to a solids retention time (SRT) of 27 days. This assumes that the digesters are not decanted, which is not a normal practice at the WWTP. To produce Class B biosolids, the design SRT

for the digesters is 40 days at 20 degrees Celsius. As such, additional digester volume is needed to meet the design loading, as was noted in the 2008 GSP.

The 20-year influent loading to the WWTP is projected to be 50 to 60 percent of the loading design criteria. It is assumed that future digester loading will be proportional to the influent loading; therefore, the digester loading is expected to be approximately 50 to 60 percent of the design loading in 20 years. An average digester feed concentration of approximately 4 percent would be necessary to maintain a 40-day SRT within the existing tankage at this level of loading. Additional digester tankage may not be necessary during the planning period if loading is consistent with the projections of this GSP. The City should carefully monitor digester loading and performance during the planning period.

As discussed in the **Rotating Biological Contactors** section, discharging secondary solids to the primary clarifiers reduces the concentration of the sludge, which correspondingly reduces the aerobic digester SRT. In the near-term, the City will manage the secondary solids separately from the primary sludge and plan for a separate thickening mechanism for secondary solids in the future.

Further, future changes to the secondary treatment system may change the digester loading, especially if the primary clarifiers were to be eliminated. In conjunction with the secondary treatment system analysis, the future engineering report must include coordinated planning and operations review of the digesters.

Conditions Assessment

The concrete tankage of the existing digesters visible from the exterior is in good condition. The operators believe the tankage to be structurally sound based on previous visual inspection during draining.

The 20 horsepower (hp) digester blowers are greater than 20 years of age and may require replacement during the planning period. The 30 hp and 40 hp blowers are expected to last into the planning period with normal O&M. These may be considered for replacement if a larger digester project is identified in the future engineering report.

Coarse bubble diffuser aeration grids were added to the small and submerged turbine aerators; these digesters serve only as mixers. This equipment is greater than 20 years of age and may require refurbishment or replacement during the planning period. The larger digesters include coarse bubble diffusers only that are believed to be in adequate condition. The future engineering report will evaluate the continued usage of primary clarifiers. Oxygen transfer in primary sludge in aerobic digesters with coarse bubble aeration is poor. If the primary clarifiers are to be maintained, replacement of the coarse bubble aerators in the large digesters with a different aeration and mixing system is recommended.

At a minimum, it is recommended that the CIP budget for the replacement of the mixers and three 20 hp blowers associated with the small digesters. Additionally, the aeration grids in each digester should be budgeted for in-kind replacement.

Dewatering System

A centrifuge is used for dewatering the digested sludge. The system produces Class B Biosolids for land application.

Capacity Evaluation

The original design criteria for the centrifuge is included in **Table 6-15**.

Table 6-15
Existing Dewatering System – Summary of Original Design Criteria

Parameter	Value	Units
Digested Sludge Pump		
Age	Greater than 20 years	
Pump Type	Double Disc	
Pump Quantity	1	
Pump Capacity	100	<i>gpm</i>
Dewatering Unit		
Age	Greater than 20 years	
Type	Centrifuge	
Quantity	1	
Nominal Hydraulic Capacity	50	<i>gpm</i>
Main Motor Size	50	<i>hp</i>
Backdrive Motor Size	10	<i>hp</i>
Bowl Diameter	14	<i>in</i>
Conveyance Equipment		
Age	Greater than 20 years	
Type	Shaftless screw conveyor	
Size	8	<i>in</i>

The centrifuge currently is operated 3 to 4 days per week during normal operating hours. As the sludge yield increases with system growth, the centrifuge can be operated for extended hours each day, or an additional 1 to 2 days per week. As such, the dewatering system should not be limited by capacity during the planning period.

Conditions Assessment

The centrifuge is greater than 20 years old and has undergone incremental refurbishments. Most recently, the bowl and scroll were replaced in 2019. The control panel for the centrifuge requires periodic replacement of internal components. A complete in-kind replacement of the control panel was considered by the City, but was deemed to be cost prohibitive. The City would prefer to make incremental component replacements in the panel while budgeting for a complete replacement of the dewatering system.

Additionally, the motor control center (MCC) in the dewatering room should be replaced due to age. This room is not suitable for an MCC due to the humidity and corrosive effects of the sludge/chemicals in the room. A new, properly rated distribution panel could be installed in this building and fed from a new MCC in the Blower Building, which needs replacement in the near-

term due to the age of the existing Blower Building MCC. This would alleviate the need for an MCC in the Sludge Dewatering Room.

The stainless steel polymer tankage is corroded and needs to be replaced or refurbished. The tank was re-welded at least once previously.

The dewatering system is functioning adequately and will continue to be used in the near-term, but full replacement of the system is expected during the planning period. At that time, a screw press and other dewatering options should be evaluated in a project-specific engineering report.

Electrical and Control

The existing standby generator at the WWTP is undersized at 200 kW and is further limited by its cooling system. The generator needs to be replaced and upsized. The generator is installed in the Blower Building, adjacent to the MCC room. It appears that installing a new, outdoor generator with a manufactured enclosure is the preferred solution, but this will be evaluated further in the generator design phase. Future consideration should be given to future WWTP improvements, including a secondary treatment system, during the sizing of the generator to ensure it is sized adequately for future motor loads.

The main MCC and plant PLC control panel are installed in the Blower Building. This equipment has exceeded its intended life and spare parts are no longer readily available. The MCC and control equipment need to be replaced early in the planning period. Similar to the generator, the sizing and configuration should allow for flexibility to handle the motor loads necessary to support future process upgrades. The likely option for completing this project is to install the new MCC and control panel in the location of the existing generator (after it is removed) to allow for the complete installation and testing of the new equipment prior to the incremental transfer of existing loads to the new equipment. This should allow for a coordinated changeover between the MCCs while maintaining WWTP operation. Additionally, the new MCC should feed equipment in the Sludge Dewatering Building to alleviate the need for an MCC in that room as discussed in the **Dewatering System** section.

Plantwide Miscellaneous Items

The basic conditions assessment of the WWTP associated with this GSP noted the following deficiencies that require rectification during the planning period.

Yard Pump Station

The existing 5 hp pump in the Yard Pump Station does not appear to have adequate power to overcome the head necessary to pump to the new headworks, similar to the new clarifier scum and RAS pumps. This needs to be remedied in the near-term. It is assumed this work will be completed as part of the normal plant maintenance, and a capital project is not included for this work.

Non-Potable Water Filter

The existing manual filter on the reuse water system clogs frequently, requiring operators to manually clean it. For this reason, reuse water usage is limited. An automatic self-cleaning filter

should be installed to replace the existing filter. It is assumed this work will be completed as part of the normal plant maintenance, and a capital project is not included for this work.

Operations Building Roof and Cracking

The flat roof on this building is causing precipitation to leak into the roof structure as evidenced by dripping through soffit vents and panels. Options for rehabilitation or replacement will be considered in the CIP.

A vertical crack has appeared in the south wall of the building and may be associated with ground settling in the area. Investigation and remedy of this issue should occur early in the planning period.

Sludge Dewatering Building Roof

The flat roof on this building exhibits the same issue as the Operations Building.

Plantwide LED Lighting

Many lighting fixtures throughout the WWTP have been converted to LED, but some still need to be upgraded. It is assumed this work will be completed as part of the normal plant maintenance, and a capital project is not included for this work.

Sludge Bin Storage Area

Enclosing the biosolids bin area is preferred to combat freezing in the winter months. The operators envision having the walls and sheeting completed by a contractor. City staff may insulate or make other improvements as needed.

Additional Heated Storage Area

The need for additional heated storage area was discussed. Storage possibly could be added in the existing sludge drying bays. It is recommended that general equipment storage areas be kept separate from enclosed biosolids storage.

Plant Fiber Communications

The existing plant fiber optics system is aging and requires component replacement to provide an adequate long-term communications system. This work represents in-kind device replacement and is expected to occur as part of the normal plant maintenance. A capital project is not included for this work.

Summary of Proposed WWTP Improvements

The following list summarizes the significant capital improvements proposed for the WWTP. These projects are included in the CIP discussion in **Chapter 7**.

1. Engineering report – specifically tailored to addressing the secondary treatment system needs.
2. Primary Sludge Valve Replacements – replace aging and inoperable plug valves.

3. Primary Clarifier Refurbishment – rehabilitate the 2002 clarifier, including recoating the mechanism and replacing or refurbishing the drive.
4. Secondary Treatment System Replacement – currently budgeted as a complete in-kind replacement of the RBCs; this will be reviewed as part of the engineering report.
5. Secondary Sludge Thickening – install a mechanical thickening unit for secondary sludge.
6. Two 35-foot Secondary Clarifier Refurbishment – rehabilitate two older clarifiers; including recoating mechanisms and replacing or refurbishing drives.
7. 50-foot Secondary Clarifier RAS/Scum Pump Improvements – rehabilitate or replace pumps as needed.
8. Digester Mixing/Aeration System Refurbishment – replace the mixing systems and three small digester blowers for the small digesters and replace the aeration grids for all digesters.
9. Dewatering System Replacement – replace the centrifuge and polymer system, including a project-specific engineering report.
10. Standby Generator Replacement – replace the undersized and aging engine generator.
11. Blower Building MCC Replacement – replace the aging MCC in the Blower Building.
12. Membrane Roof Repair – repair or replace the roofing material for the Sludge Dewatering Building and Operations Building.
13. Enclose Sludge Bin Storage Area – enclose and insulate the bin storage area.
14. Add Heated Storage at WWTP – budget for an additional heated storage area at the WWTP.

7 | CAPITAL IMPROVEMENT PLAN

Introduction

This chapter presents proposed improvements to the City's sewer system that are necessary to resolve existing system deficiencies and plan for the projected customer growth. The sewer system improvements were identified from an evaluation of the results of the system analyses presented in **Chapter 6**. The sewer system improvements were sized to meet the system's projected demand conditions at the end of the 20-year planning period.

A Capital Improvement Plan number, herein referred to as a CIP number, has been assigned to each improvement. Numbers were assigned to the improvements as shown in **Figure A-7**. The improvements are organized and presented in this chapter according to the following primary categories. Note: The number symbol will be replaced with a corresponding improvement number in the descriptions.

- Lift Station, Force Main, and Interceptor Improvements (LS##)
- Collection System Gravity Sewer Main Improvements (CS##)
- Wastewater Treatment Plant Improvements (WW##)
- Miscellaneous Items such as Planning Work (M##)

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

For planning purposes, the improvement projects described herein are based on the alternative that appears most cost effective for providing the necessary improvement. Other alternatives may be viable for each recommended project and should be considered where applicable during a predesign process to ensure the best and lowest cost alternative design is selected. Further, evaluation of alternatives should be performed in the future if growth patterns change or if residential, commercial, or industrial development occurs beyond that assumed by this GSP. Where not explicitly mentioned, open-cut construction was assumed for preparing cost estimates for sewer main replacements and extensions.

Description of Improvements

This section provides a brief general description of each recommended capital improvement, as well as the deficiency that each improvement will resolve. The system deficiencies were identified in more detail in **Chapter 6**.

It is intended that this GSP contain an inclusive list of recommended system improvements; however, additional projects may need to be added or removed from the list as growth occurs or conditions change. The City will evaluate the capacity of the wastewater collection system as growth occurs and as development permits are received.

Lift Station, Force Main, and Interceptor Improvements

The following includes a brief description of the proposed improvements to the lift stations, force mains, and interceptors as prompted by either the condition assessment or capacity

analyses included in **Chapter 6**. Minor improvements to these components are assumed to be included in LS00, while major improvements are detailed in LS01 and higher.

LS00 – Annual Short-Lived Asset Replacement Fund

Due to the number of lift stations within the collection system, it is not feasible to estimate minor improvements, such as in-kind replacement of mechanical and electrical equipment, at each location. For the purposes of budgeting, a fund should be established for the incremental replacement of short-lived assets at lift stations during the planning period.

LS01 – C.C. 5 and Force Main Improvements

Deficiency: The existing lift station and force main are near full capacity at the current condition.

Improvement: The existing lift station will be rehabilitated with larger pumps and the force main will be replaced and extended to bypass lift station C.C. 4. This project is being constructed in 2021.

LS02 – C.C. 1 Improvements

Deficiency: The existing lift station mechanical and electrical equipment is aging, and the lift station configuration presents operational difficulties. Structural deficiencies to the building were also noted.

Improvement: Convert the existing lift station to include three submersible sewage pumps to replace the existing wet-pit/dry-pit configuration. This project also was identified in the 2006 GSP. It is the City's intent to standardize on submersible pump-style lift stations.

LS03 – C.C. 3 Improvements

Deficiency: The existing lift station is aging and difficult to maintain. Additionally, the collection pipes for this lift station are near or below the lake level, under structures, are in-accessible, and are aging and difficult to maintain.

Improvement: Improvements are necessary to remedy deficiencies at this location. One such option may be removal of the lift station and replacement of the system with individual grinder pumps. Other options may also exist and should be further analyzed. This GSP provides a budgetary item for analysis and improvements to rectify the current deficiencies.

LS04 – Transfer Lift Station Bypass Valve Replacement

Deficiency: The buried valve allowing for bypass of the screening and grit system during maintenance work is not operable.

Improvement: Replace this valve to allow bypass to function if necessary.

LS05 – C.C. 8 Forcemain Replacement

Deficiency: The existing forcemain is aging and should be planned for rehabilitation or replacement during the planning period

Improvement: Replace or rehabilitate this forcemain and consider connecting this lift station directly to the Northshore interceptors to reduce flow to the gravity collection system along SR 150.

LS06 – C.C. 9 Replacement

Deficiency: This lift station serves a limited area and could be replaced with future extension of gravity collection piping to this location, which would reduce City lift station O&M.

Improvement: As development occurs between SR 150 and Golf Course Road, extend gravity collection system piping to the C.C. 9 location and covert the existing lift station into a gravity collection manhole. This area would flow into the C.C. 15 basin. This GSP estimates a budgetary item for a portion of the necessary gravity system extension, assuming a portion is also completed by normal collection system installation during development.

Collection System Gravity Sewer Main Improvements

The following includes a brief description of the proposed improvements to the collection system, as prompted by either the condition assessment or capacity analyses included in **Chapter 6**. Minor pipe replacements throughout the system are assumed to be included in CS00, while major pipe replacements are detailed in CS01 and higher.

CS00 – Annual Pipe Replacement Fund

For the purposes of budgeting, a fund should be established for the incremental replacement or rehabilitation of gravity collection system piping during the planning period as prompted by age, condition, or other factors. Various small pipeline replacement projects have been identified in **Appendix E** that can be included for replacement through this fund. Project priorities can be realigned as needed to remedy the most pressing minor pipeline projects.

CS01 – Golf Course Road Sewer

Deficiency: Sewer collection system piping does not currently completely extend up Golf Course Road. Sewer from Bogey Boulevard and Hillcrest Place follows an undesirable route to the collection system piping in No-See-Um Road.

Improvement: As prompted by development, sewer collection system piping will be extended up Golf Course Road in 2021.

CS02 – SR 150 Mainline near Chelan Fruit (MH K-77 and K-78)

Deficiency: The existing 21-inch collection system piping along SR 150 near Chelan Fruit discharges to a 16-inch pipe prior to flowing through the low pressure interceptor to the WWTP. At this transition, the manholes surcharge significantly.

Improvement: A portion or all of the 16-inch pipe should be upsized to at least 21-inch pipe and the transition from the existing 21-inch pipe should be realigned to avoid surcharging at current and future flows.

CS03 – SR 150 Mainline Upsize (MH A-69 to A-12)

Deficiency: The existing 8-inch and 10-inch pipes along SR 150 are aging and nearing full capacity.

Improvement: This project budgets for the full replacement of these pipes with 15-inch pipes. If improvements made throughout the system remove substantial flow from these pipes, then trenchless rehabilitation of the pipes and manholes could be considered. A remedy to these deficiencies is recommended in the near-term.

CS04 – Columbia Street Mainline Upsize (MH A-12 to C.C. 1)

Deficiency: The existing 12-inch pipes along SR 150 are aging and at least one segment appears to be at capacity.

Improvement: This project budgets for the full replacement of these pipes with 15-inch pipes. If improvements made throughout the system remove substantial flow from these pipes, then trenchless rehabilitation of the pipes and manholes could be considered. A remedy to these deficiencies is recommended in the near-term.

CS05 – Mainline C.C. 1/C.C. 2 to Transfer Lift Station (MH C-25 to Transfer Lift Station)

Deficiency: The existing 18-inch and 21-inch pipes between the C.C. 1 and C.C. 2 discharge to the Transfer Lift Station are nearing full capacity.

Improvement: This project budgets for the full replacement of these pipes with 24- to 30-inch pipes. However, once C.C. 1 and C.C. 5 are replaced, it is likely that the peak flows to this section of pipes will be somewhat mitigated by the flow pacing in the updated lift stations. The effect of these improvements should be monitored and if they mitigate loading to this section of pipe, it is likely that improvements could be delayed until the latter portion of the planning period pending periodic review of pipe condition and integrity.

CS06 – SR 97A Mainline Draining to C.C. 2 (MH E-23 to C.C. 2)

Deficiency: The existing 15-inch pipes along SR 97A draining to C.C. 2 may near full capacity during the planning period.

Improvement: This project budgets for the full replacement of these pipes with 21-inch pipe. As stated in **Chapter 6**, if the projected growth does not occur, this project may not be required during the planning period. Conversely, the need for this project could be accelerated by near-term development.

Wastewater Treatment Plant Improvements

The following includes a brief description of the proposed improvements to the WWTP, as prompted by either the condition assessment or capacity analyses included in **Chapter 6**.

WW01 – RBC Air Cup Replacement

Deficiency: The air cups that drive the rotation of the existing RBCs require replacement.

Improvement: This project will replace the air cups on the existing RBCs.

WW02 – Engineering Report

Deficiency: The existing RBCs have exceeded their design life and may need to be completely replaced during the planning period.

Improvement: The replacement of the RBCs prompts a general review of available secondary treatment options, and how each option would affect other processes within the WWTP, such as the primary clarifiers and solids handling systems. A coordinated review of these systems is necessary to analyze the life-cycle costs of each possible secondary treatment option and their ability to meet process and operational objectives.

WW03 – Standby Generator

Deficiency: The existing standby generator is undersized and does not operate reliably.

Improvement: The generator should be replaced with a larger generator capable of serving existing and future electrical loads. The new generator likely will be located outside the Blower Building in a fabricated enclosure, allowing the existing generator space in the Blower Building to be repurposed. This project consists of replacement of existing equipment as part of normal maintenance. This should be discussed with Ecology, but it is assumed that an Engineering Report specific to this project will not be required.

WW04 – Blower Building MCC Replacement

Deficiency: The existing MCC and WWTP control panel in the Blower Building have exceeded their intended life and spare parts are not readily available. Further, the dewatering room MCC is aging and installed in an undesirable location.

Improvement: A new MCC and control panel shall be installed in the Blower Building, potentially in the location of the existing generator, which will be removed. This will allow the existing MCC to remain operable while the new MCC is installed. Additionally, the new MCC should be sized to subfeed a new distribution panel in the dewatering room to allow the MCC in the dewatering room to be removed as part of the project. This project consists of replacement of existing equipment as part of normal maintenance. This should be discussed with Ecology, but it is assumed that an Engineering Report specific to this project will not be required.

WW05 – Primary Sludge Valves Replacement

Deficiency: The existing plug valves in the primary sludge pump station are aging and largely inoperable.

Improvement: Replace each valve with a new plug valve. This work may be performed as a small works project, or as part of a larger project. This project is considered maintenance and should not require an Engineering Report.

WW06 – Primary Clarifier Refurbishment

Deficiency: One primary clarifier mechanism is showing signs of corrosion, and the drive assembly is nearing the end of its intended life.

Improvement: Sandblast, replace fasteners as needed, and recoat the existing clarifier mechanism. Either refurbish (if applicable) or completely replace the drive assembly. This project is considered maintenance and should not require an Engineering Report.

WW07 – Secondary Treatment System Replacement

Deficiency: The existing RBCs have exceeded their design life and may need to be completely replaced during the planning period.

Improvement: Prior to this work, an Engineering Report should be completed to determine the best approach for a new secondary treatment system (CIP WW02). With the outcome of that analysis currently unknown, this GSP estimates the secondary treatment system improvements based on in-kind replacement of the 16 existing RBCs. If another treatment alternative looks favorable, this budgetary item can be reallocated as needed.

WW08 – Secondary Sludge Thickening

Deficiency: Currently, secondary sludge is discharged to the primary clarifiers for co-settling with primary sludge. This can reduce the concentration of sludge from the primary clarifiers, significantly affecting the solids handling system performance.

Improvement: If flow and loading remains low relative to WWTP capacity, this is not a major issue. However, it may become a larger problem in the future, and as such, mechanical thickening of the secondary sludge should be planned as part of the Engineering Report in WW02. The thickened sludge would be discharged directly to the digesters. Should the Engineering Report change the future direction of secondary treatment at the WWTP, this budgetary item may be reallocated to other work. This GSP provides a budgetary estimate for a mechanical thickener such as a rotary drum thickener in a small dedicated building for weather protection.

WW09 – Two 35-Foot Secondary Clarifier Refurbishments

Deficiency: The two small secondary clarifiers are showing signs of corrosion on the mechanism, and the drive assemblies are nearing the end of their intended lives.

Improvement: Sandblast, replace fasteners as needed, and recoat the existing clarifier mechanisms. Either refurbish (if applicable) or completely replace the drive assemblies. This project could be completed in conjunction with the recommended primary clarifier refurbishments. This project is considered maintenance and should not require an Engineering Report.

WW10 – 50-Foot Secondary Clarifier RAS/Scum Pump Improvements

Deficiency: The RAS and scum pumps installed for the large secondary clarifier do not appear to adequately pump either liquid.

Improvement: The exact scope of the necessary improvements is unknown without further analysis, but this GSP provides a budgetary item for the replacement of the pumps with larger pumps and cleaning or pigging of the RAS and scum lines. This project is considered maintenance and should not require an Engineering Report.

WW11 – Digester Mixing and Aeration System Refurbishment

Deficiency: The mixing equipment in the small digesters is beyond its intended life, and the aeration systems in all digesters are aging. Additionally, the three 20 hp blowers for the small digesters are beyond their intended life and should be planned for replacement.

Improvement: Replace the mixing system and three 20-hp blowers for the small digesters. Replace the aeration grids in all digesters. This project consists of replacement of existing equipment as part of normal maintenance. This should be discussed with Ecology, but it is assumed that an Engineering Report specific to this project will not be required.

WW12 – Dewatering System Replacement

Deficiency: The centrifuge control panel has extended its intended life and needs to be replaced. Additionally, both the centrifuge and polymer systems are aging and will exceed their intended life during the planning period.

Improvement: New dewatering and polymer makedown equipment will be installed to replace the existing systems. An Engineering Report should be completed to review applicable dewatering system options, such as centrifuges, screw presses, or other equipment. This project could be completed with CIP WW04, as that project will decommission the dewatering room MCC.

WW13 – Membrane Roof Repair (Operations, Blower, and Dewatering Buildings)

Deficiency: The existing membrane roofing system on these buildings are leaking and need to be repaired or replaced.

Improvement: The exact scope of the necessary improvements is unknown at this time, but this GSP conservatively budgets primarily for the replacement of roofing materials with some areas potentially being repaired in place. This work could be broken into multiple projects as needed.

WW14 – Enclose Sludge Bin Storage Area

Deficiency: The exterior location of the sludge bin allows for freezing of the sludge during the winter months.

Improvement: This GSP budgets for the simple enclosure of a small area of the sludge bin, allowing for insulation and heat as necessary to avoid sludge freezing. This work likely could be completed by City staff if desired.

Miscellaneous Items

The following are miscellaneous items such as planning efforts or other work that will be funded, at least in part, by the sewer utility.

M01 – General Sewer Plan Update

Improvement: For the purposes of budgeting, it is recommended that a general sewer plan update is completed on 10-year intervals.

M02 – Public Works Building

Deficiency: The aging Public Works Building will be demolished and replaced.

Improvement: The sewer utility will pay for its share of the new Public Works Building proportionate to usage.

M03 – Sewer Rate Study

Improvement: For the purposes of budgeting, it is recommended that a sewer rate study be completed on 5-year intervals.

M04 – Updated City Standards

Deficiency: The City’s standard plans and details have not been updated in nearly 20 years. Increased development pressure has prompted the need for updated and robust standards for City utility design and construction.

Improvement: Update the City’s standard plans and specifications (sewer utility portion). This improvement was underway in 2021.

M05 – Northshore Interceptor Analysis

Deficiency: The dual Northshore force mains discharge into a single low pressure interceptor routed through the City to the Transfer Lift Station. This pipe is a critical piece of infrastructure and its integrity is unknown.

Improvement: Analyze the Northshore low pressure interceptor to verify its integrity and estimate its remaining useful life, operational improvements, and any necessary rehabilitation.

M06 – Additional Heated Storage for City Maintenance Crews

Deficiency: The City lacks sufficient heated storage for maintenance vehicles and equipment.

Improvement: The sewer utility will pay for its share of the new heated storage space proportionate to usage.

Estimating Costs of Improvements

Cost estimates prepared by RH2 for projects in the CIP are considered to be Class 5 estimates based on standards established by the American Association of Cost Engineers (AACE). Class 5 estimates are described as generally being prepared with very limited information and subsequently have wide accuracy ranges. The typical accuracy range for this cost estimate class is from -20 percent to -50 percent on the low side and from +30 percent to +100 percent on the high side. Class 5 estimates are prepared for any number of strategic business planning purposes including, but not limited to, market studies, assessment of initial viability, evaluation of alternate schemes, project screening, project location studies, evaluation of resource needs and budgeting, long-range capital planning, etc.

Project costs for wastewater treatment facility and lift station improvements, planning, and miscellaneous projects were estimated based on costs of similar recently constructed projects in Eastern Washington.

Improvements to gravity collection system piping were estimated based on project unit costs (i.e., cost per foot length). The unit costs for each pipe size are shown in **Table 7-1**. The four levels of pipe installation costs shown in the table provide a range of unit costs based on relative installation difficulty and complexity. The unit costs shown in the table represent full project costs. This includes 40% for indirect costs including survey, geotechnical review, permitting, design and construction administration. Sales tax is included at 8.3% and

contingency at 30%. The unit costs do not include costs associated with easement or other land acquisition.

Table 7-1
Collection System Gravity Sewer Pipe Unit Project Costs

Main Diameter (in.)	2021 Project Cost per Linear Foot			
	Outside of Roadway	In-Roadway No Overlay	In-Roadway Low Difficulty	In-Roadway High Difficulty
8	\$365	\$465	\$520	\$565
10	\$410	\$515	\$570	\$615
12	\$455	\$560	\$615	\$665
15	\$495	\$605	\$655	\$710
18	\$535	\$645	\$695	\$750
21	\$590	\$705	\$755	\$815
24	\$645	\$760	\$810	\$875
27	\$690	\$835	\$875	\$955
30	\$730	\$910	\$940	\$1,030

Notes:

Outside of Roadway: Minimal paving; <8 feet average pipe cover; minimal dewatering, rock excavation, and traffic control.

In-Roadway No Overlay: Paving for trench patch only; <8 feet average pipe cover; minimal dewatering, rock excavation, and traffic control.

In-Roadway Low Difficulty: Paving for single lane overlay; <8 feet average pipe cover; some dewatering, rock excavation, and traffic control.

In-Roadway High Difficulty: Paving for trench patch only; paving for single lane overlay; >10 feet average pipe cover; some dewatering, rock excavation, and traffic control.

The final cost of the projects will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, and other variable factors. As a result, the final project costs likely will vary from those presented. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

Future Project Cost Adjustments

The cost estimates shown in **Table 7-1** and **7-2** are presented in 2021 dollars. Therefore, it is recommended that future costs be adjusted to account for the effects of inflation and changing construction market conditions at the actual time of project implementation. The City has standardized on using a rate of 4 percent annually to estimate project costs during anticipated future market conditions based on inflation and other factors.

Prioritizing Improvements

The system improvements were prioritized by the City by balancing the need for the improvement and available funding. As detailed in **Chapter 6**, most improvements are driven by the current condition or integrity of infrastructure, and some are driven by current or future capacity constraints. For capacity-driven improvements, prioritization was based on the

hydraulic model results provided in **Chapter 6**, which displayed the capacity utilized at the existing and 20-year conditions.

Future projects that are not identified as part of the City's CIP may become necessary. Such projects may be required to remedy an emergency or address deficiencies or growth that is unforeseen at the time of writing this GSP. The completion of such projects may require modifications to the recommended CIP to fit within the City's budget. The implementation schedule is flexible, with the intent of estimating the annual budget, with the allowance for projects to be moved or replaced within each year while generally maintaining the same financial structure. The City can reschedule, expand, or reduce the projects included in the CIP and add new projects to the CIP, as best determined by rate payers and the City Council, when new information becomes available for review and analysis.

Developer Driven-Projects

The City currently is experiencing a high level of development pressure within the UGA. Chapter 2 of the 2018 *Water System Plan* identified potential developments within the City. The overall likelihood of each development occurring, as well as the build-out timing, is difficult to predict. However, large developments can put significant pressure on portions of the collection system. For the purposes of planning, the potential development locations and relative sizes were used for estimating growth distribution within the City to identify future capacity constraints. However, the effect of each individual potential development was not analyzed in the hydraulic modeling. As such, the CIP projects identified as being capacity driven are estimated based on the projected normal growth patterns and are not assumed to be developer-driven. However, if specific developments occur that accelerate the CIP schedule or place unforeseen capacity constraints on the system, the developer should equitably compensate the City for any necessary improvements.

Recommended Capital Improvement Plan

The summarized table of recommended projects and the implementation schedule is provided in **Table 7-2**. The full CIP table with cost allocations for LCRD and LCSD is included in **Appendix G**. The City should review the CIP at least annually and reprioritize as necessary to match budget, growth, flows, and other City conditions/priorities.

Table 7-2
Proposed CIP Implementation Schedule

Estimated Total Cost by Improvement Year (Cost Multiplier starting with 3% in 2021)												
CIP No.	Description	Project Cost			2022 (Yr. 1)	2023 (Yr. 2)	2024 (Yr. 3)	2025 (Yr. 4)	2026 (Yr. 5)	2027 - 2031	2032 - 36	2037 - 40
		Indirect	Direct	Total	1.03	1.06	1.09	1.12	1.15	1.30	1.45	1.60
Lift Station, Force Main and Interceptor Improvements												
LS00	Annual Short-lived Assets Replacement (Project Cost Totalized)	\$0	\$1,710,000	\$1,710,000	\$97,850	\$100,700	\$103,550	\$106,400	\$109,250	\$123,500	\$137,750	\$152,000
LS01	CC 5 and Force Main Improvements	-	-	-								
LS02	CC 1 Improvements	\$300,000	\$1,000,000	\$1,300,000		\$159,000	\$1,253,500					
LS03	CC 3 Improvements	\$34,615	\$115,385	\$150,000			\$18,865	\$148,615				
LS04	Transfer Lift Station Bypass Valve Replacement	\$9,231	\$30,769	\$40,000					\$46,000			
LS05	CC 8 Force Main Replacement	\$46,154	\$153,846	\$200,000						\$260,000		
LS06	CC 9 Removal	\$115,385	\$384,615	\$500,000						\$650,000		
Collection System Gravity Sewer Main Improvements												
CS00	Annual Pipe Replacement Fund (Project Cost Totalized)	\$1,977,229	\$6,590,763	\$8,568,000	\$56,571	\$504,559	\$518,839	\$533,119	\$547,399	\$3,093,997	\$3,450,997	\$3,807,996
CS01	Golf Course Road Sewer	-	-	-								
CS02	SR 150 Mainline near Chelan Fruit	\$87,115	\$290,384	\$377,500		\$46,171	\$363,997					
CS03	SR 150 Mainline Upsize	\$376,846	\$1,256,153	\$1,633,000				\$211,034	\$1,661,262			
CS04	Columbia Street Mainline Upsize	\$114,692	\$382,307	\$497,000				\$64,228	\$505,601			
CS05	Mainline CC 1/CC 2 to Transfer Lift Station	\$607,384	\$2,024,613	\$2,632,000							\$720,650	
CS06	SR 97A Mainline Draining to CC 2	\$178,673	\$595,576	\$774,250								\$1,238,800
WWTP Projects												
WW01	RBC Air Cup Replacement	-	-	-								
WW02	Secondary Treatment System Engineering Report	\$150,000	\$0	\$150,000					\$172,500			
WW03	Standby Generator Replacement	\$103,846	\$346,154	\$450,000	\$53,481	\$421,961						
WW04	Blower Building MCC Replacement	\$191,538	\$638,461	\$830,000	\$98,642	\$778,284						
WW05	Primary Sludge Valves Replacement	\$11,538	\$38,462	\$50,000			\$54,500					
WW06	Primary Clarifier Refurbishment	\$53,077	\$176,923	\$230,000						\$299,000		
WW07	Secondary Treatment System Replacement	\$1,846,152	\$6,153,840	\$8,000,000								\$12,800,000
WW08	Secondary Sludge Thickening	\$235,384	\$784,615	\$1,020,000							\$1,479,000	
WW09	Two 35-ft Secondary Clarifier Refurbishments	\$80,769	\$269,231	\$350,000						\$455,000		
WW10	50-ft Sec. Clarifier RAS/Scum Pump Improvements	\$9,231	\$30,769	\$40,000			\$43,600					
WW11	Digester Mixing/Aeration System Refurbishment	\$129,231	\$430,769	\$560,000						\$728,000		
WW12	Dewatering System Replacement	\$223,846	\$746,153	\$970,000	\$115,281	\$909,561						
WW13	Membrane Roof Repair (3 Bldgs.)	\$256,154	\$853,845	\$1,110,000						\$1,443,000		
WW14	Enclose Sludge Bin Storage Area	\$9,231	\$30,769	\$40,000						\$52,000		
Miscellaneous Items												
M01	General Sewer Plan (Total for 2 in 2021 dollars)	\$400,000	\$0	\$400,000						\$260,000		\$320,000
M02	Public Works Building (sewer portion)	\$0	\$291,262	\$291,262	\$300,000							
M03	Sewer Rate Study (Total for 4 in 2021 dollars)	\$75,472	\$0	\$75,472		\$20,000				\$24,528	\$27,359	\$30,189
M04	Update City Standards	\$25,000	\$0	\$25,000								
M05	Northshore Interceptor Analysis	\$50,000	\$20,000	\$70,000	\$45,000					\$26,000		
M06	Additional Heated Storage for Maintenance Crews	\$57,692	\$192,308	\$250,000							\$362,500	
Totals		\$7,755,484	\$25,537,970	\$33,293,484	\$766,824	\$2,940,236	\$2,356,852	\$1,063,396	\$3,042,013	\$7,415,025	\$6,178,255	\$18,348,985

- Table Reference Notes:
1. The indirect and direct costs are estimated with standard factors based on project type. These are shown only for the purposes of estimating annual budget allocation.
 2. Indirect costs are reduced for projects that consist of simple in-kind equipment replacement
 3. Where applicable, project costs are set to be consistent with other planning documents.
 4. The approximate portions of total WWTP flow volumes are: 5.5% LCSD, ~30% LCRD, ~65% City with the approximation of LCSD portion of total flow at the following areas:
LCSD: ~5% of flow at Transfer Lift Station and downstream to WWTP; ~8% of flow between C.C. 2 and Transfer Lift Station; 50% of flow between LCSD and C.C. 2
 5. Allocation of LCRD and LCSD costs for individual projects is per the City's discretion and may be lower than the portion of flow allocation to allow for conservative budgeting.

8 | OPERATIONS AND MAINTENANCE

Introduction

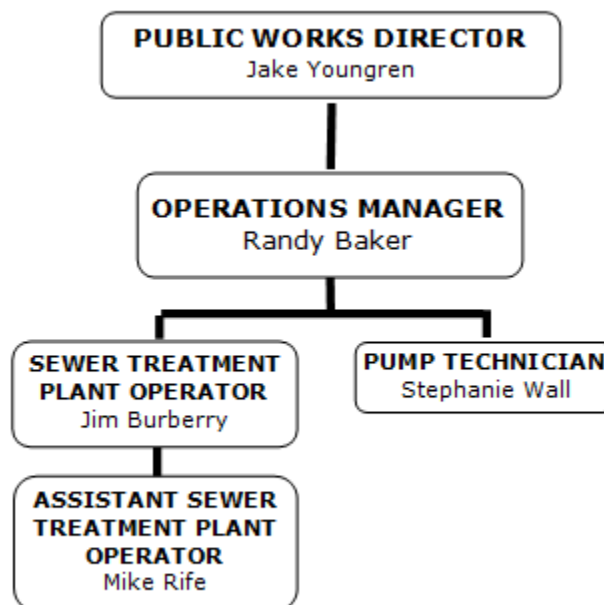
The City wastewater O&M program consists of the following elements:

- Normal operation of the wastewater collection and treatment system.
- Emergency operation of the wastewater collection and treatment system, when one or more of the components is not available for normal use due to natural or manmade events.
- A preventive maintenance program to ensure that the wastewater system is receiving maintenance in accordance with generally accepted standards.
- Daily maintenance of the wastewater collection and treatment system.
- Development review.
- Construction inspection.

City Personnel

The City's wastewater division is supervised by the Public Works Director. The general organization of the City's wastewater division staff is shown in **Figure 8-1**.

Figure 8-1
Wastewater Division Organization Chart



The wastewater system tasks performed by O&M staff include development review, inspection, testing, installation, and repair of system facilities; routine operation and preventive maintenance; water quality sampling; regulatory compliance monitoring; recordkeeping; administrative tasks;

general clerical work; and corrective or breakdown maintenance required in response to emergencies. Some of these duties may be outsourced to accommodate workload and staffing levels.

Personnel Responsibilities

The key responsibilities of City staff responsible for the operation and maintenance of the wastewater division are summarized as follows.

Public Works Director – The Public Works Director plans, organizes, and directs the functions of the Public Works Department, and oversees services in engineering, building inspection, equipment maintenance, street and storm drainage maintenance, traffic control, and water and sewer treatment.

Sewer Treatment Plant Operator – Performs maintenance and operation of the wastewater collection system, treatment system, and related work.

Certification of Personnel

Washington State Law (Chapter 173-230 WAC) requires the City’s wastewater treatment system is operated under the direct supervision of a Certified Operator. Section S5.A of the NPDES permit for the WWTP states the following:

This permitted facility must be operated by an operator certified by the state of Washington for at least a Class III plant. This operator must be in responsible charge of the day-to-day operation of the wastewater treatment plant. An operator certified for at least a Class II plant must be in charge during all regularly scheduled shifts.

Table 8-2 shows the current certifications of the City’s wastewater staff.

Table 8-2
Personnel Certification

City Wastewater Staff	Wastewater Operator Certification Level, State of Washington
Jim Burberry	III
Mike Rife	III
Stephanie Wall	I
Eric Goeke ¹	I
Troy Brooks ¹	I

1. Water Filtration Plant Operator cross trained in wastewater treatment.

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 the time and money invested in training, certification, and professional organizations are repaid many times in improved safety, skills, and confidence.

Available Equipment and Material

The sanitary sewer division of the Public Works Department shares equipment with other divisions of the Public Works Department. The City has several types of equipment available for O&M of the sewer system. If additional equipment is required for specific projects, the City will rent or contract with a local contractor for the services needed. A list of major equipment available includes the following.

- Jetter Truck
- Camera
- Backhoe
- Mini Excavator
- Vac-Tron

Additionally, the City stockpiles spare parts and chemicals in sufficient quantities for normal and emergency WWTP operations in accordance with the *WWTP O&M Manual*.

9 | Financial Summary

Introduction

The City intends to complete rate studies for the sewer utility on 5-year intervals in conjunction with the water utility rate studies. The next scheduled study will occur in 2023. Due to this impending rate study, this chapter focuses on providing a brief summary of financial planning in order to complete near-term capital projects within the existing rate structure, with the understanding that rates and connection fees will be analyzed and updated as necessary in 2023 to support the full CIP for the planning period.

Sewer Capital Fund History

The City maintains the Sewer Capital Fund for the purpose of funding capital improvements for the sewer utility. The historical inflow, outflow, and year-end balance for this fund over the past 5 years is included in **Table 9-1**.

Table 9-1
5-Year History of Sewer Capital Fund

Year	2016	2017	2018	2019	2020
Cash on Hand Beginning of Year	\$2,649,665	\$978,756	\$1,687,685	\$1,920,595	\$1,294,752
Transfer In - Rates Revenue	\$700,000	\$700,000	\$700,000	\$500,000	\$928,487
Other Revenues (GFC's and District Payments), Assessments	\$462,975	\$1,464,673	\$578,184	\$554,516	\$1,319,838
Revenue Bond Issue	-	-	-	-	\$2,530,000
Use of Cash - Debt Service	(\$657,699)	(\$654,527)	(\$651,356)	(\$592,789)	(\$657,082)
Use of Cash - Projects	(\$2,176,185)	(\$801,217)	(\$393,918)	(\$1,087,570)	(\$1,161,647)
Unobligated cash on Hand at year end	\$978,756	\$1,687,685	\$1,920,595	\$1,294,752	\$4,254,349

Funds are transferred into the Sewer Capital Fund from rate revenue, revenue bonds, and other sources. Monthly sewer service charges, from the City as well as from LCRD and LCSD, are the primary source of ongoing revenue. Outflow from the Sewer Capital Fund goes to existing debt service and payments for capital projects. The remaining balance for the Sewer Capital Fund constitutes unobligated cash in the fund at year end. As shown in **Table 9-1**, the year-end unobligated cash on hand balance has been generally maintained above \$1M over the last 5 years, with a minor exception in 2016.

Current Rates and Charges

The City Council has authority to set rates and charges for the sewer utility. The monthly sewer service rate is a flat rate per dwelling unit for sewer service. Resolution 2021-1386 includes tables for estimating ERUs for non-residential customers. Some commercial and industrial customers pay based on metered potable water consumption. The City Council adopted the rate ordinance shown in **Figure 9-1** through Resolution 2021-1386 in 2021.

Figure 9-1
Monthly Sewer Rates, Effective January 2021

Monthly Sewer Rates	2019	2020	2021	2022	2023
Fixed Charge per ERU:					
Monthly rate per ERU	\$43.46	\$47.15	\$49.51	\$51.99	\$54.59

These rates are inclusive of the City Utility Tax of 9.5%

Source: Resolution 2021-1386

The next sewer utility rate study is scheduled for 2023. The recommendations from this study will be used to establish a new rate ordinance if necessary.

Sewer Rate Hardship

The current estimated median household income (MHI) for the City of Chelan is \$51,979, based on data from the U.S Census Bureau. A sewer rate of 2 percent of MHI is a typically accepted minimum threshold for rate hardship. Ecology and other agencies evaluate hardship created by sewer rates in order to rank capital projects for potential grant funding. A monthly sewer rate of \$86.63 per ERU would equate to 2 percent of the current estimated MHI for the City. The current monthly sewer rate is significantly below this level, and future rate adjustments are unlikely to cause rates to exceed this threshold. As such, the City's rate structure does not meet the minimum threshold for rate hardship.

Sewer General Facilities Charges

Sewer general facilities charges, or connection fees, are collected for connections to the system for sewer services for redevelopment or change in use. These charges are for the right to connect and make use of the system. All connections must obtain a sewer permit and pay the associated inspection and connection fees. Effective January 26, 2021, the sewer general facilities charge was \$5,531 for a new single-family residence, with an additional charge assessed proportional to increased usage above 1 ERU. An additional \$1,970 is charged for properties within the Lord Acres Sewer Benefit Area. Connection charges for non-residential connections are charged at \$12,895 per ERU as defined in City Code.

5-Year Capital Financing Plan

Chapter 7 identifies approximately \$33.3 million (2021 dollars) in recommended capital improvements for the sewer system during the planning period. The 5-year improvements were prioritized to align with funds available through the Sewer Capital Fund. The 5-year capital improvement projects and associated total project costs (2021) are listed in **Table 9-2**.

Table 9-2
5-Year CIP, 2022-2026

CIP No.	Description	Total Project Cost (2021 Dollars)		
		Indirect	Direct	Total
Lift Station, Force Main and Interceptor Improvements				
LS00	Annual Short-lived Assets Replacement (20-year Total)	\$0	\$1,710,000	\$1,710,000
LS02	CC 1 Improvements	\$300,000	\$1,000,000	\$1,300,000
LS03	CC 3 Improvements	\$34,615	\$115,385	\$150,000
LS04	Transfer Lift Station Bypass Valve Replacement	\$9,231	\$30,769	\$40,000
Collection System Gravity Sewer Main Improvements				
CS00	Annual Pipe Replacement Fund (20-year Total)	\$1,977,229	\$6,590,763	\$8,568,000
CS02	SR 150 Mainline near Chelan Fruit	\$87,115	\$290,384	\$377,500
CS03	SR 150 Mainline Upsize	\$376,846	\$1,256,153	\$1,633,000
CS04	Columbia Street Mainline Upsize	\$114,692	\$382,307	\$497,000
WWTP Projects				
WW02	Secondary Treatment System Engineering Report	\$150,000	\$0	\$150,000
WW03	Standby Generator Replacement	\$103,846	\$346,154	\$450,000
WW04	Blower Building MCC Replacement	\$191,538	\$638,461	\$830,000
WW05	Primary Sludge Valves Replacement	\$11,538	\$38,462	\$50,000
WW10	Primary Clarifier Refurbishment	\$9,231	\$30,769	\$40,000
WW12	50-ft Sec. Clarifier RAS/Scum Pump Improvements	\$223,846	\$746,153	\$970,000
Miscellaneous Items				
M02	Public Works Building (sewer portion)	\$0	\$291,262	\$291,262
M03	Sewer Rate Study (Total for 4 in 2021 dollars)	\$75,472	\$0	\$75,472
M05	Northshore Interceptor Analysis	\$50,000	\$20,000	\$70,000

*Totals are rounded up to nearest \$100.

After applying construction cost escalation, the totalized cost for the 5-year CIP is \$10.2 million for 2022 through 2026. **Table 9-3** displays the prioritized projects and associated costs for the 5-year CIP.

Table 9-3
5-Year CIP Prioritization, 2022-2026

CIP No.	Estimated Total Cost by Improvement Year (Cost Multiplier starting with 3% in 2021)				
	2022 (Yr. 1)	2023 (Yr. 2)	2024 (Yr. 3)	2025 (Yr. 4)	2026 (Yr. 5)
	1.03	1.06	1.09	1.12	1.15
Lift Station, Force Main and Interceptor Improvements					
LS00	\$97,850	\$100,700	\$103,550	\$106,400	\$109,250
LS02		\$159,000	\$1,253,500		
LS03			\$18,865	\$148,615	
LS04					\$46,000
Collection System Gravity Sewer Main Improvements					
CS00	\$56,571	\$504,559	\$518,839	\$533,119	\$547,399
CS02		\$46,171	\$363,997		
CS03				\$211,034	\$1,661,262
CS04				\$64,228	\$505,601
WWTP Projects					
WW02					\$172,500
WW03	\$53,481	\$421,961			
WW04	\$98,642	\$778,284			
WW05			\$54,500		
WW10			\$43,600		
WW12	\$115,281	\$909,561			
Miscellaneous Items					
M02	\$300,000				
M03		\$20,000			
M05	\$45,000				
Totals	\$766,900	\$2,940,300	\$2,356,900	\$1,063,400	\$3,042,100
5-year Total	\$10,169,600				

*Totals are rounded up to nearest \$100.

A portion of the capital improvement costs will be borne by LCRD and LCSD. The City's portion of the total capital improvement costs (2021 dollars) is estimated by year for the 5-year CIP in **Table 9-4**.

Table 9-4
City Portion of Totalized Project Costs for 5-Year CIP, 2022-2026

			Estimated Total Cost by Improvement Year (Cost Multiplier starting with 3% in 2021)				
CIP No.	LCSD Portion	LCRD Portion	2022 (Yr. 1)	2023 (Yr. 2)	2024 (Yr. 3)	2025 (Yr. 4)	2026 (Yr. 5)
			1.03	1.06	1.09	1.12	1.15
Lift Station, Force Main and Interceptor Improvements							
LS00	0%	0%	\$97,850	\$100,700	\$103,550	\$106,400	\$109,250
LS02	0%	0%		\$159,000	\$1,253,500		
LS03	0%	0%			\$18,865	\$148,615	
LS04	5%	30%					\$29,900
Collection System Gravity Sewer Main Improvements							
CS00	0%	5%	\$53,742	\$479,332	\$492,898	\$506,463	\$520,029
CS02	5%	30%		\$30,011	\$236,598		
CS03	0%	0%				\$211,034	\$1,661,262
CS04	0%	0%				\$64,228	\$505,601
WWTP Projects							
WW02	5%	30%					\$112,125
WW03	5%	30%	\$34,762	\$274,275			
WW04	5%	30%	\$64,117	\$505,884			
WW05	5%	30%			\$35,425		
WW10	5%	30%			\$28,340		
WW12	5%	30%	\$74,932	\$591,214			
Miscellaneous Items							
M02	0%	0%	\$300,000				
M03	0%	0%		\$20,000			
M05	0%	50%	\$22,500				
Totals			\$648,000	\$2,160,500	\$2,169,200	\$1,036,800	\$2,938,200
5-year Total							\$8,952,700

*Totals are rounded up to nearest \$100.

Table 9-5 summarizes the City's cash flow projections for the Sewer Capital Fund based on the 5-year CIP.

Table 9-5
Cash Flow Projections for Sewer Capital Fund 2022-2026

Year	2022	2023	2024	2025	2026	2027
Cash on Hand Beginning of Year	\$1,896,916	\$2,169,943	\$1,109,770	\$1,041,604	\$1,065,285	\$2,259,875
Transfer In - Rates Revenue	\$1,035,794	\$1,240,254	\$1,301,635	\$1,366,462	\$1,434,924	\$1,507,220
Other Revenues (GFC, Assessments, Int)	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
GFC Adjustment (for 2021)	\$200,000	-	-	-	-	-
District Project Reimbursements	\$22,500	\$857,170	\$203,754	\$26,574	\$106,921	-
Revenue Bond Issue	-	-	\$1,000,000	-	\$3,000,000	-
Use of Cash - Debt Service	(\$518,442)	(\$517,359)	(\$516,703)	(\$516,016)	(\$515,298)	(\$514,099)
Use of Cash - Revenue Bonds Projected	-	-	-	(\$89,941)	(\$89,941)	(\$449,705)
Use of Cash - Projects	(\$766,825)	(\$2,940,239)	(\$2,356,853)	(\$1,063,397)	(\$3,042,015)	(\$1,349,567)
Unobligated cash on Hand at year end	\$2,169,943	\$1,109,770	\$1,041,604	\$1,065,285	\$2,259,875	\$1,753,724

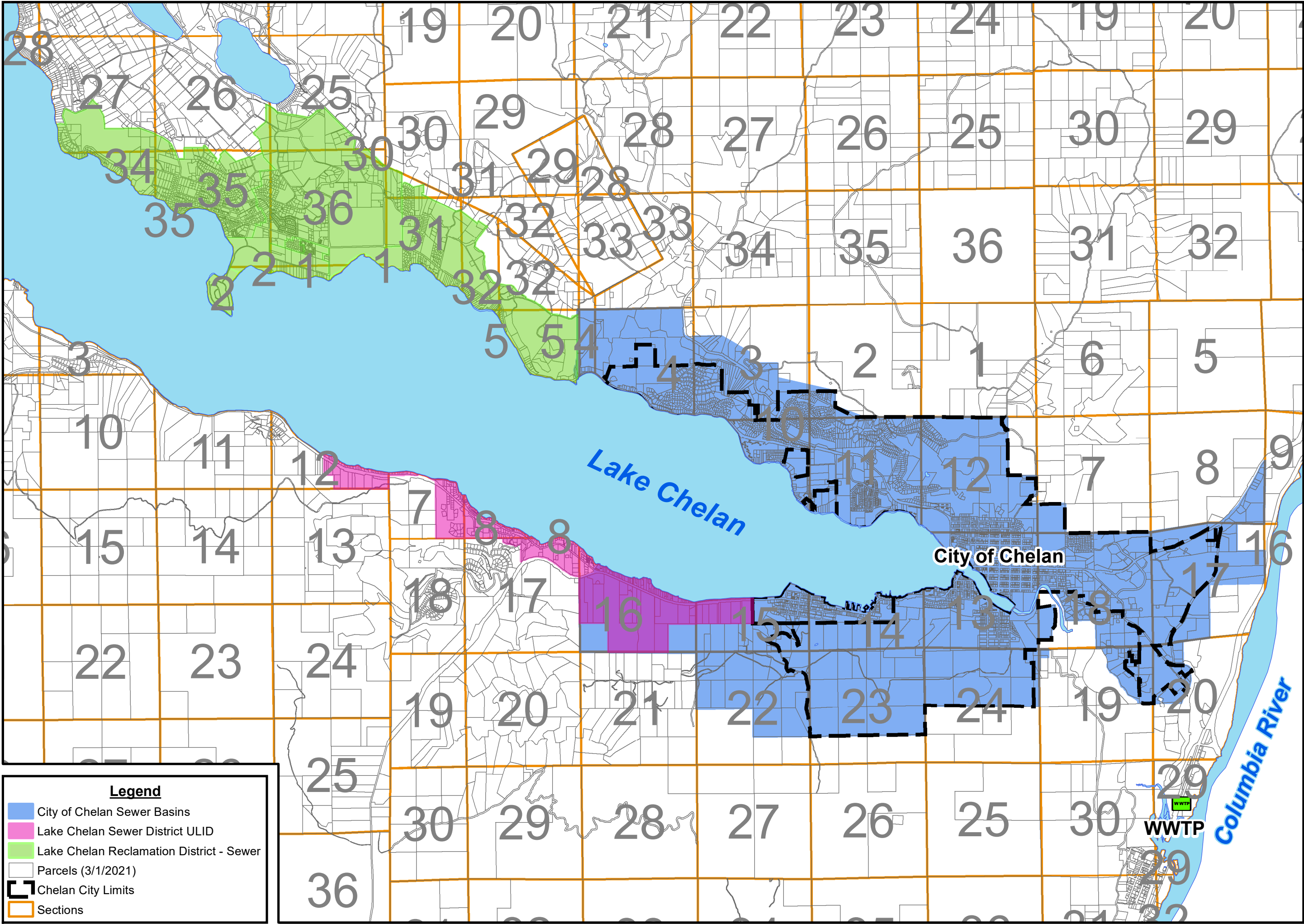
Summary

The cash flow projections provided in this chapter demonstrate that the Sewer Capital Fund will be able to support the 5-year CIP, as established by this GSP, without an immediate need to change rates or connection fees. In 2023, the City will utilize a financial consultant to perform a rate study that will include an analysis of the CIP projects remaining for completion during the planning period. At that time, potential changes to rates and connection fees will be evaluated.

APPENDICES

APPENDIX A

FIGURES



Legend

- City of Chelan Sewer Basins
- Lake Chelan Sewer District ULID
- Lake Chelan Reclamation District - Sewer
- Parcels (3/1/2021)
- Chelan City Limits
- Sections

This map is a graphic representation derived from the City of Chelan Geographic Information System. It was designed and intended for City of Chelan use only; it is not guaranteed to survey accuracy. This map is based on the best information available on the date shown on this map.

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Vicinity Map



Figure A-1
Chelan Sewer System Vicinity Map
City of Chelan

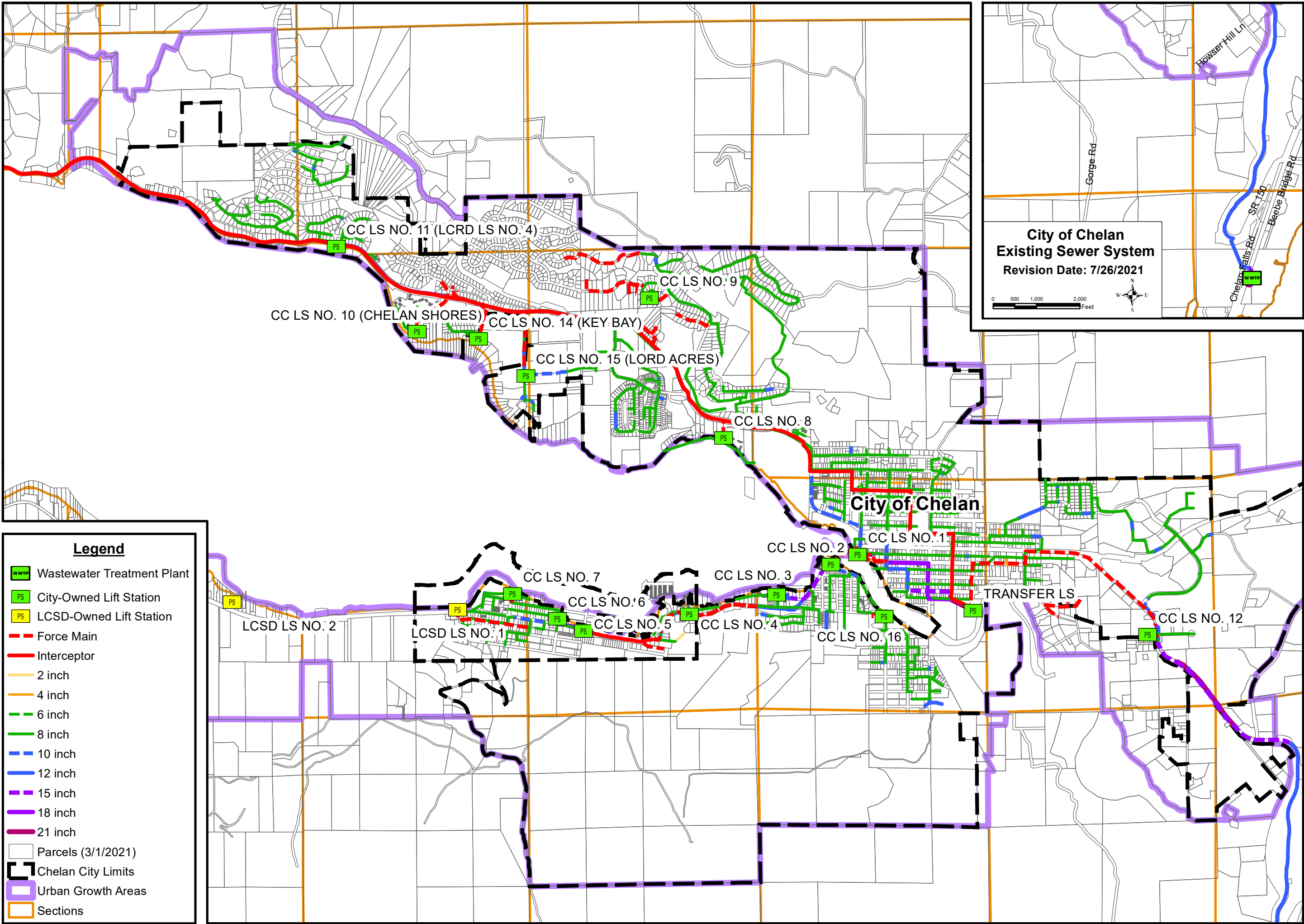


1 inch = 4,000 feet
0 1,000 2,000 4,000 Feet
DRAWING IS FULL SCALE
WHEN BAR MEASURES 1"



PRELIMINARY

J:\DATA\CH20-0007\2020 GENERAL SERVICES - SEWER\20007.10 GENERAL SEWER PLAN\GIS\CHELANSEWER_VICINITY 11X17.MXD BY: CZACHOW PLOT DATE: JUL 26, 2021



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Vicinity Map



Figure A-2
Existing Sewer System Overview
City of Chelan



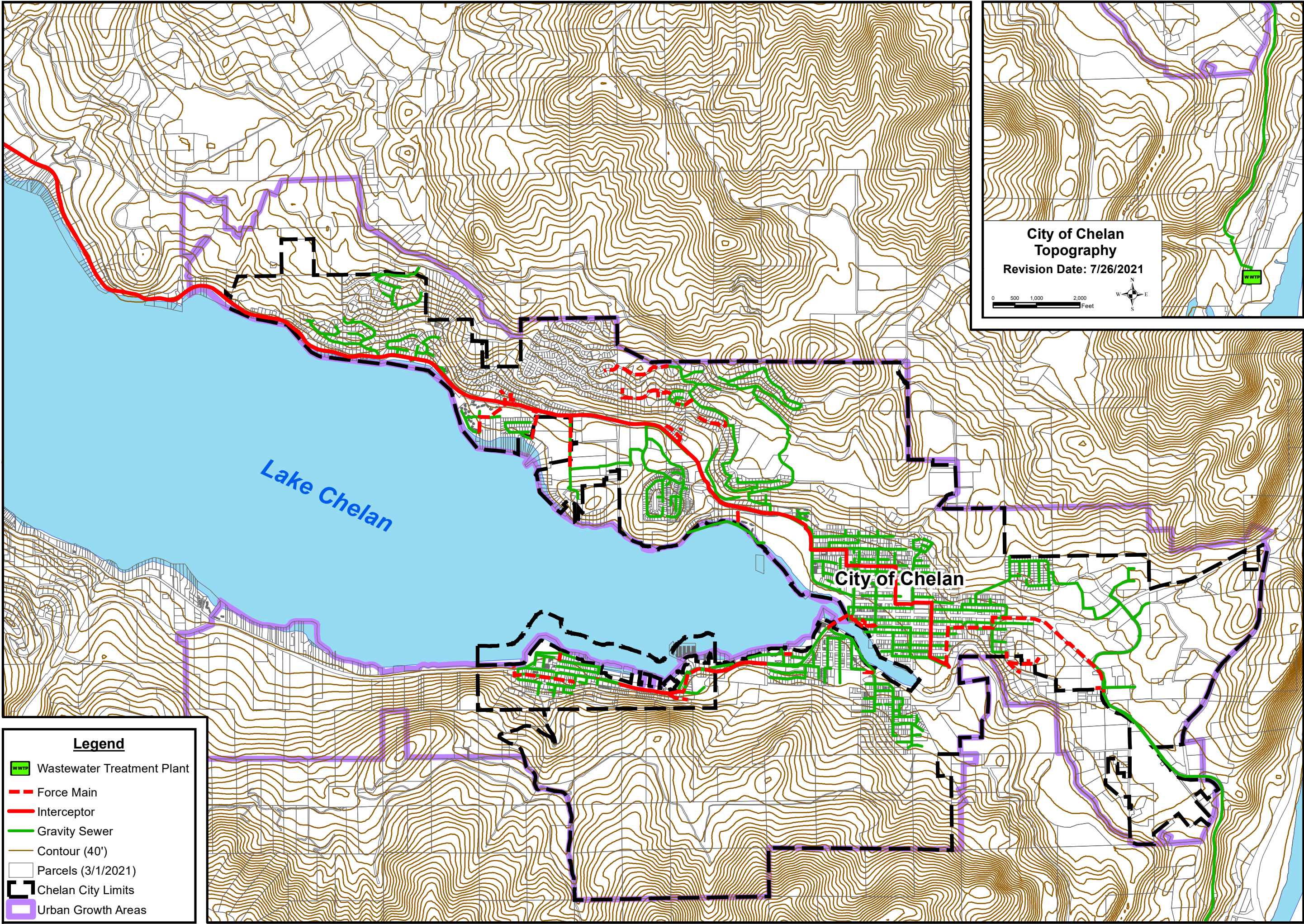
1 inch = 2,000 feet

Scale: 0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 1"



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Legend

- Wastewater Treatment Plant
- Force Main
- Interceptor
- Gravity Sewer
- Contour (40')
- Parcels (3/1/2021)
- Chelan City Limits
- Urban Growth Areas

**City of Chelan
Topography**
Revision Date: 7/26/2021

0 500 1,000 2,000 Feet

N
W E
S

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Vicinity Map

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**Figure A-3
Topography
City of Chelan**

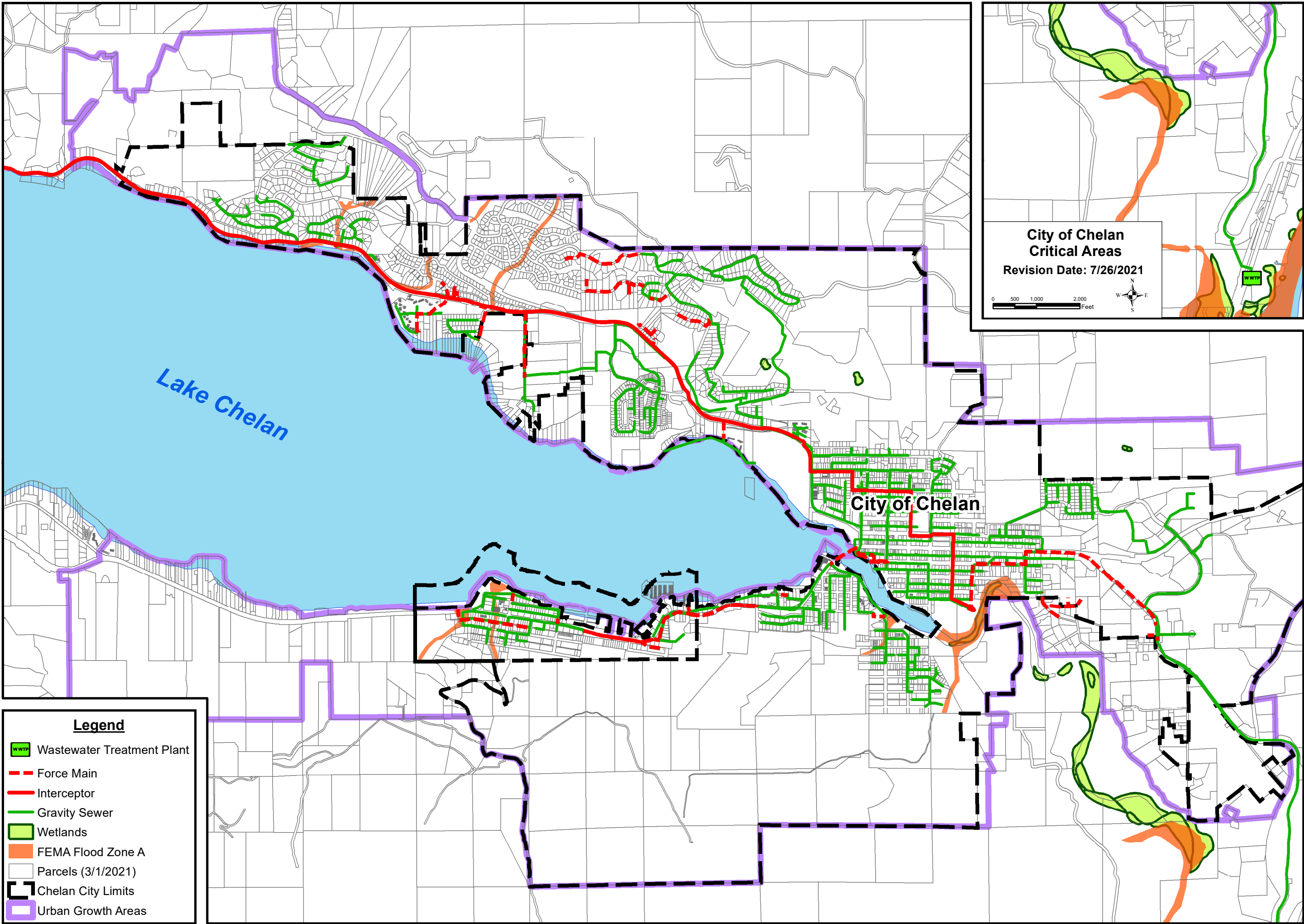
1 inch = 2,372 feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 1"

RH2

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Vicinity Map

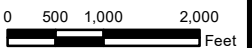


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Figure A-4
Critical Areas
City of Chelan



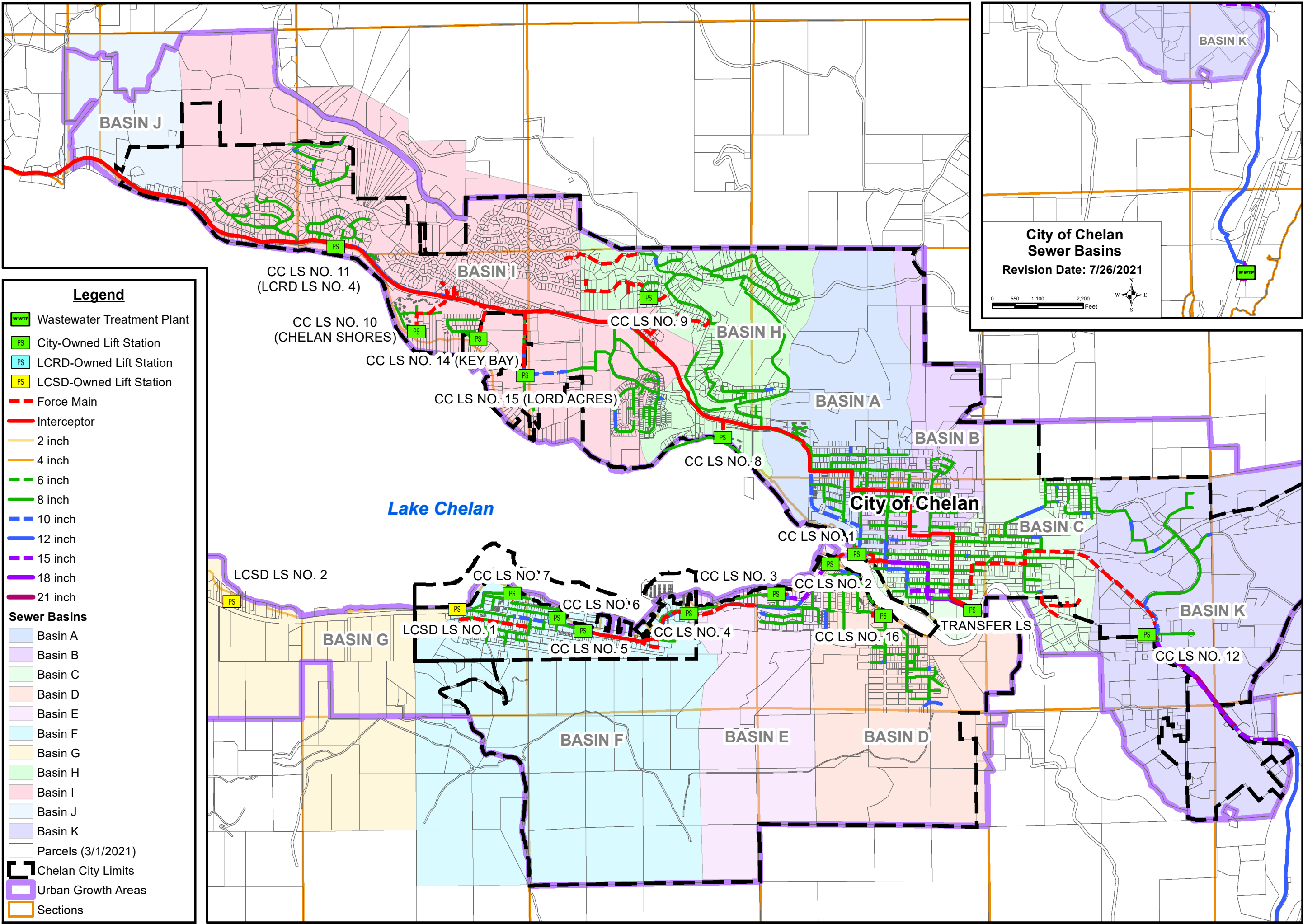
1 inch = 2,000 feet



DRAWING IS FULL SCALE
WHEN BAR MEASURES 1"



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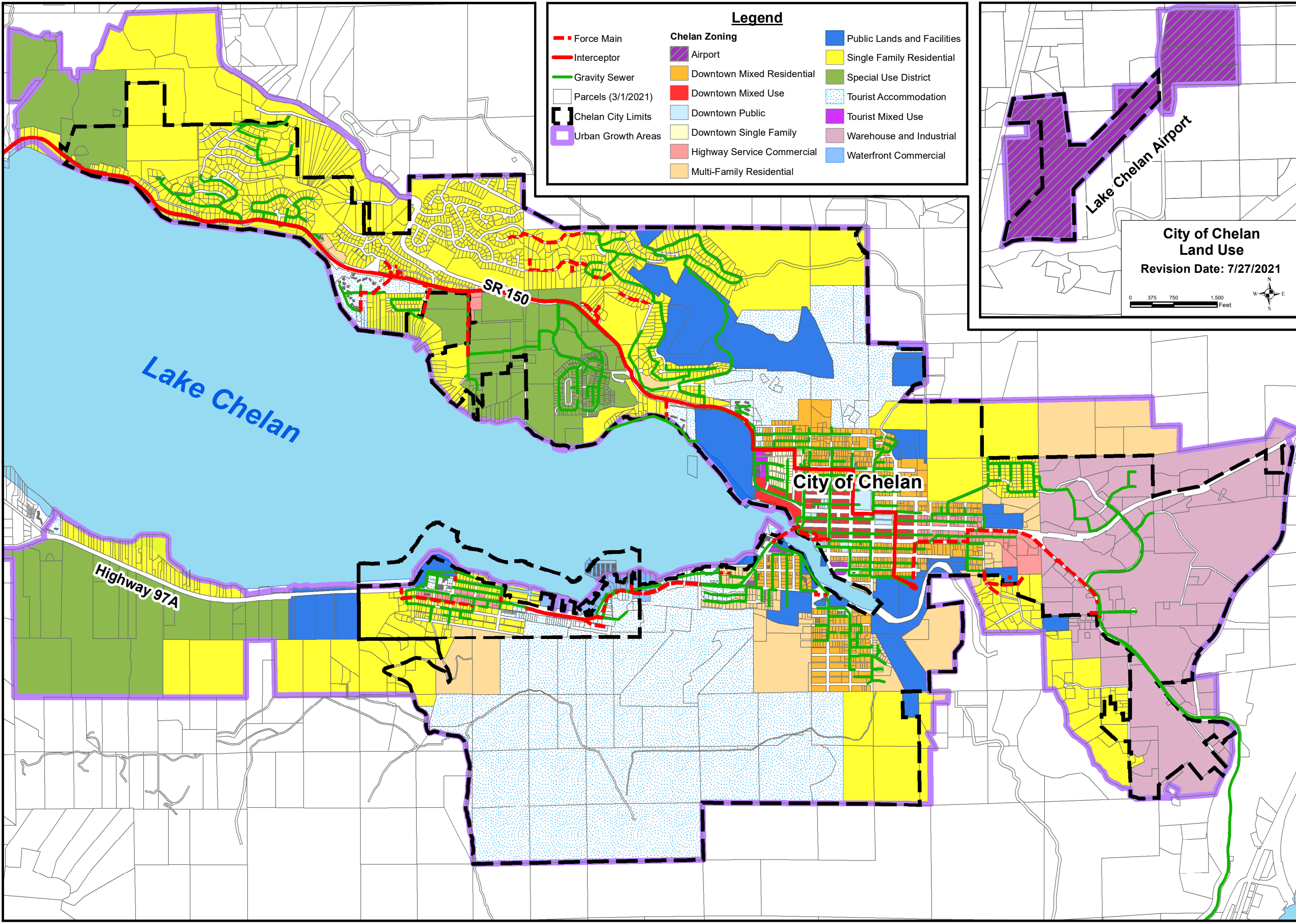
Figure A-5
Sewer Basins
City of Chelan



1 inch = 2,000 feet
0 500 1,000 2,000 Feet
DRAWING IS FULL SCALE WHEN BAR MEASURES 1"



J:\DATA\CH20-0007\2020 GENERAL SERVICES - SEWER\200007.10 GENERAL SEWER PLAN\GIS\CHELANSEWER_SEWER BASINS 11X17.MXD BY: CZACHOW PLOT DATE: JUL 26, 2021



Legend

Force Main	Chelan Zoning	Public Lands and Facilities
Interceptor	Airport	Single Family Residential
Gravity Sewer	Downtown Mixed Residential	Special Use District
Parcels (3/1/2021)	Downtown Mixed Use	Tourist Accommodation
Chelan City Limits	Downtown Public	Tourist Mixed Use
Urban Growth Areas	Downtown Single Family	Warehouse and Industrial
	Highway Service Commercial	Waterfront Commercial
	Multi-Family Residential	

Vicinity Map

City of Chelan Land Use
Revision Date: 7/27/2021

Scale: 0 375 750 1,500 Feet

North Arrow

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Vicinity Map

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Figure A-6
Land Use
City of Chelan

CITY OF CHELAN

1 inch = 2,000 feet

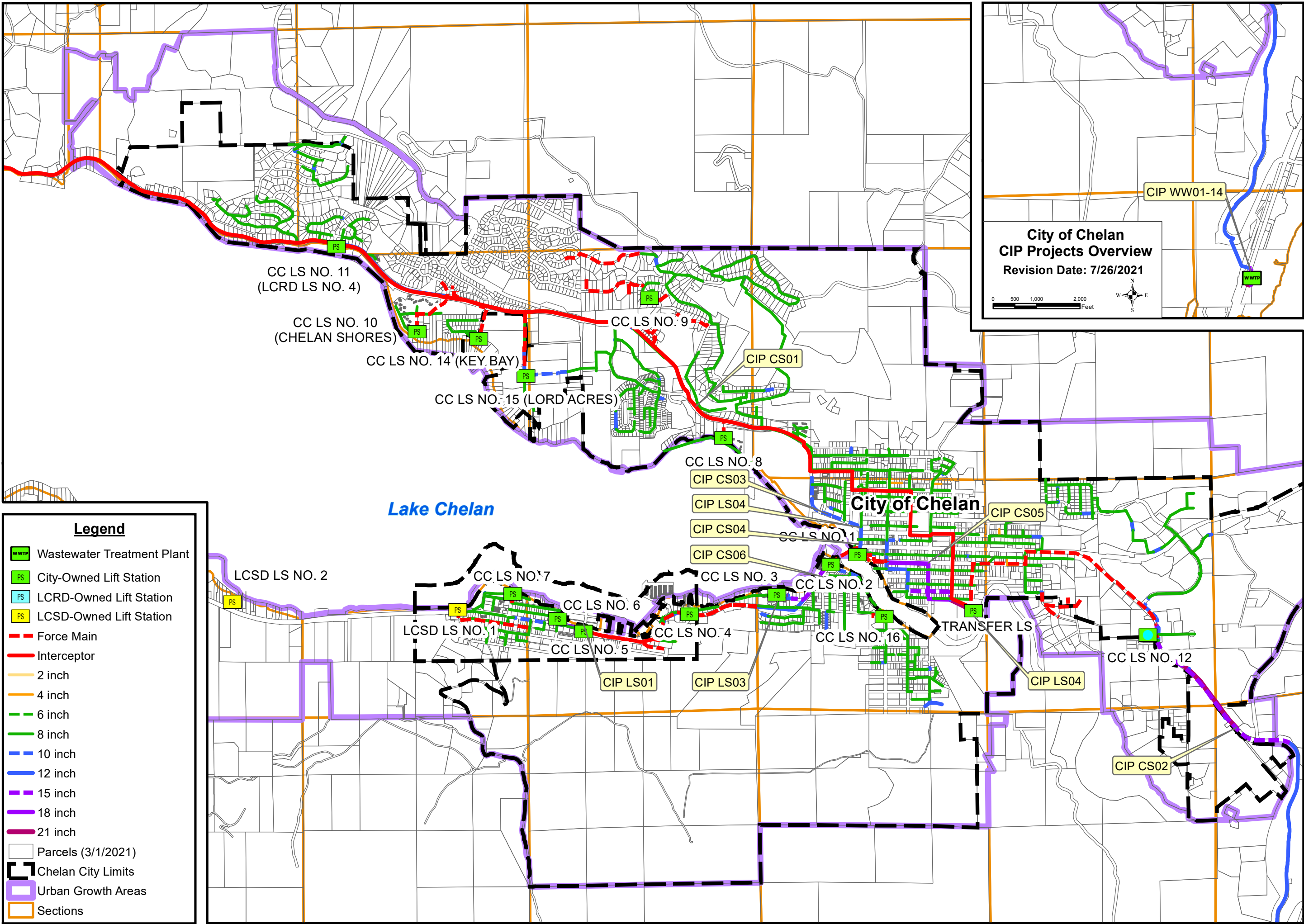
0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 1"

RH2

NORTH

J:\DATA\CH20-0007\2020 GENERAL SERVICES - SEWER\200007.10 GENERAL SEWER PLAN\GIS\CHELANSEWER_LAND USE 11X17.MXD BY: CZACHOW PLOT DATE: JUL 27, 2021



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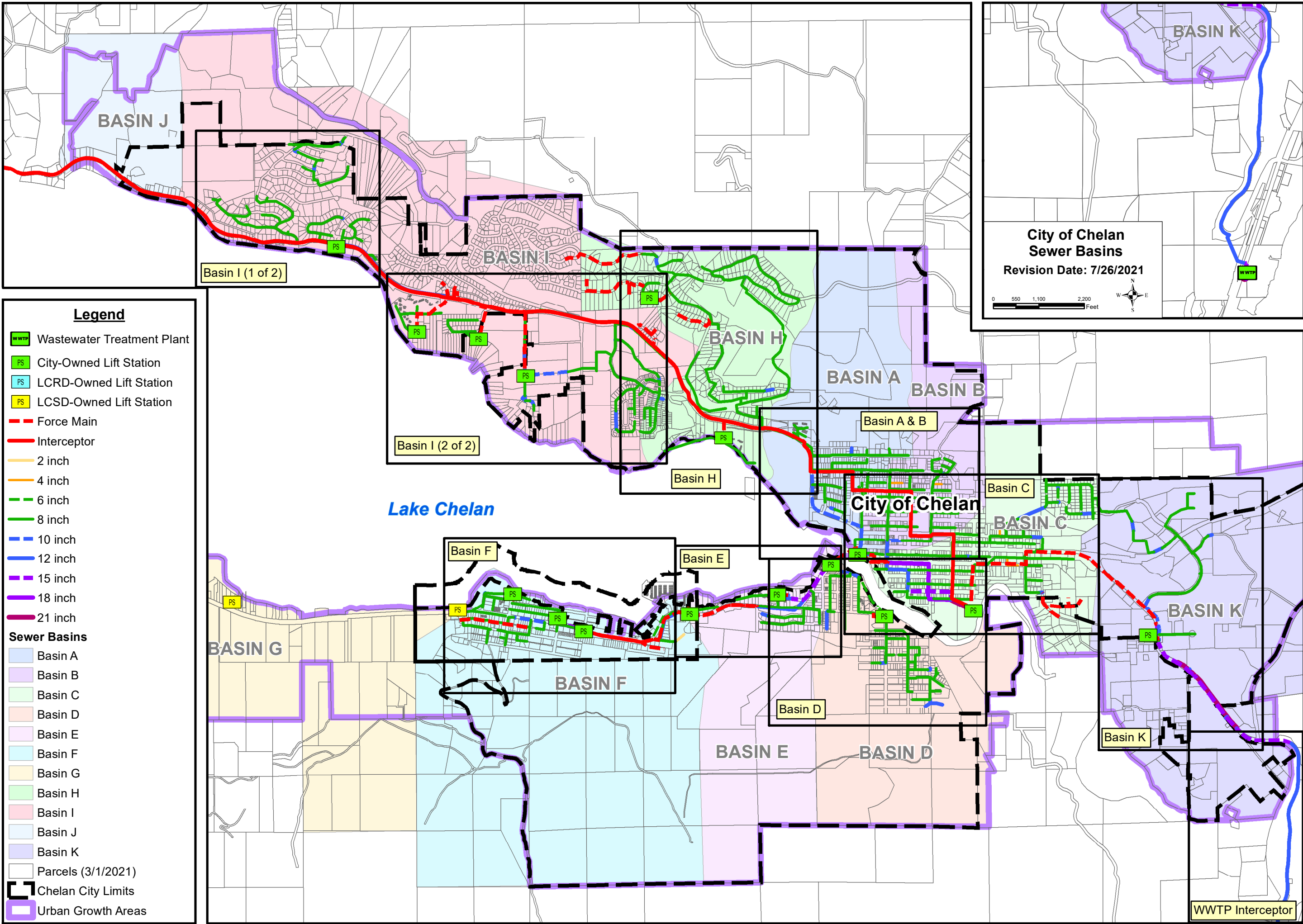
Figure A-7
CIP Projects Overview
City of Chelan



1 inch = 2,000 feet
0 500 1,000 2,000 Feet
DRAWING IS FULL SCALE WHEN BAR MEASURES 1"



J:\DATA\CH20-0007\2020 GENERAL SERVICES - SEWER\200007.10 GENERAL SEWER PLAN\GIS\CHELANSEWER_CIP PROJECTS 11X17.MXD BY: CZACHOW PLOT DATE: JUL 26, 2021



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Vicinity Map



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Figure B-1
Sewer Basins Inset Map
City of Chelan



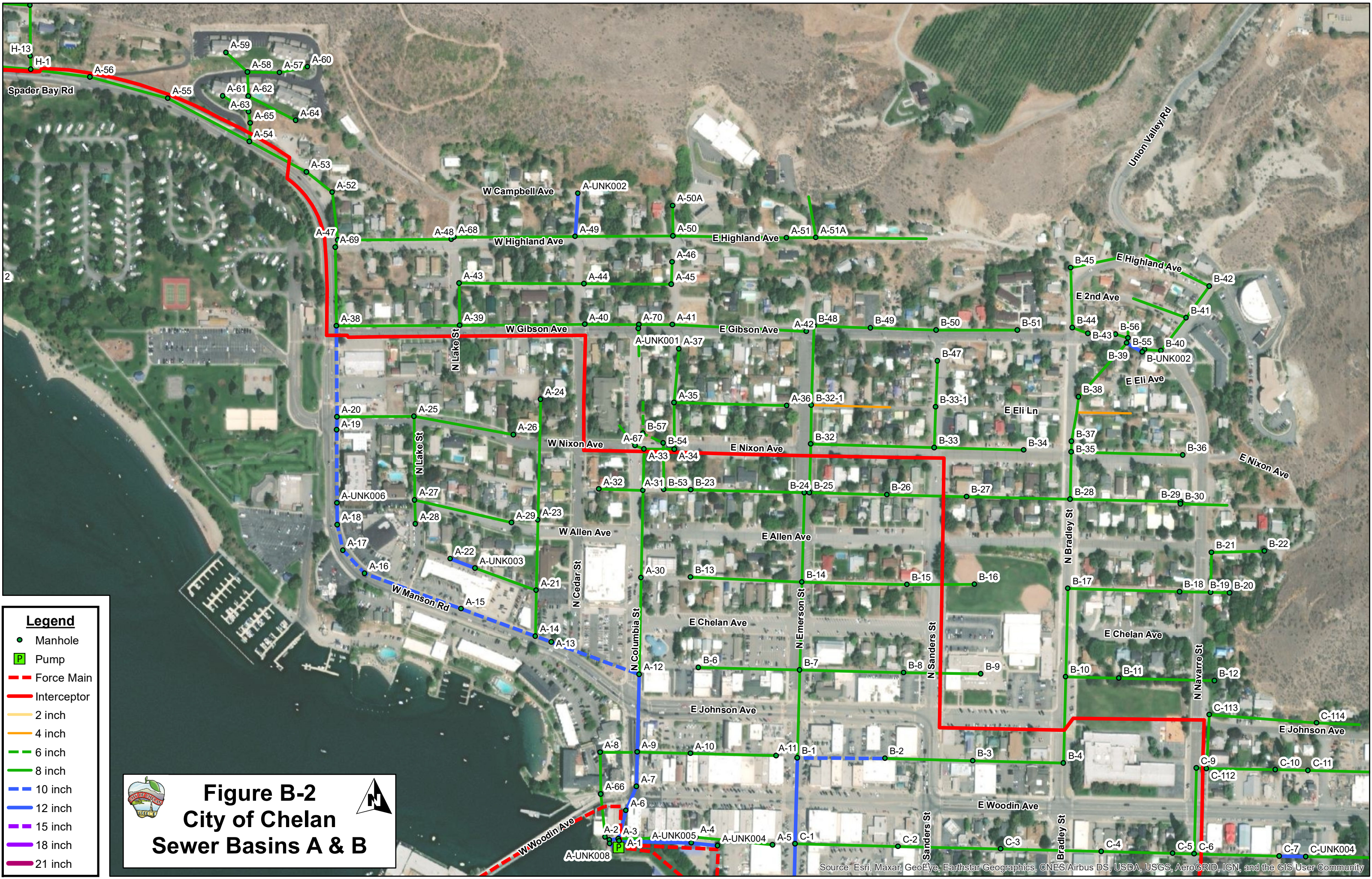
1 inch = 2,000 feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 1"



J:\DATA\CH20-0007\2020 GENERAL SERVICES - SEWER\200007.10 GENERAL SEWER PLAN\GIS\CHELANSEWER_SEWER BASINS INSET MAP 11X17.MXD BY: CZACHOW PLOT DATE: JUL 26, 2021



Legend

- Manhole
- Pump
- Force Main
- Interceptor
- 2 inch
- 4 inch
- 6 inch
- 8 inch
- 10 inch
- 12 inch
- 15 inch
- 18 inch
- 21 inch



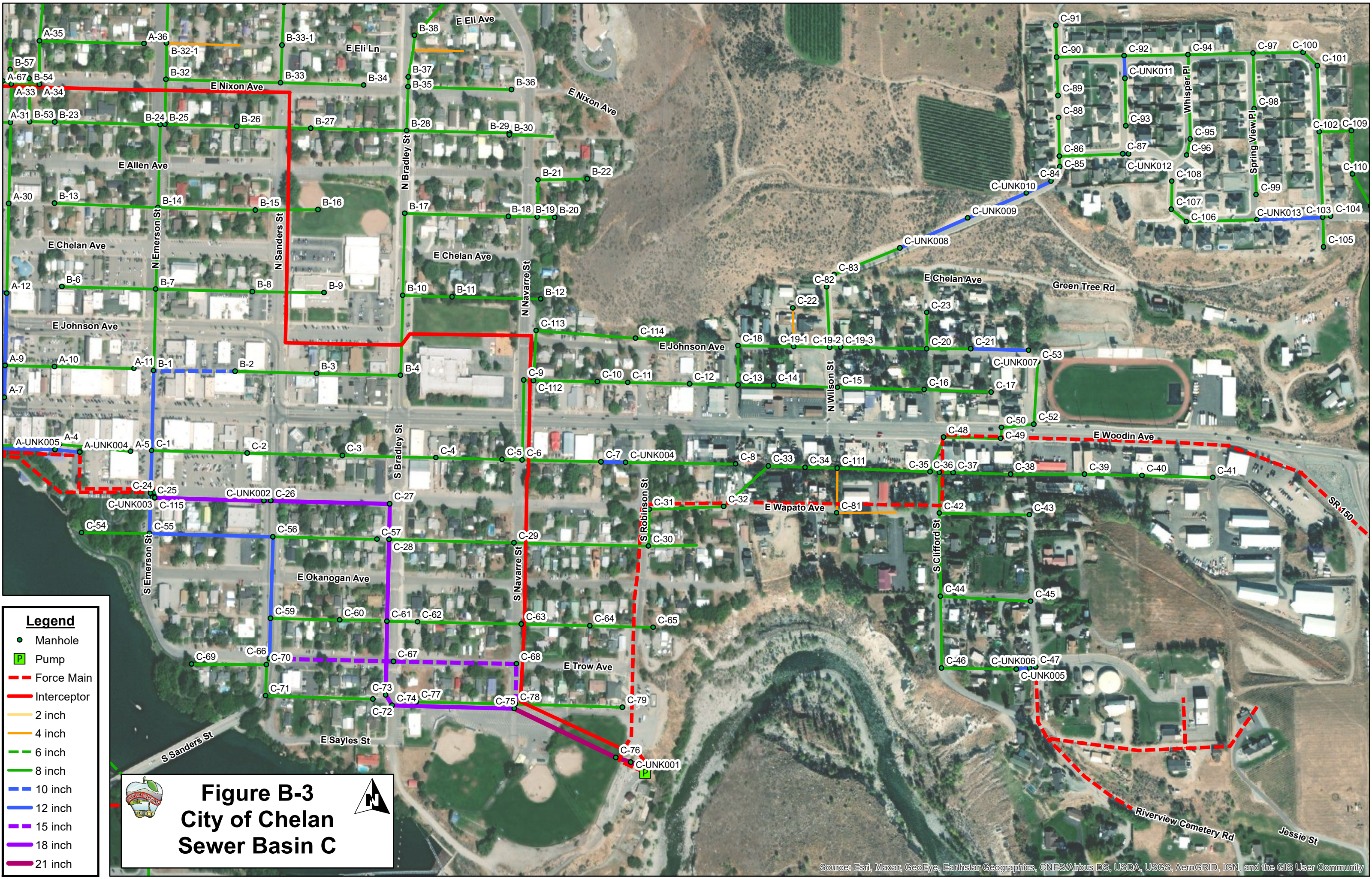


Figure B-2
City of Chelan
Sewer Basins A & B



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- Manhole
- Pump
- Force Main
- Interceptor
- 2 inch
- 4 inch
- 6 inch
- 8 inch
- 10 inch
- 12 inch
- 15 inch
- 18 inch
- 21 inch



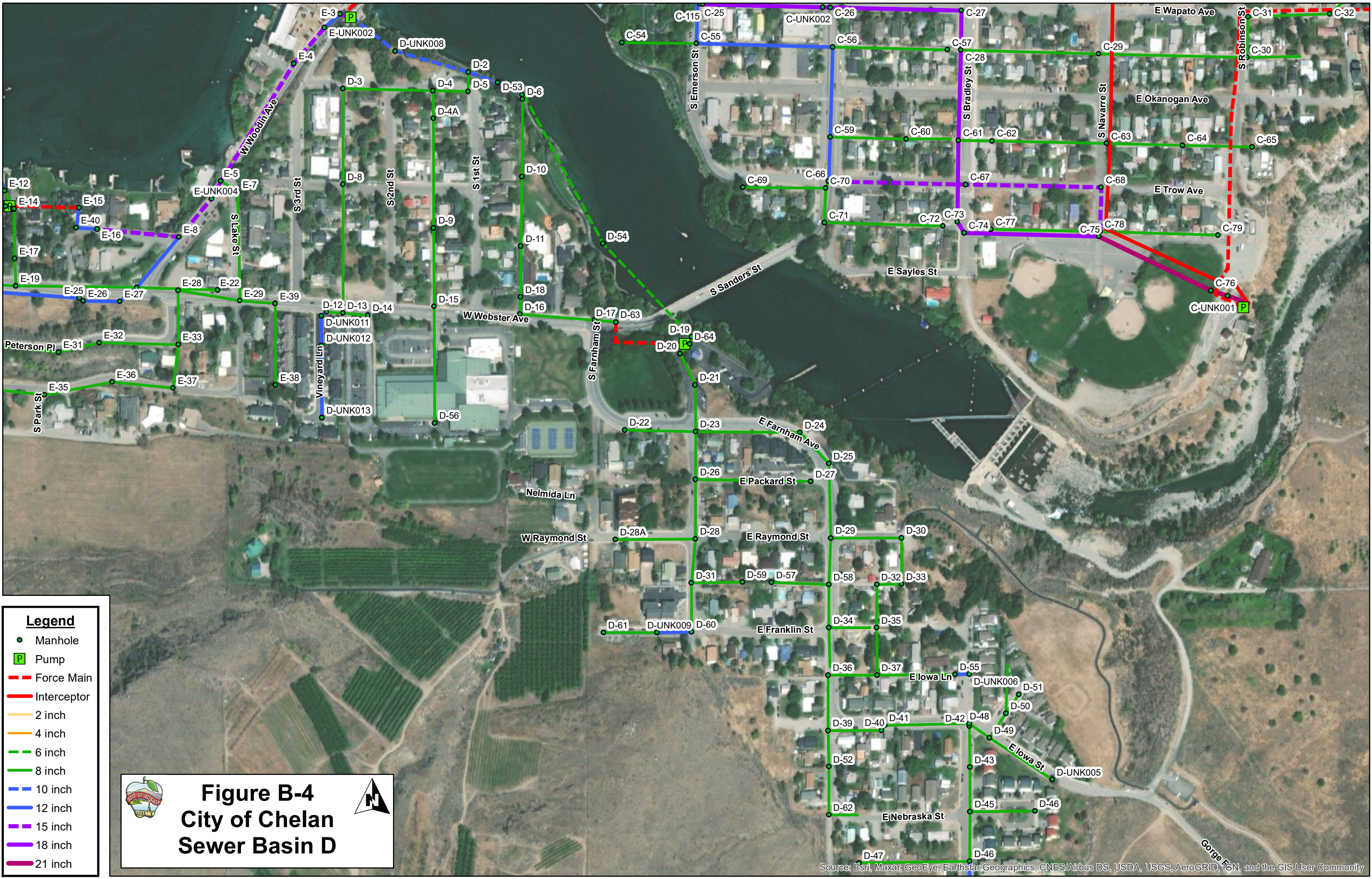


Figure B-3
City of Chelan
Sewer Basin C







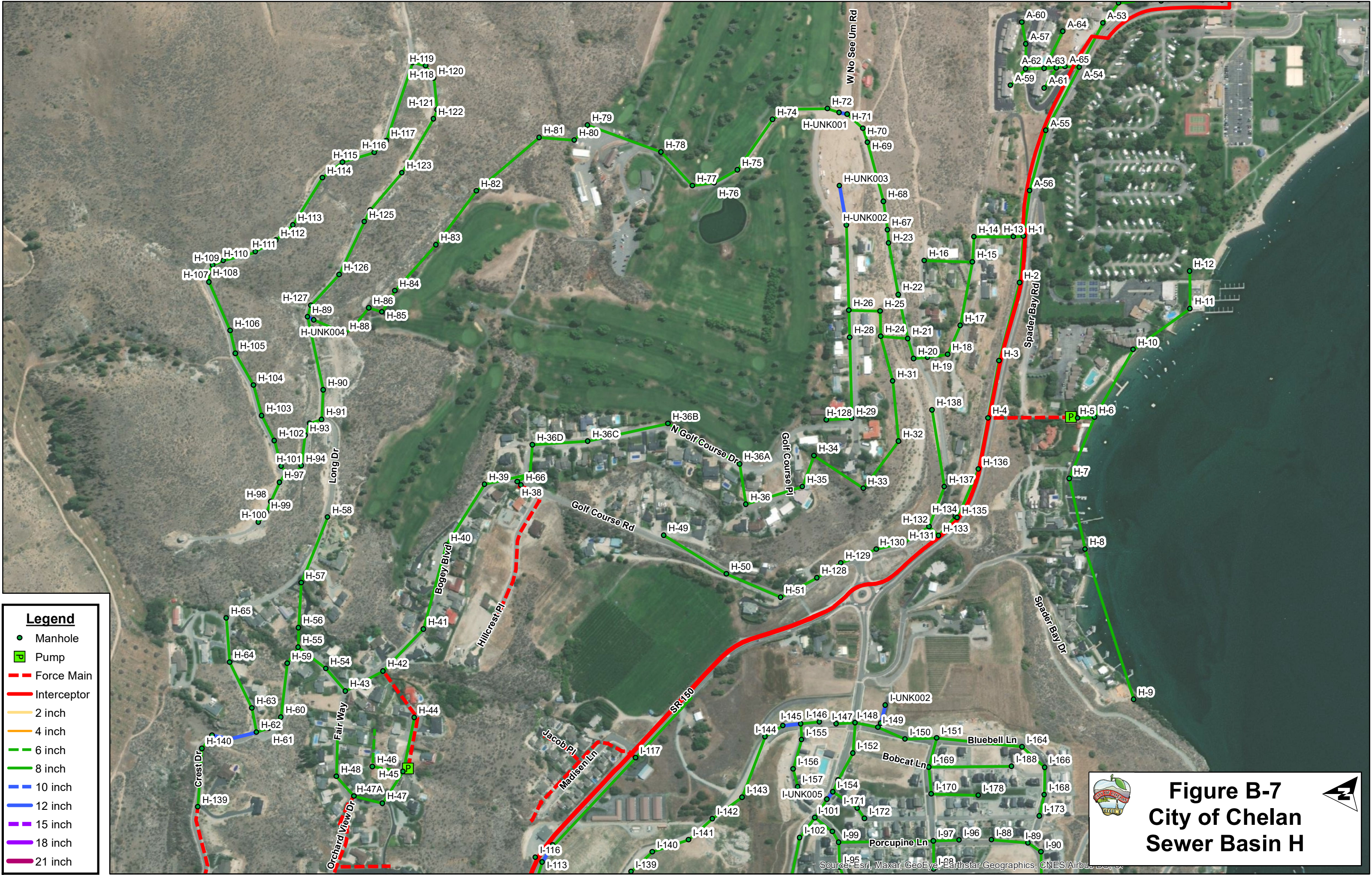


Legend

- Manhole
- Pump
- Force Main
- Interceptor
- 2 inch
- 4 inch
- 6 inch
- 8 inch
- 10 inch
- 12 inch
- 15 inch
- 18 inch
- 21 inch

**Figure B-6**
City of Chelan
Sewer Basin F

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community





Legend

- Manhole
- Pump
- Force Main
- Interceptor
- 2 inch
- 4 inch
- 6 inch
- 8 inch
- 10 inch
- 12 inch
- 15 inch
- 18 inch
- 21 inch





Figure B-8

City of Chelan

Sewer Basin I (1 of 2)



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- Manhole
- Pump
- Force Main
- Interceptor
- 2 inch
- 4 inch
- 6 inch
- 8 inch
- 10 inch
- 12 inch
- 15 inch
- 18 inch
- 21 inch



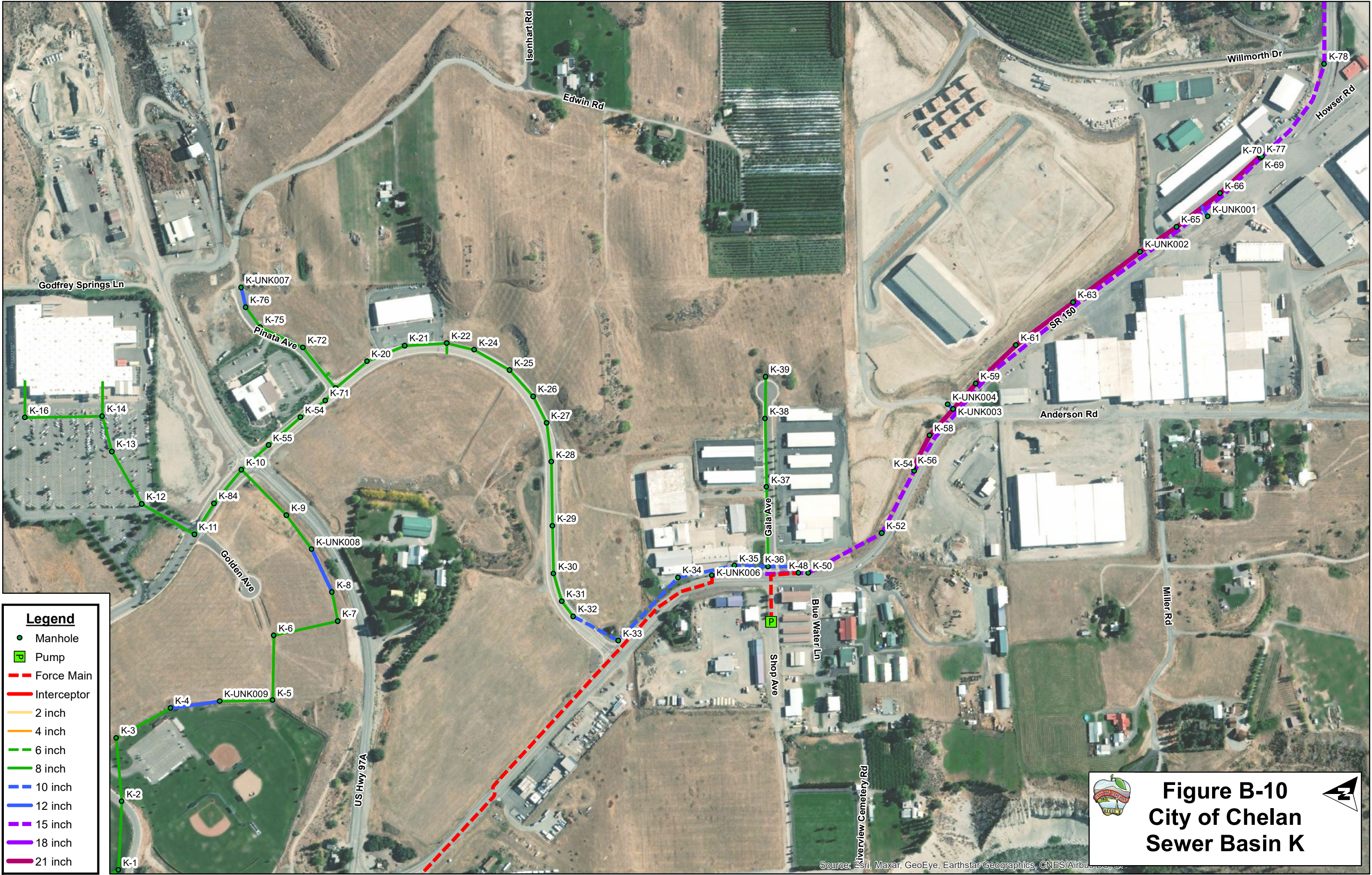


Figure B-9
City of Chelan
Sewer Basin I (2 of 2)



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community





Legend

- Manhole
- Pump
- Force Main
- Interceptor
- 2 inch
- 4 inch
- 6 inch
- 8 inch
- 10 inch
- 12 inch
- 15 inch
- 18 inch
- 21 inch



Figure B-11
City of Chelan
WWTP Interceptor



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, etc.

APPENDIX B

NPDES PERMIT AND FACTSHEET

Issuance Date: December 16, 2016
Effective Date: February 1, 2017
Expiration Date: January 31, 2022

**National Pollutant Discharge Elimination System
Waste Discharge Permit No. WA0020605**

State of Washington
DEPARTMENT OF ECOLOGY
Central Region Office
1250 West Alder Street
Union Gap, WA 98903

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1342 et seq.

**CITY OF CHELAN
PUBLICLY-OWNED TREATMENT WORKS
PO BOX 1669
CHELAN, WA 98816**

is authorized to discharge in accordance with the Special and General Conditions that follow.

Plant Location:
498 So. Bradley St.
Chelan, WA 98816

Receiving Water:
Columbia River, Mile: 503.5

Treatment Type: Rotating biological contactors, Aerobic digestion, UV disinfection



David B. Bowen
Section Manager
Water Quality Program
Central Regional Office
Washington State Department of Ecology

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Appendix A 46

Summary of Permit Report Submittals

Refer to the Special and General Conditions of this permit for additional submittal requirements. The following table is for quick reference only. Enforceable submittal requirements are contained in the permit narrative.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A.10.a.	Monthly Discharge Monitoring Report (DMR)	Monthly	March 15, 2017
S3.A.10.c.	Annual DMR	Annual	January 15, 2018
S3.A.10.d.	Permit Renewal Application Monitoring Data	1/year	January 15, 2018
S2A.3q	DMR - Priority Pollutant Data - Single Sample Data	3/permit term	July 31, 2017
S3.F.2.a.	Reporting Permit Violations – Phone Call	As necessary	
S3.F.2.c.	Reporting Permit Violations - Written	As necessary	
S4.B	Plans for Maintaining Adequate Capacity	As necessary	
S4.D	Notification of New or Altered Sources	As necessary	
S4.E	Infiltration and Inflow Evaluation	1/permit cycle	June 15, 2020
S4.F	Wasteload Assessment	1/permit cycle	June 15, 2020
S5.F	Bypass Notification	As necessary	
S5.G	Operations and Maintenance Manual Review	Annually	
S8.	Application for Permit Renewal	1/permit cycle	January 31, 2021
S9.	Outfall Evaluation	1/permit cycle	December 15, 2020
S10.A2	Acute Toxicity: Characterization Written Report and Priority Pollutant Scan(s)	Quarterly for one year beginning 2 nd Quarter 2017	July 31, 2017
S11.A2	Chronic Toxicity: Characterization Written Report	Quarterly for one year beginning 2 nd Quarter 2017	July 31, 2017
G1.	Notice of Change in Authorization	As necessary	
G4.	Reporting Planned Changes	As necessary	
G5.	Engineering Report for Construction or Modification Activities	As necessary	
G7.	Notice of Permit Transfer	As necessary	
G10.	Duty to Provide Information	As necessary	
G20.	Compliance Schedules	As necessary	
G21.	Contract Submittal	As necessary	

Special Conditions

S1. Discharge limits

S1.A. Effluent limits

All discharges and activities authorized by this permit must comply with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a level in excess of, that identified and authorized by this permit violates the terms and conditions of this permit.

Beginning on **February 1, 2017**, the Permittee may discharge treated domestic wastewater to the Columbia River at the permitted location subject to compliance with the following limits:

Effluent Limits: Outfall 001		
Latitude 47.80928 N		Longitude -119.97724 W
Parameter	Average Monthly ^a	Average Weekly ^b
Biochemical Oxygen Demand (5-day) (BOD ₅)	30 milligrams/liter (mg/L) 661 pounds/day (lbs/day) 85% removal of influent BOD ₅	45 mg/L 991 lbs/day
Total Suspended Solids (TSS)	30 milligrams/liter (mg/L) 661 pounds/day (lbs/day) 85% removal of influent BOD ₅	45 mg/L 991 lbs/day
Total Residual Chlorine ^c	0.5 mg/L	0.75 mg/L
Parameter	Minimum	Maximum
pH	6.0 standard units	9.0 standard units
Parameter	Monthly Geometric Mean	Weekly Geometric Mean
Fecal Coliform Bacteria ^d	CFU ^e 100/100 milliliter (mL)	CFU 200/100 mL
a	Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured. See footnote c for fecal coliform calculations.	
b	Average weekly discharge limit means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges' measured during that week. See footnote c for fecal coliform calculations.	
c	Chlorine limits apply only during emergency periods when UV disinfection is not available and the Permittee uses chlorine for disinfection. During normal operations with UV disinfection, chlorine limits do not apply. When not using chlorine during the monitoring period, enter "no discharge" for chlorine on the DMR for the period.	
d	Ecology provides directions to calculate the monthly and the weekly geometric mean in publication No. 04-10-020, Information Manual for Treatment Plant Operators available at: http://www.ecy.wa.gov/pubs/0410020.pdf	
e	CFU means colony forming units	

S1.B. Mixing zone authorization

Mixing zone for Outfall 001

The paragraph below defines the maximum boundaries of the mixing zones.

Chronic mixing zone

The chronic mixing zone extends 300 feet downstream and 100 feet upstream of the outfall and is 27 feet wide.

Acute mixing zone

The acute mixing zone extends 30 feet downstream and 10 upstream of the outfall and is 21 feet wide. Available Dilution (dilution factor).

Parameter	Dilution Factors
Acute Aquatic Life Criteria	185
Chronic Aquatic Life Criteria	278

S2. Monitoring requirements

S2.A. Monitoring schedule

The Permittee must monitor in accordance with the following schedule and the requirements specified in Appendix A.

The Permittee must monitor the wastewater according to the following schedule. The Permittee must use the specified analytical methods unless the method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136. If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report. If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

Parameter	Units	Laboratory Method	Minimum Sampling Frequency	Sample Type
(1) Wastewater influent				
Wastewater Influent means the raw sewage flow from the collection system into the treatment facility. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant.				
Flow	MGD	Influent Parshall Flume	Continuous ^a	Metered
Biochemical Oxygen Demand (BOD ₅)	mg/L	SM 5210 B	1/week ^b	24-hr composite ^c
BOD ₅	lbs/day	Not applicable (NA)	1/week	Calculated ^d
Total Suspended Solids (TSS)	mg/L	SM 2540 D	1/week	24-hour composite
TSS	lbs/day	NA	1/week	Calculated
pH	standard units	NA	5/week ^g	Grab ^h
(2) Final wastewater effluent				
Final Wastewater Effluent means wastewater which is exiting, or has exited, the last treatment process or operation. Typically, this is after or at the exit from the chlorine contact chamber or other disinfection process. The Permittee may take effluent samples for the BOD ₅ analysis before or after the disinfection process. If taken after, dechlorinate and reseed the sample.				
Flow	MGD	NA	Continuous	Metered
BOD ₅	mg/L	SM 5210 B	1/week	24-hr composite
BOD ₅	lbs/day	NA	1/week	Calculated
BOD ₅	Percent removal ^e	NA	1/month ^f	Calculated
TSS	mg/L	SM 2540 D	1/week	Grab
TSS	lbs/day	NA	1/week	Calculated
TSS	Percent removal	NA	1/month	Calculated
Total Ammonia	mg/L as N	SM4500-NH3-G H	1/month	24-hr composite
Chlorine (Total Residual)	mg/L	SM 4500 Cl G	daily when in use ⁱ	Grab
Fecal Coliform ^h	# /100 ml	SM 9222 D (MF)	2/week ^j	24-hr composite
pH ⁱ	standard units	SM 4500-H+B	5/week	Grab
Temperature ^k	°C	Grab, analog recorder or use micro-recording devices known as thermistors	5/week	Measurement

Parameter	Units	Laboratory Method	Minimum Sampling Frequency	Sample Type
(3) Permit renewal application requirements – final wastewater effluent ¹				
The Permittee must record and report the wastewater treatment plant flow discharged on the day it collects the sample for priority pollutant testing and WET testing with the discharge monitoring report.				
Dissolved Oxygen	mg/L	SM4500-OC/OG	Once per year ^m	Grab
Nitrate plus Nitrite Nitrogen	mg/L as N	4500-NO3-E/F/H	Once per year	24-hr composite
Total Kjeldahl Nitrogen (TKN)	mg/L as N	SM 4500-N Org B/C	Once per year	24-hr composite
Phosphorus (Total)	mg/L as P	SM 4500 PB followed by SM4500-PE/PF	Once per year	24-hr composite
Total Dissolved Solids	mg/L	SM2540 C	Once per year	24-hr composite
Oil and Grease	mg/L	1664 A or B	Once per year	24-hr composite
Total Hardness	mg/L	SM2340B	Once per year	24-hr composite
Acute Toxicity Characterization ^{n, o} (see S10.A1)	% survivability	NA	4/permit term ^p	Grab
Chronic Toxicity Characterization ^{n, o} (see S11.A1)	% survivability	NA	4/permit term	Grab
Priority Pollutant Scan	Milligrams or micrograms per liter	Tables II and III of Appendix D of 40 CFR Part 122	3/Permit term ^{q, s}	Grab
a	Continuous means without interruption throughout the operating and discharging of the Permittee's facility, except for infrequent shutdowns for maintenance,			
b	1/week means one (1) time during each calendar week and on a rotational basis throughout the days of the week, except weekends and holidays.			
c	24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.			
d	Calculated means figured concurrently with the respective sample, using the following formula: Concentration (in mg/L) X Flow (in MGD) X Conversion Factor (8.34) = lbs/day			
e	Percent removal means calculated via this equation $\% \text{ removal} = \frac{\text{Influent concentration (mg/L)} - \text{Effluent concentration (mg/L)}}{\text{Influent Concentration (mg/L)}} \times 100$ Calculate the percent (%) removal of BOD ₅ and TSS using the above equation.			
f	One month means one (1) time per month.			
g	5/week means five (5) times during each calendar week and on a rotational basis throughout the days of the week, except weekends and holidays.			
h	Grab means an individual sample collected over a fifteen (15) minute, or less, period.			
i	It is only necessary to collect total residual chlorine samples if using chlorine in the wastewater treatment system. In case of use, monitor daily.			
j	Report a numerical value for fecal coliforms following the procedures in Ecology's <i>Information Manual for Wastewater Treatment Plant Operators</i> , Publication Number 04-10-020 available at:			

Parameter	Units	Laboratory Method	Minimum Sampling Frequency	Sample Type
	http://www.ecy.wa.gov/programs/wq/permits/guidance.html . Do not report a result as too numerous to count (TNTC).			
k	2/week means two (2) times during each calendar week and on a rotational basis throughout the days of the week, except weekends and holidays.			
l	Report the daily pH and the minimum and maximum for the monthly monitoring period.			
m	Temperature grab sampling must occur when the effluent is at or near its daily maximum temperature, which usually occurs in the late afternoon. If the Permittee measures temperature continuously, it must determine and report a daily maximum from half-hour measurements in a 24-hour period and report a 7 DAD Max for each day by averaging each day's maximum value with the maximum values from the preceding 6 days. Continuous monitoring instruments must achieve an accuracy of 0.2 degrees C and the Permittee must verify accuracy annually.			
n	Final Effluent means wastewater which is exiting, or has exited, the last treatment process of operation. Typically, this is after or at the exit from the chlorine contact chamber or other disinfection process.			
o	One per year means one (1) time per year of the permit with sampling on a rotational quarterly basis. Quarterly sampling periods are January through March, April through June, July through September, and October through December. The Permittee must submit results with the monthly DMR in which the results are available.			
p	Ecology Publication No. WQ-R-95-80, <i>Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria</i> .			
q	The Permittee must record and report the wastewater treatment plant flow discharged on the day it collects the sample for priority pollutant testing and WET testing with the discharge monitoring report.			
r	4/permit term means (4) times during the permit term. The first chronic test must be sampled summer quarter 2017. The first acute test must be sampled summer quarter 2017.			
s	3/permit term means three (3) times during the permit cycle. The priority pollutant scans must be sampled at the same time WET sampling occurs. The first sampling occurs in the 2nd quarter of 2017 and following two quarters thereafter.			

S2.B. Sampling and analytical procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters. The Permittee must conduct representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions that may affect effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 (or as applicable in 40 CFR subchapters N [Parts 400–471] or O [Parts 501-503]) unless otherwise specified in this permit . Ecology may only specify

alternative methods for parameters without permit limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

S2.C. Flow measurement, field measurement, and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow measurement, field measurement, and continuous monitoring devices and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard, the manufacturer's recommendation, and approved O&M manual procedures for the device and the wastestream.
3. Calibrate continuous monitoring instruments weekly unless it can demonstrate a longer period is sufficient based on monitoring records. The Permittee:
 - a. May calibrate apparatus for continuous monitoring of dissolved oxygen by air calibration.
 - b. Must calibrate continuous pH measurement instruments using a grab sample analyzed in the lab with a pH meter calibrated with standard buffers and analyzed within 15 minutes of sampling.
 - c. Must calibrate continuous chlorine measurement instruments using a grab sample analyzed in the laboratory within 15 minutes of sampling.
4. Calibrate micro-recording temperature devices, known as thermistors, using protocols from Ecology's Quality Assurance Project Plan Development Tool (*Standard Operating Procedures for Continuous Temperature Monitoring of Fresh Water Rivers and Streams Version 1.0 10/26/2011*). This document is available online at:
http://www.ecy.wa.gov/programs/eap/qa/docs/ECY_EAP_SOP_Cont_Temp_Mon_Ambient_v1_0EAP080.pdf

Calibration as specified in this document is not required if the Permittee uses recording devices certified by the manufacturer
5. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
6. Maintain calibration records for at least three years.

S2.D. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology for permit specified parameters is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement. The Permittee must obtain accreditation for conductivity and pH if it must receive accreditation or registration for other parameters.

S2.E. Request for reduction in monitoring

The Permittee may request a reduction of the sampling frequency after twelve (12) months of monitoring. Ecology will review each request and at its discretion grant the request when it reissues the permit or by a permit modification.

The Permittee must:

1. Provide a written request.
2. Clearly state the parameters for which it is requesting reduced monitoring.
3. Clearly state the justification for the reduction.

S3. Reporting and recording requirements

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

S3.A. Discharge monitoring reports

The first monitoring period begins on **February 1, 2017** of the permit (unless otherwise specified). The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic discharge monitoring report (DMR) form provided by Ecology within the Water Quality Permitting Portal. Include data for each of the parameters tabulated in Special Condition S2 and as required by the form. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable) included on the electronic form.

To find out more information and to sign up for the Water Quality Permitting Portal go to: <http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html>

2. Enter the “No Discharge” reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.
3. Report single analytical values below detection as “less than the detection level (DL)” by entering < followed by the numeric value of the detection level (e.g. < 2.0) on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.
4. **Not** report zero for bacteria monitoring. Report as required by the laboratory method.
5. Calculate the geometric mean values for bacteria (unless otherwise specified in the permit) using:
 - a. The reported numeric value for all bacteria samples measured above the detection value except when it took multiple samples in one day. If the Permittee takes multiple samples in one day it must use the arithmetic average for the day in the geometric mean calculation.
 - b. The detection value for those samples measured below detection.
6. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in Appendix A or S2.
7. Calculate average values and calculated total values (unless otherwise specified in the permit) using:
 - a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.
 - b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample from the same monitoring point for the reporting period.
 - c. Zero (for values reported below detection) if the lab did not detect the parameter in another sample for the reporting period.

8. Report single-sample grouped parameters (for example: priority pollutants, PAHs, pulp and paper chlorophenolics, TTOs) on the WQWebDMR form and include: sample date, concentration detected, detection limit (DL) (as necessary), and laboratory quantitation level (QL) (as necessary).

The Permittee must also submit an electronic copy of the laboratory report as an attachment using WQWebDMR. The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.

9. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.
10. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, quarterly, annual, etc.) at the reporting schedule identified below. The Permittee must:
 - a. Submit **monthly** DMRs by the 15th day of the following month.
 - b. Submit **annual DMRs** unless otherwise specified in the permit, by **January 15, 2018** for the previous calendar year. The annual sampling period is the calendar year.
 - c. Submit permit renewal application monitoring and PP scan data in WQWebDMR as required in Special Condition S2.

S3.B. Permit Submittals and Schedules

The Permittee must use the Water Quality Permitting Portal – Permit Submittals application (unless otherwise specified in the permit) to submit all other written permit-required reports by the date specified in the permit.

Water Quality Permit Coordinator
Department of Ecology
Central Regional Office
1250 West Alder Street
Union Gap, WA 98903

S3.C. Records retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of

retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

S3.D. Recording of results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

S3.E. Additional monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Special Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR unless otherwise specified by Special Condition S2.

S3.F. Reporting permit violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.
2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

a. Immediate reporting

The Permittee must immediately report to Ecology and the Department of Health, and the Chelan-Douglas County Health District (at the numbers listed below), all:

- Failures of the disinfection system.
- Collection system overflows.
- Plant bypasses discharging to marine surface waters.

- Any other failures of the sewage system (pipe breaks, etc.)

Central Regional Office	509-575-2490
Department of Health,	360-236-3330 (business hours)
Drinking Water Program	360-789-8962 (after business hours)
Chelan-Douglas County Health	509-886-6000 (business hours)
District	509-866-6499 (after business hours)

b. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone numbers listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.
2. Any unanticipated bypass that causes an exceedance of an effluent limit in the permit (See Part S5.F, "Bypass Procedures").
3. Any upset that causes an exceedance of an effluent limit in the permit (See G.15, "Upset").
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.
5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit.

c. Report within five days

The Permittee must also submit a written report within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.
3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
5. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of written reports

Ecology may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All other permit violation reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

S3.G. Other reporting

a. Spills of Oil or Hazardous Materials

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter 173-303-145. You can obtain further instructions at the following website:
<http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm> .

b. Failure to submit relevant or correct facts

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

S3.H. Maintaining a copy of this permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S4. Facility loading

S4.A. Design criteria

The flows or waste loads for the permitted facility must not exceed the following design criteria:

Maximum Month Design Flow (MMDF)	2.64 MGD
Peak Instantaneous Design Flow (PIDF)	4.32 MGD
BOD ₅ Influent Loading for Maximum Month	4,986 lbs/day
TSS Influent Loading for Maximum Month	6,315 lbs/day

S4.B. Plans for maintaining adequate capacity

a. Conditions triggering plan submittal

The Permittee must submit a plan and a schedule for continuing to maintain capacity to Ecology when:

1. The actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three consecutive months.
2. The projected plant flow or loading would reach design capacity within five years.

b. Plan and schedule content

The plan and schedule must identify the actions necessary to maintain adequate capacity for the expected population growth and to meet the limits and requirements of the permit. The Permittee must consider the following topics and actions in its plan.

1. Analysis of the present design and proposed process modifications
2. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system
3. Limits on future sewer extensions or connections or additional waste loads
4. Modification or expansion of facilities
5. Reduction of industrial or commercial flows or waste loads

Engineering documents associated with the plan must meet the requirements of WAC 173-240-060, "Engineering Report," and be approved by Ecology prior to any construction.

S4.C. Duty to mitigate

The Permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

S4.D. Notification of new or altered sources

1. The Permittee must submit written notice to Ecology whenever any new discharge or a substantial change in volume or character of an existing discharge into the wastewater treatment plant is proposed which:
 - a. Would interfere with the operation of, or exceed the design capacity of, any portion of the wastewater treatment plant.
 - b. Is not part of an approved general sewer plan or approved plans and specifications.
 - c. Is subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act.
2. This notice must include an evaluation of the wastewater treatment plant's ability to adequately transport and treat the added flow and/or waste load, the quality and volume of effluent to be discharged to the treatment plant, and the anticipated impact on the Permittee's effluent [40 CFR 122.42(b)].

S4.E. Infiltration and inflow evaluation

1. The Permittee must conduct an infiltration and inflow evaluation. Refer to the U.S. EPA publication, I/I Analysis and Project Certification, available as Publication No. 97-03 at:
<http://www.ecy.wa.gov/programs/wq/permits/guidance.html>
2. The Permittee may use monitoring records to assess measurable infiltration and inflow.
3. The Permittee must prepare a report summarizing any measurable infiltration and inflow. If infiltration and inflow have increased by more than 15 percent from that found in the previous report based on equivalent rainfall, the report must contain a plan and a schedule to locate the sources of infiltration and inflow and to correct the problem.
4. The Permittee must submit a report summarizing the results of the evaluation and any recommendations for corrective actions by **June 15, 2020**.

S4.F. Wasteload assessment

The Permittee must conduct an assessment of its influent flow and waste load and submit a report to Ecology by **June 15, 2020**. The report must contain:

1. A description of compliance or noncompliance with the permit effluent limits.
2. A comparison between the existing and design:
 - a. Monthly average dry weather and wet weather flows.
 - b. Peak flows.
 - c. BOD₅ loading.
 - d. Total suspended solids loadings.
3. The percent change in the above parameters since the previous report (except for the first report).
4. The present and design population or population equivalent.
5. The projected population growth rate.
6. The estimated date upon which the Permittee expects the wastewater treatment plant to reach design capacity, according to the most restrictive of the parameters above.

Ecology may modify the interval for review and reporting if it determines that a different frequency is sufficient.

S5. Operation and maintenance

The Permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit.

S5.A. Certified operator

This permitted facility must be operated by an operator certified by the state of Washington for at least a Class III plant. This operator must be in responsible charge of the day-to-day operation of the wastewater treatment plant. An operator certified for at least a Class II plant must be in charge during all regularly scheduled shifts.

S5.B. Operation and maintenance program

The Permittee must:

1. Institute an adequate operation and maintenance program for the entire sewage system.
2. Keep maintenance records on all major electrical and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed.
3. Make maintenance records available for inspection at all times.

S5.C. Short-term reduction

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out according to the approved O&M manual or as otherwise approved by Ecology.

If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limits on a short-term basis for any reason, and such reduction cannot be avoided, the Permittee must:

1. Give written notification to Ecology, if possible, thirty (30) days prior to such activities.
2. Detail the reasons for, length of time of, and the potential effects of the reduced level of treatment.

This notification does not relieve the Permittee of its obligations under this permit.

S5.D. Electrical power failure

The Permittee must ensure that adequate safeguards prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the treatment plant and/or sewage lift stations. Adequate safeguards include, but are not limited to, alternate power sources, standby generator(s), or retention of inadequately treated wastes.

The Permittee must maintain Reliability Class II (EPA 430-99-74-001) at the wastewater treatment plant. Reliability Class II requires a backup power source sufficient to operate all vital components and critical lighting and ventilation during peak wastewater flow conditions. Vital components used to support the secondary processes (i.e., mechanical aerators or aeration basin air compressors) need not be operable to full levels of treatment, but must be sufficient to maintain the biota.

S5.E. Prevent connection of inflow

The Permittee must strictly enforce its sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

S5.F. Bypass procedures

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least ten (10) days before the date of the bypass.

2. Bypass which is unavoidable, unanticipated, and results in noncompliance of this permit.

This permit authorizes such a bypass only if:

- a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.
- b. No feasible alternatives to the bypass exist, such as:
 - The use of auxiliary treatment facilities.
 - Retention of untreated wastes.
 - Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
 - Transport of untreated wastes to another treatment facility.

- c. Ecology is properly notified of the bypass as required in Special Condition S3.F of this permit.
3. If bypass is anticipated and has the potential to result in noncompliance of this permit.
 - a. The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:
 - A description of the bypass and its cause.
 - An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
 - A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
 - The minimum and maximum duration of bypass under each alternative.
 - A recommendation as to the preferred alternative for conducting the bypass.
 - The projected date of bypass initiation.
 - A statement of compliance with SEPA.
 - A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
 - Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.
 - b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during the project planning and design process. The project-specific engineering report or facilities plan as well as the plans and specifications must include details of probable construction bypasses to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.
 - c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:
 - If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.

- If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

S5.G. Operations and maintenance (O&M) manual

a. O&M manual submittal and requirements

The Permittee must:

1. Review the O&M Manual at least annually.
2. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual.
3. Keep the approved O&M Manual at the permitted facility.
4. Follow the instructions and procedures of this manual.

b. O&M manual components

In addition to the requirements of WAC 173-240-080(1) through (5), the O&M Manual must be consistent with the guidance in Table G1-3 in the *Criteria for Sewage Works Design* (Orange Book), 2008. The O&M Manual must include:

1. Emergency procedures for cleanup in the event of wastewater system upset or failure.
2. A review of system components which if failed could pollute surface water or could impact human health. Provide a procedure for a routine schedule of checking the function of these components.
3. Wastewater system maintenance procedures that contribute to the generation of process wastewater.
4. Reporting protocols for submitting reports to Ecology to comply with the reporting requirements in the discharge permit.
5. Any directions to maintenance staff when cleaning or maintaining other equipment or performing other tasks which are necessary to protect the

operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine).

6. The treatment plant process control monitoring schedule.
7. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.

S6. Pretreatment

S6.A. General requirements

The Permittee must work with Ecology to ensure that all commercial and industrial users of the publicly owned treatment works (POTW) comply with the pretreatment regulations in 40 CFR Part 403 and any additional regulations that the Environmental Protection Agency (U.S. EPA) may promulgate under Section 307(b) (pretreatment) and 308 (reporting) of the Federal Clean Water Act.

S6.B. Duty to enforce discharge prohibitions

1. Under federal regulations (40 CFR 403.5(a) and (b)), the Permittee must not authorize or knowingly allow the discharge of any pollutants into its POTW which may be reasonably expected to cause pass through or interference, or which otherwise violate general or specific discharge prohibitions contained in 40 CFR Part 403.5 or WAC 173-216-060.
2. The Permittee must not authorize or knowingly allow the introduction of any of the following into their treatment works:
 - a. Pollutants which create a fire or explosion hazard in the POTW (including, but not limited to waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21).
 - b. Pollutants which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, or greater than 11.0 standard units, unless the works are specifically designed to accommodate such discharges.
 - c. Solid or viscous pollutants in amounts that could cause obstruction to the flow in sewers or otherwise interfere with the operation of the POTW.
 - d. Any pollutant, including oxygen-demanding pollutants, (BOD₅, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW.
 - e. Petroleum oil, non-biodegradable cutting oil, or products of mineral origin in amounts that will cause interference or pass through.

- f. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity which may cause acute worker health and safety problems.
 - g. Heat in amounts that will inhibit biological activity in the POTW resulting in interference but in no case heat in such quantities such that the temperature at the POTW headworks exceeds 40 degrees Centigrade (104 degrees Fahrenheit) unless Ecology, upon request of the Permittee, approves, in writing, alternate temperature limits.
 - h. Any trucked or hauled pollutants, except at discharge points designated by the Permittee.
 - i. Wastewaters prohibited to be discharged to the POTW by the Dangerous Waste Regulations (chapter 173-303 WAC), unless authorized under the Domestic Sewage Exclusion (WAC 173-303-071).
3. The Permittee must also not allow the following discharges to the POTW unless approved in writing by Ecology:
 - a. Noncontact cooling water in significant volumes.
 - b. Stormwater and other direct inflow sources.
 - c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment, or would not be afforded a significant degree of treatment by the system.
4. The Permittee must notify Ecology if any industrial user violates the prohibitions listed in this section (S6.B), and initiate enforcement action to promptly curtail any such discharge.

S6.C. Wastewater discharge permit required

The Permittee must:

1. Establish a process for authorizing non-domestic wastewater discharges that ensures all SIUs in all tributary areas meet the applicable state waste discharge permit (SWDP) requirements in accordance with chapter 90.48 RCW and chapter 173-216 WAC.
2. Immediately notify Ecology of any proposed discharge of wastewater from a source, which may be a significant industrial user (SIU) [see fact sheet definitions or refer to 40 CFR 403.3(v)(i)(ii)].
3. Require all SIUs to obtain a SWDP from Ecology prior to accepting their non-domestic wastewater, or require proof that Ecology has determined they do not require a permit.
4. Require the documentation as described in S6.C.3 at the earliest practicable date as a condition of continuing to accept non-domestic wastewater

discharges from a previously undiscovered, currently discharging and unpermitted SIU.

5. Require sources of non-domestic wastewater, which do not qualify as SIUs but merit a degree of oversight, to apply for a SWDP and provide it a copy of the application and any Ecology responses.
6. Keep all records documenting that its users have met the requirements of S6.C.

S6.D. Identification and reporting of existing, new, and proposed industrial users

1. The Permittee must take continuous, routine measures to identify all existing, new, and proposed SIUs and potential significant industrial users (PSIUs) discharging or proposing to discharge to the Permittee's sewer system (see **Appendix C** of the fact sheet for definitions).
2. Within 30 days of becoming aware of an unpermitted existing, new, or proposed industrial user who may be a significant industrial user (SIU), the Permittee must notify such user by registered mail that, if classified as an SIU, they must apply to Ecology and obtain a State Waste Discharge Permit. The Permittee must send a copy of this notification letter to Ecology within this same 30-day period.
3. The Permittee must also notify all Potential SIUs (PSIUs), as they are identified, that if their classification should change to an SIU, they must apply to Ecology for a State Waste Discharge Permit within 30 days of such change.

S7. Solid wastes

S7.A. Solid waste handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

S7.B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S8. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit by **January 31, 2021**.

The Permittee must also submit a new application or supplement at least one hundred eighty (180) days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

S9. Outfall evaluation

The Permittee must inspect, the submerged portion of the outfall line and diffuser to document its integrity and continued function. If conditions allow for a photographic verification, the Permittee must include such verification in the report. By **December 15, 2020**, the Permittee must submit the inspection report to Ecology through the Water Quality Permitting Portal – Permit Submittals application. The Permittee must submit hard-copies of any video files to Ecology as required by Permit Condition S3.B. The Portal does not support submittal of video files.

The inspector must at minimum:

- Assess the physical condition of the outfall pipe, diffuser, and associated couplings.
- Determine the extent of sediment accumulation in the vicinity of the diffuser.
- Ensure diffuser ports are free of obstructions and are allowing uniform flow.
- Confirm physical location (latitude/longitude) and depth (at MLLW) of the diffuser section of the outfall.
- Assess physical condition of the submarine line.
- Assess physical condition of anchors used to secure the submarine line.

S10. WET Characterization - Acute toxicity Outfall 001

S10.A. Effluent Characterization

The Permittee must:

1. Conduct quarterly acute toxicity testing on the final effluent for **one year** starting in the **2nd Quarter of 2017**. Quarter means: 1st Quarter - January

through March; **2nd Quarter - April through June**; 3rd Quarter - July through September; and 4th Quarter - October through December.

2. Submit a quarterly written report to Ecology for one year within 30 days of sampling and starting no later than **July 31, 2017**. Each subsequent report is due on **October 31, 2017, January 31, 2018 and April 30, 2018**. Further instructions on testing conditions and test report content are in Section B below.
3. Use a dilution series consisting of a minimum of five concentrations and a control. The five concentrations should include 100% effluent.
4. Conduct the acute toxicity tests using the two organisms listed below:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	<i>Pimephales promelas</i>	EPA-821-R-02-012
Daphnid 48-hour static test	<i>Ceriodaphnia dubia</i> , <i>Daphnia pulex</i> , or <i>Daphnia magna</i>	EPA-821-R-02-012

5. The effluent limit for acute toxicity listed in Section B below applies if after one year of effluent characterization:

- The median survival of any species in 100% effluent is below 80%.
- Any one test of any species exhibits less than 65% survival in 100% effluent.

If the limit applies, then the Permittee must immediately follow the instructions in Sections B, C, D, E, and G. If the limit does not apply, then the Permittee must follow the instructions in Section F and G.

S10.B. Effluent limit for acute toxicity

The effluent limit for acute toxicity is:

No acute toxicity detected in a test concentration representing the acute critical effluent concentration (ACEC).

The ACEC means the maximum concentration of effluent during critical conditions at the boundary of the acute mixing zone, defined in Section S1.C of this permit. The ACEC equals 0.5 % effluent.

S10.C. Compliance with the effluent limit for acute toxicity

Compliance with the effluent limit for acute toxicity means the results of the

testing specified in Section D show no statistically significant difference in survival between the control and the ACEC.

If the test results show a statistically significant difference in survival between the control and the ACEC, the Permittee must then immediately conduct the additional testing described in Section D. The Permittee is in compliance with the requirements of Section B if all of the additional tests required by Section D show no significant difference in survival between the control and ACEC. If any of the additional test results show a significant difference in survival between the control and the ACEC then the Permittee is in violation of its WET limit.

The Permittee must determine the statistical significance by conducting a hypothesis test at the 0.05 level of significance (Appendix H, EPA/600/4-89/001). If the difference in survival between the control and the ACEC is less than 10%, the Permittee must conduct the hypothesis test at the 0.01 level of significance.

S10.D. Compliance testing for acute toxicity

The Permittee must:

1. Perform the acute toxicity tests with 100% effluent, the ACEC, and a control, or with a full dilution series.
2. Conduct quarterly acute toxicity testing on the final effluent if characterization determines that the effluent limit for acute toxicity applies. Quarter means: January through March, April through June, July through September, and October through December.
3. Submit a quarterly written report to Ecology within 30 days of sampling and starting no later than **July 31, 2017**. Each subsequent report is due on **October 31, 2017 January 31, 2018 and April 30, 2018** of each year. Further instructions on testing conditions and test report content are in Section F below.
4. The Permittee must perform compliance tests using each of the species and protocols listed below on a rotating basis:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	<i>Pimephales promelas</i>	EPA-821-R-02-012
Daphnid 48-hour static test	<i>Ceriodaphnia dubia</i> , <i>Daphnia pulex</i> , or <i>Daphnia magna</i>	EPA-821-R-02-012

S10.E. Response to noncompliance with the effluent limit for acute toxicity

If a toxicity test conducted under Section D determines a statistically significant

difference in response between the ACEC and the control, using the statistical test described in Section C, the Permittee must begin additional testing within one week from the time of receiving the test results. The Permittee must:

1. Conduct one additional test each week for four consecutive weeks, using the same test and species as the failed compliance test.
2. Test at least five effluent concentrations and a control to determine appropriate point estimates. One of these effluent concentrations must equal the ACEC. The results of the test at the ACEC will determine compliance with the effluent limit for acute toxicity as described in Section C.
3. Return to the original monitoring frequency in Section D after completion of the additional compliance monitoring.

Anomalous test results: If a toxicity test conducted under Section D indicates noncompliance with the acute toxicity limit and the Permittee believes that the test result is anomalous, the Permittee may notify Ecology that the compliance test result may be anomalous. The Permittee may take one additional sample for toxicity testing and wait for notification from Ecology before completing the additional testing. The Permittee must submit the notification with the report of the compliance test result and identify the reason for considering the compliance test result to be anomalous.

If Ecology determines that the test result was not anomalous, the Permittee must complete all of the additional monitoring required in this section. Or,

If the one additional sample fails to comply with the effluent limit for acute toxicity, then the Permittee must complete all of the additional monitoring required in this section. Or,

If Ecology determines that the test result was anomalous, the one additional test result will replace the anomalous test result.

If all of the additional testing in this section complies with the permit limit, the Permittee must submit a report to Ecology on possible causes and preventive measures for the transient toxicity event, which triggered the additional compliance monitoring. This report must include a search of all pertinent and recent facility records, including:

- Operating records
- Monitoring results
- Inspection records
- Spill reports
- Weather records

- Production records
- Raw material purchases
- Pretreatment records, etc.

If the additional testing in this section shows another violation of the acute toxicity limit, the Permittee must submit a Toxicity Identification/Reduction Evaluation (TI/RE) plan to Ecology within sixty (60) days after the sample date (WAC 173-205-100(2)).

S10.F. Testing when there is no permit limit for acute toxicity

The Permittee must:

1. Conduct acute toxicity testing on a series of at least five concentrations of effluent, including 100% effluent and a control.
2. Use each of the following species and protocols for each acute toxicity test:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	<i>Pimephales promelas</i>	EPA-821-R-02-012
Daphnid 48-hour static test	<i>Ceriodaphnia dubia</i> , <i>Daphnia pulex</i> , or <i>Daphnia magna</i>	EPA-821-R-02-012

S10.G. Sampling and reporting requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data in electronic format for entry into Ecology's database, then the Permittee must send the data to Ecology along with the test report, bench sheets, and reference toxicant results.
2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.

4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Subsection C and the Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Section A or pristine natural water of sufficient quality for good control performance.
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the acute critical effluent concentration (ACEC). The ACEC equals 0.5% effluent.
8. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing must comply with the acute statistical power standard of 29% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

S11. WET Characterization - Chronic toxicity

S11.A. Effluent Characterization

The Permittee must:

1. Conduct quarterly chronic toxicity testing on the final effluent for **one year** starting in the **2nd Quarter of 2017**. Quarter means: 1st Quarter - January through March; 2nd Quarter - April through June; 3rd Quarter - July through September; and 4th Quarter - October through December.
2. Submit a quarterly written report to Ecology for one year within 30 days of sampling and starting no later than **July 31, 2017**. Each subsequent report is due on **October 31, 2017, January 31, 2018, and April 30, 2018**. Further instructions on testing conditions and test report content are in Section B below.

3. Conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). **The ACEC equals 0.5% effluent.** The series of dilutions should also contain **the CCEC of 0.36% effluent.**
4. Conduct the chronic toxicity tests on the two organisms listed below:

Freshwater Chronic Test	Species	Method
Fathead minnow survival and growth	<i>Pimephales promelas</i>	EPA-821-R-02-013
Water flea survival and reproduction	<i>Ceriodaphnia dubia</i>	EPA-821-R-02-013

The effluent limit for chronic toxicity listed in Section B below applies if after one year of effluent characterization any test shows a significant difference between the control and the ACEC at the 0.05 level of significance using hypothesis testing (Appendix H, EPA/600/4-89/001). If the limit applies, then the Permittee must immediately follow the instructions in Sections E and F.

S11.B. Effluent limit for chronic toxicity

The effluent limit for chronic toxicity is:

No toxicity detected in a test concentration representing the chronic critical effluent concentration (CCEC).

The CCEC means the maximum concentration of effluent during critical conditions at the boundary of the mixing zone, defined in Section S1.B. of this permit. **The CCEC equals 0.36% effluent.**

S11.C. Compliance with the effluent limit for chronic toxicity

Compliance with the effluent limit for chronic toxicity means the results of the testing specified in Subsection D. show no statistically significant difference in response between the control and the CCEC.

If the test results show a statistically significant difference in response between the control and the CCEC, the test does not comply with the effluent limit for chronic toxicity. The Permittee must then immediately conduct the additional testing described in Subsection E. The Permittee will comply with the requirements of this section by meeting the requirements of Subsection E.

The Permittee must determine the statistical significance by conducting a hypothesis test at the 0.05 level of significance (Appendix H, EPA/600/4-89/001).

If the difference in response between the control and the CCEC is less than 20%, the Permittee must conduct the hypothesis test at the 0.01 level of significance.

Ecology will reevaluate the need for the chronic toxicity limit in future permits. Therefore, the Permittee must also conduct this same hypothesis test (Appendix H, EPA/600/4-89/001) to determine whether a statistically significant difference in response exists between the acute critical effluent concentration (ACEC) and the control.

S11.D. Compliance testing for chronic toxicity

The Permittee must:

1. Perform the chronic toxicity tests using the CCEC, the ACEC, and a control, or with a full dilution series.
2. Conduct quarterly acute toxicity testing on the final effluent for one (1) year. Quarter means: January through March, April through June, July through September, and October through December.
3. Submit a quarterly written report to Ecology within 30 days of sampling and starting no later than **July 31, 2017**. Each subsequent report is due on **October 31, 2017; January 31, 2018; and April 30, 2018**. Further instructions on testing conditions and test report content are in Section F below.
4. The Permittee must perform compliance tests using each of the species and protocols listed below on a rotating basis:

Freshwater Chronic Test	Species	Method
Fathead minnow survival and growth	<i>Pimephales promelas</i>	EPA-821-R-02-013
Water flea survival and reproduction	<i>Ceriodaphnia dubia</i>	EPA-821-R-02-013

S11.E. Response to noncompliance with the effluent limit for chronic toxicity

If a toxicity test conducted under Subsection D determines a statistically significant difference in response between the CCEC and the control using the statistical test described in Subsection C, the Permittee must begin additional testing within one week from the time of receiving the test results. The Permittee must:

1. Conduct additional testing each month for three consecutive months using the same test and species as the failed compliance test.
2. Use a series of at least five effluent concentrations and a control to determine appropriate point estimates. One of these effluent concentrations must equal

the CCEC. The results of the test at the CCEC will determine compliance with the effluent limit for chronic toxicity as described in Subsection B.

3. Return to the original monitoring frequency in Subsection C after completion of the additional compliance monitoring.

Anomalous test results: If a toxicity test conducted under Subsection D indicates noncompliance with the chronic toxicity limit and the Permittee believes that the test result is anomalous, the Permittee may notify Ecology that the compliance test result may be anomalous. The Permittee may take one additional sample for toxicity testing and wait for notification from Ecology before completing the additional testing. The Permittee must submit the notification with the report of the compliance test result and identify the reason for considering the compliance test result to be anomalous.

If Ecology determines that the test result was not anomalous, the Permittee must complete all of the additional monitoring required in this section. Or,

If the one additional sample fails to comply with the effluent limit for chronic toxicity, then the Permittee must complete all of the additional monitoring required in this section. Or,

If Ecology determines that the test result was anomalous, the one additional test result will replace the anomalous test result.

If all of the additional testing required by this section complies with the permit limit, the Permittee must submit a report to Ecology on possible causes and preventive measures for the transient toxicity event, which triggered the additional compliance monitoring. This report must include a search of all pertinent and recent facility records, including:

- Operating records
- Monitoring results
- Inspection records
- Spill reports
- Weather records
- Production records
- Raw material purchases
- Pretreatment records, etc.

If the additional testing required by this section shows another violation of the chronic toxicity limit, the Permittee must submit a Toxicity Identification / Reduction Evaluation (TI/RE) plan to Ecology within 60 days after the sample date (WAC 173-205-100(2)).

S11.F. Testing when there is no permit limit for chronic toxicity

The Permittee must:

1. Conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). The ACEC equals 0.05% effluent. The series of dilutions should also contain the CCEC of 0.36% effluent.
2. Compare the ACEC to the control using hypothesis testing at the 0.05 level of significance as described in Appendix H, EPA/600/4-89/001.
3. Perform chronic toxicity tests with all of the following species and the most recent version of the following protocols:

Freshwater Chronic Test	Species	Method
Fathead minnow survival and growth	<i>Pimephales promelas</i>	EPA-821-R-02-013
Water flea survival and reproduction	<i>Ceriodaphnia dubia</i>	EPA-821-R-02-013

S11.G. Sampling and reporting requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data in electronic format for entry into Ecology's database, then the Permittee must send the data to Ecology along with the test report, bench sheets, and reference toxicant results.
2. The Permittee must collect 24-hour composite effluent for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.
4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Section C. and the Ecology Publication no. WQ-R-95-80, *Laboratory Guidance and*

Whole Effluent Toxicity Test Review Criteria. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.

5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Subsection C. or pristine natural water of sufficient quality for good control performance.
6. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the CCEC and the ACEC. The CCEC and the ACEC may either substitute for the effluent concentrations that are closest to them in the dilution series or be extra effluent concentrations. The CCEC equals 0.36% effluent. The ACEC equals 0.5% effluent.
7. All whole effluent toxicity tests that involve hypothesis testing must comply with the chronic statistical power standard of 39% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

General Conditions

G1. Signatory requirements

1. All applications, reports, or information submitted to Ecology must be signed and certified.
 - a. In the case of corporations, by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
 - A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or
 - The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and

accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

- b. In the case of a partnership, by a general partner.
- c. In the case of sole proprietorship, by the proprietor.
- d. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

Applications for permits for domestic wastewater facilities that are either owned or operated by, or under contract to, a public entity shall be submitted by the public entity.

- 2. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - a. The authorization is made in writing by a person described above and submitted to Ecology.
 - b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)
- 3. Changes to authorization. If an authorization under paragraph G1.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph G1.2, above, must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.
- 4. Certification. Any person signing a document under this section must make the following certification:

“I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

G2. Right of inspection and entry

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

1. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.
2. To have access to and copy, at reasonable times and at reasonable cost, any records required to be kept under the terms and conditions of this permit.
3. To inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.
4. To sample or monitor, at reasonable times, any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. Permit actions

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 40 CFR 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

1. The following are causes for terminating this permit during its term, or for denying a permit renewal application:
 - a. Violation of any permit term or condition.
 - b. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.
 - c. A material change in quantity or type of waste disposal.
 - d. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination.
 - e. A change in any condition that requires either a temporary or permanent reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit.
 - f. Nonpayment of fees assessed pursuant to RCW 90.48.465.
 - g. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.
2. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:
 - a. A material change in the condition of the waters of the state.

- b. New information not available at the time of permit issuance that would have justified the application of different permit conditions.
 - c. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.
 - d. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.
 - e. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.
 - f. Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.
 - g. Incorporation of an approved local pretreatment program into a municipality's permit.
3. The following are causes for modification or alternatively revocation and reissuance:
 - a. When cause exists for termination for reasons listed in 1.a through 1.g of this section, and Ecology determines that modification or revocation and reissuance is appropriate.
 - b. When Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G7) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. Reporting planned changes

The Permittee must, as soon as possible, but no later than one hundred eighty (180) days prior to the proposed changes, give notice to Ecology of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:

1. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).
2. A significant change in the nature or an increase in quantity of pollutants discharged.
3. A significant change in the Permittee's sludge use or disposal practices. Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. Plan review required

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in this permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology.

1. Transfers by Modification

Except as provided in paragraph (2) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

2. Automatic Transfers

This permit may be automatically transferred to a new Permittee if:

- a. The Permittee notifies Ecology at least thirty (30) days in advance of the proposed transfer date.
- b. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.
- c. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. Reduced production for compliance

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. Other requirements of 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. Additional monitoring

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof shall be punished by a

fine of up to ten thousand dollars (\$10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit may incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars (\$10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. Upset

Definition – “Upset” means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset.
2. The permitted facility was being properly operated at the time of the upset.
3. The Permittee submitted notice of the upset as required in Special Condition S3.E.
4. The Permittee complied with any remedial measures required under S3.E of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. Property rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. Toxic pollutants

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. Penalties for tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment shall be a fine of not more than \$20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G20. Compliance schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than fourteen (14) days following each schedule date.

G21. Service agreement review

The Permittee must submit to Ecology any proposed service agreements and proposed revisions or updates to existing agreements for the operation of any wastewater treatment facility covered by this permit. The review is to ensure consistency with chapters 90.46 and 90.48 RCW as required by RCW 70.150.040(9). In the event that Ecology does not comment within a thirty-day (30) period, the Permittee may assume consistency and proceed with the service agreement or the revised/updated service agreement.

Appendix A

LIST OF POLLUTANTS WITH ANALYTICAL METHODS, DETECTION LIMITS AND QUANTITATION LEVELS

The Permittee must use the specified analytical methods, detection limits (DLs) and quantitation levels (QLs) in the following table for permit and application required monitoring unless:

- Another permit condition specifies other methods, detection levels, or quantitation levels.
- The method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136.

If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

When the permit requires the Permittee to measure the base neutral compounds in the list of priority pollutants, it must measure all of the base neutral pollutants listed in the table below. The list includes EPA required base neutral priority pollutants and several additional polynuclear aromatic hydrocarbons (PAHs). The Water Quality Program added several PAHs to the list of base neutrals below from Ecology's Persistent Bioaccumulative Toxics (PBT) List. It only added those PBT parameters of interest to Appendix A that did not increase the overall cost of analysis unreasonably.

Ecology added this appendix to the permit in order to reduce the number of analytical "non-detects" in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost.

The lists below include conventional pollutants (as defined in CWA section 502(6) and 40 CFR Part 122.), toxic or priority pollutants as defined in CWA section 307(a)(1) and listed in 40 CFR Part 122 Appendix D, 40 CFR Part 401.15 and 40 CFR Part 423 Appendix A),

and nonconventionals. 40 CFR Part 122 Appendix D (Table V) also identifies toxic pollutants and hazardous substances which are required to be reported by dischargers if expected to be present. This permit appendix A list does not include those parameters.

CONVENTIONAL POLLUTANTS

Pollutant	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL) ¹ µg/L unless specified	Quantitation Level (QL) ² µg/L unless specified
Biochemical Oxygen Demand		SM5210-B		2 mg/L
Biochemical Oxygen Demand, Soluble		SM5210-B ³		2 mg/L
Fecal Coliform		SM 9221E,9222	N/A	Specified in method - sample aliquot dependent
Oil and Grease (HEM) (Hexane Extractable Material)		1664 A or B	1,400	5,000
pH		SM4500-H ⁺ B	N/A	N/A
Total Suspended Solids		SM2540-D		5 mg/L

NONCONVENTIONAL POLLUTANTS

Pollutant & CAS No. (if available)	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL) ¹ µg/L unless specified	Quantitation Level (QL) ² µg/L unless specified
Alkalinity, Total		SM2320-B		5 mg/L as CaCO ₃
Aluminum, Total	7429-90-5	200.8	2.0	10
Ammonia, Total (as N)		SM4500-NH ₃ -B and C/D/E/G/H		20
Barium Total	7440-39-3	200.8	0.5	2.0
BTEX (benzene +toluene + ethylbenzene + m,o,p xylenes)		EPA SW 846 8021/8260	1	2
Boron, Total	7440-42-8	200.8	2.0	10.0
Chemical Oxygen Demand		SM5220-D		10 mg/L
Chloride		SM4500-Cl B/C/D/E and SM4110 B		Sample and limit dependent

NONCONVENTIONAL POLLUTANTS

Pollutant & CAS No. (if available)	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
Chlorine, Total Residual		SM4500 Cl G		50.0
Cobalt, Total	7440-48-4	200.8	0.05	0.25
Color		SM2120 B/C/E		10 color units
Dissolved oxygen		SM4500-OC/OG		0.2 mg/L
Flow		Calibrated device		
Fluoride	16984-48-8	SM4500-F E	25	100
Hardness, Total		SM2340B		200 as CaCO ₃
Iron, Total	7439-89-6	200.7	12.5	50
Magnesium, Total	7439-95-4	200.7	10	50
Manganese, Total	7439-96-5	200.8	0.1	0.5
Molybdenum, Total	7439-98-7	200.8	0.1	0.5
Nitrate + Nitrite Nitrogen (as N)		SM4500-NO ₃ - E/F/H		100
Nitrogen, Total Kjeldahl (as N)		SM4500-N _{org} B/C and SM4500NH ₃ - B/C/D/EF/G/H		300
NWTPH Dx ⁴		Ecology NWTPH Dx	250	250
NWTPH Gx ⁵		Ecology NWTPH Gx	250	250
Phosphorus, Total (as P)		SM 4500 PB followed by SM4500-PE/PF	3	10
Salinity		SM2520-B		3 practical salinity units or scale (PSU or PSS)
Settleable Solids		SM2540 -F		Sample and limit dependent
Soluble Reactive Phosphorus (as P)		SM4500-P E/F/G	3	10
Sulfate (as mg/L SO ₄)		SM4110-B		0.2 mg/L
Sulfide (as mg/L S)		SM4500-S ² F/D/E/G		0.2 mg/L
Sulfite (as mg/L SO ₃)		SM4500-SO ₃ B		2 mg/L

NONCONVENTIONAL POLLUTANTS

Pollutant & CAS No. (if available)	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
Temperature (max. 7-day avg.)		Analog recorder or Use micro-recording devices known as thermistors		0.2° C
Tin, Total	7440-31-5	200.8	0.3	1.5
Titanium, Total	7440-32-6	200.8	0.5	2.5
Total Coliform		SM 9221B, 9222B, 9223B	N/A	Specified in method - sample aliquot dependent
Total Organic Carbon		SM5310-B/C/D		1 mg/L
Total dissolved solids		SM2540 C		20 mg/L

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
METALS, CYANIDE & TOTAL PHENOLS					
Antimony, Total	114	7440-36-0	200.8	0.3	1.0
Arsenic, Total	115	7440-38-2	200.8	0.1	0.5
Beryllium, Total	117	7440-41-7	200.8	0.1	0.5
Cadmium, Total	118	7440-43-9	200.8	0.05	0.25
Chromium (hex) dissolved	119	18540-29-9	SM3500-Cr EC	0.3	1.2
Chromium, Total	119	7440-47-3	200.8	0.2	1.0
Copper, Total	120	7440-50-8	200.8	0.4	2.0
Lead, Total	122	7439-92-1	200.8	0.1	0.5
Mercury, Total	123	7439-97-6	1631E	0.0002	0.0005
Nickel, Total	124	7440-02-0	200.8	0.1	0.5
Selenium, Total	125	7782-49-2	200.8	1.0	1.0
Silver, Total	126	7440-22-4	200.8	0.04	0.2

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
METALS, CYANIDE & TOTAL PHENOLS					
Thallium, Total	127	7440-28-0	200.8	0.09	0.36
Zinc, Total	128	7440-66-6	200.8	0.5	2.5
Cyanide, Total	121	57-12-5	335.4	5	10
Cyanide, Weak Acid Dissociable	121		SM4500-CN I	5	10
Cyanide, Free Amenable to Chlorination (Available Cyanide)	121		SM4500-CN G	5	10
Phenols, Total	65		EPA 420.1		50

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
ACID COMPOUNDS					
2-Chlorophenol	24	95-57-8	625	1.0	2.0
2,4-Dichlorophenol	31	120-83-2	625	0.5	1.0
2,4-Dimethylphenol	34	105-67-9	625	0.5	1.0
4,6-dinitro-o-cresol (2-methyl-4,6,-dinitrophenol)	60	534-52-1	625/1625B	1.0	2.0
2,4 dinitrophenol	59	51-28-5	625	1.0	2.0
2-Nitrophenol	57	88-75-5	625	0.5	1.0
4-Nitrophenol	58	100-02-7	625	0.5	1.0
Parachlorometa cresol (4-chloro-3-methylphenol)	22	59-50-7	625	1.0	2.0
Pentachlorophenol	64	87-86-5	625	0.5	1.0
Phenol	65	108-95-2	625	2.0	4.0
2,4,6-Trichlorophenol	21	88-06-2	625	2.0	4.0

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
VOLATILE COMPOUNDS					
Acrolein	2	107-02-8	624	5	10
Acrylonitrile	3	107-13-1	624	1.0	2.0
Benzene	4	71-43-2	624	1.0	2.0
Bromoform	47	75-25-2	624	1.0	2.0
Carbon tetrachloride	6	56-23-5	624/601 or SM6230B	1.0	2.0
Chlorobenzene	7	108-90-7	624	1.0	2.0
Chloroethane	16	75-00-3	624/601	1.0	2.0
2-Chloroethylvinyl Ether	19	110-75-8	624	1.0	2.0
Chloroform	23	67-66-3	624 or SM6210B	1.0	2.0
Dibromochloromethane (chlordibromomethane)	51	124-48-1	624	1.0	2.0
1,2-Dichlorobenzene	25	95-50-1	624	1.9	7.6
1,3-Dichlorobenzene	26	541-73-1	624	1.9	7.6
1,4-Dichlorobenzene	27	106-46-7	624	4.4	17.6
Dichlorobromomethane	48	75-27-4	624	1.0	2.0
1,1-Dichloroethane	13	75-34-3	624	1.0	2.0
1,2-Dichloroethane	10	107-06-2	624	1.0	2.0
1,1-Dichloroethylene	29	75-35-4	624	1.0	2.0
1,2-Dichloropropane	32	78-87-5	624	1.0	2.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) ⁶	33	542-75-6	624	1.0	2.0
Ethylbenzene	38	100-41-4	624	1.0	2.0
Methyl bromide (Bromomethane)	46	74-83-9	624/601	5.0	10.0
Methyl chloride (Chloromethane)	45	74-87-3	624	1.0	2.0
Methylene chloride	44	75-09-2	624	5.0	10.0
1,1,2,2-Tetrachloroethane	15	79-34-5	624	1.9	2.0

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
VOLATILE COMPOUNDS					
Tetrachloroethylene	85	127-18-4	624	1.0	2.0
Toluene	86	108-88-3	624	1.0	2.0
1,2-Trans-Dichloroethylene (Ethylene dichloride)	30	156-60-5	624	1.0	2.0
1,1,1-Trichloroethane	11	71-55-6	624	1.0	2.0
1,1,2-Trichloroethane	14	79-00-5	624	1.0	2.0
Trichloroethylene	87	79-01-6	624	1.0	2.0
Vinyl chloride	88	75-01-4	624/SM6200B	1.0	2.0

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)					
Acenaphthene	1	83-32-9	625	0.2	0.4
Acenaphthylene	77	208-96-8	625	0.3	0.6
Anthracene	78	120-12-7	625	0.3	0.6
Benzidine	5	92-87-5	625	12	24
Benzyl butyl phthalate	67	85-68-7	625	0.3	0.6
Benzo(a)anthracene	72	56-55-3	625	0.3	0.6
Benzo(b)fluoranthene (3,4-benzofluoranthene) ⁷	74	205-99-2	610/625	0.8	1.6
Benzo(j)fluoranthene ⁷		205-82-3	625	0.5	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) ⁷	75	207-08-9	610/625	0.8	1.6
Benzo(r,s,t)pentaphene		189-55-9	625	0.5	1.0
Benzo(a)pyrene	73	50-32-8	610/625	0.5	1.0

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)					
Benzo(<i>ghi</i>)Perylene	79	191-24-2	610/625	0.5	1.0
Bis(2-chloroethoxy)methane	43	111-91-1	625	5.3	21.2
Bis(2-chloroethyl)ether	18	111-44-4	611/625	0.3	1.0
Bis(2-chloroisopropyl)ether	42	39638-32-9	625	0.3	0.6
Bis(2-ethylhexyl)phthalate	66	117-81-7	625	0.1	0.5
4-Bromophenyl phenyl ether	41	101-55-3	625	0.2	0.4
2-Chloronaphthalene	20	91-58-7	625	0.3	0.6
4-Chlorophenyl phenyl ether	40	7005-72-3	625	0.3	0.5
Chrysene	76	218-01-9	610/625	0.3	0.6
Dibenzo (a,h)acridine		226-36-8	610M/625M	2.5	10.0
Dibenzo (a,j)acridine		224-42-0	610M/625M	2.5	10.0
Dibenzo(a- <i>h</i>)anthracene (1,2,5,6-dibenzanthracene)	82	53-70-3	625	0.8	1.6
Dibenzo(a,e)pyrene		192-65-4	610M/625M	2.5	10.0
Dibenzo(a,h)pyrene		189-64-0	625M	2.5	10.0
3,3-Dichlorobenzidine	28	91-94-1	605/625	0.5	1.0
Diethyl phthalate	70	84-66-2	625	1.9	7.6
Dimethyl phthalate	71	131-11-3	625	1.6	6.4
Di-n-butyl phthalate	68	84-74-2	625	0.5	1.0
2,4-dinitrotoluene	35	121-14-2	609/625	0.2	0.4
2,6-dinitrotoluene	36	606-20-2	609/625	0.2	0.4
Di-n-octyl phthalate	69	117-84-0	625	0.3	0.6
1,2-Diphenylhydrazine (<i>as Azobenzene</i>)	37	122-66-7	1625B	5.0	20
Fluoranthene	39	206-44-0	625	0.3	0.6
Fluorene	80	86-73-7	625	0.3	0.6
Hexachlorobenzene	9	118-74-1	612/625	0.3	0.6

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)					
Hexachlorobutadiene	52	87-68-3	625	0.5	1.0
Hexachlorocyclopentadiene	53	77-47-4	1625B/625	0.5	1.0
Hexachloroethane	12	67-72-1	625	0.5	1.0
Indeno(1,2,3- <i>cd</i>)Pyrene	83	193-39-5	610/625	0.5	1.0
Isophorone	54	78-59-1	625	0.5	1.0
3-Methyl cholanthrene		56-49-5	625	2.0	8.0
Naphthalene	55	91-20-3	625	0.3	0.6
Nitrobenzene	56	98-95-3	625	0.5	1.0
N-Nitrosodimethylamine	61	62-75-9	607/625	2.0	4.0
N-Nitrosodi-n-propylamine	63	621-64-7	607/625	0.5	1.0
N-Nitrosodiphenylamine	62	86-30-6	625	0.5	1.0
Perylene		198-55-0	625	1.9	7.6
Phenanthrene	81	85-01-8	625	0.3	0.6
Pyrene	84	129-00-0	625	0.3	0.6
1,2,4-Trichlorobenzene	8	120-82-1	625	0.3	0.6

PRIORITY POLLUTANT	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
DIOXIN					
2,3,7,8-Tetra-Chlorodibenzo-P-Dioxin (2,3,7,8 TCDD)	129	1746-01-6	1613B	1.3 pg/L	5 pg/L

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)¹ µg/L unless specified	Quantitation Level (QL)² µg/L unless specified
PESTICIDES/PCBs					
Aldrin	89	309-00-2	608	0.025	0.05
alpha-BHC	102	319-84-6	608	0.025	0.05
beta-BHC	103	319-85-7	608	0.025	0.05
gamma-BHC (Lindane)	104	58-89-9	608	0.025	0.05
delta-BHC	105	319-86-8	608	0.025	0.05
Chlordane ⁸	91	57-74-9	608	0.025	0.05
4,4'-DDT	92	50-29-3	608	0.025	0.05
4,4'-DDE	93	72-55-9	608	0.025	0.05
4,4' DDD	94	72-54-8	608	0.025	0.05
Dieldrin	90	60-57-1	608	0.025	0.05
alpha-Endosulfan	95	959-98-8	608	0.025	0.05
beta-Endosulfan	96	33213-65-9	608	0.025	0.05
Endosulfan Sulfate	97	1031-07-8	608	0.025	0.05
Endrin	98	72-20-8	608	0.025	0.05
Endrin Aldehyde	99	7421-93-4	608	0.025	0.05
Heptachlor	100	76-44-8	608	0.025	0.05
Heptachlor Epoxide	101	1024-57-3	608	0.025	0.05
PCB-1242 ⁹	106	53469-21-9	608	0.25	0.5
PCB-1254	107	11097-69-1	608	0.25	0.5
PCB-1221	108	11104-28-2	608	0.25	0.5
PCB-1232	109	11141-16-5	608	0.25	0.5
PCB-1248	110	12672-29-6	608	0.25	0.5
PCB-1260	111	11096-82-5	608	0.13	0.5
PCB-1016 ⁹	112	12674-11-2	608	0.13	0.5
Toxaphene	113	8001-35-2	608	0.24	0.5

1. Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.
2. Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to $(1, 2, \text{ or } 5) \times 10^n$, where n is an integer. (64 FR 30417).

ALSO GIVEN AS:

The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

3. Soluble Biochemical Oxygen Demand method note: First, filter the sample through a Millipore Nylon filter (or equivalent) - pore size of 0.45-0.50 um (prep all filters by filtering 250 ml of laboratory grade deionized water through the filter and discard). Then, analyze sample as per method 5210-B.
4. NWTPH Dx - Northwest Total Petroleum Hydrocarbons Diesel Extended Range – see <http://www.ecy.wa.gov/biblio/97602.html> .
5. NWTPH Gx - Northwest Total Petroleum Hydrocarbons Gasoline Extended Range – see <http://www.ecy.wa.gov/biblio/97602.html>
6. 1, 3-dichloroproylene (mixed isomers) You may report this parameter as two separate parameters: cis-1, 3-dichloropropene (10061-01-5) and trans-1, 3-dichloropropene (10061-02-6).
7. Total Benzo(a)fluoranthenes - Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzo(a)fluoranthenes.
8. Chlordane – You may report alpha-chlordane (5103-71-9) and gamma-chlordane (5103-74-2) in place of chlordane (57-74-9). If you report alpha and gamma-chlordane, the DL/PQLs that apply are 0.025/0.050.
9. PCB 1016 & PCB 1242 – You may report these two PCB compounds as one parameter called PCB 1016/1242.

Fact Sheet for NPDES Permit No. WA0020605

CITY OF CHELAN PUBLICLY OWNED TREATMENT WORKS

December 16, 2016

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for City of Chelan Publicly Owned Treatment Works (Chelan).

This fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for Chelan, NPDES Permit No. WA0020605, are available for public review and comment from September 30, 2016 until October 30, 2016. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

Chelan reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, wastewater discharges, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as **Appendix E - Response to Comments**, and publish it when issuing the final NPDES permit. Ecology will not revise the rest of the fact sheet, but the full document will become part of the legal history contained in the facility's permit file.

Summary

The City of Chelan is seeking reissuance of the NPDES Permit for its regional publicly-owned treatment works (POTW). Chelan is located in north-central Washington, in Chelan County, at the southern end of Lake Chelan. The POTW provides wastewater treatment to customers within the City and along the northern and southern shores of the lake.

The Chelan POTW consists of a collection system for the north and south shores of Lake Chelan, transfer pump station, and the secondary treatment plants. The City has operating agreements with sewer districts in outlying areas to provide wastewater treatment to these incorporated and unincorporated areas. The POTW accomplishes secondary-level wastewater treatment utilizing

rotating biological contactors. The POTW discharges disinfected effluent to the nearby Columbia River.

The proposed permit requires compliance with effluent limits and monthly submittal of discharge monitoring reports (DMRs). The proposed limits are unchanged from the previous permit issued in March 18, 2010. In addition, the permit requires submittal of periodic wasteload assessments and infiltration and inflow (I&I) evaluations.

All permit conditions, including effluent limits and dilution factors, are subject to change. Although the criteria for modifying or revoking a permit are detailed in State and Federal regulations, see General Condition G3, actions of the National Marine Fisheries Service to protect endangered species present in the Columbia River may require changes in this permit before its expiration.

EPA requires the permit applicant for a POTW above a design criteria of 1 MGD conduct four (4) Whole Effluent Toxicity (WET) testing and three (3) priority pollutant scans within 4.5 years of the application dates. Therefore, Ecology requires the Chelan POTW to conduct these tests during the permit cycle.

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I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations apply to domestic wastewater NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC)
- Technical criteria for discharges from municipal wastewater treatment facilities (chapter 173-221 WAC)
- Water quality criteria for surface waters (chapter 173-201A WAC)
- Water quality criteria for groundwaters (chapter 173-200 WAC)
- Whole effluent toxicity testing and limits (chapter 173-205 WAC)
- Sediment management standards (chapter 173-204 WAC)
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC)

These rules require any treatment facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for requirements imposed by the permit.

Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050). (See **Appendix A-Public Involvement Information** for more detail about the public notice and comment procedures).

After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in **Appendix E**.

II. Background Information

Table 1 General Facility Information

Facility Information	
Applicant	City of Chelan
Facility Name and Address	City of Chelan Publicly Owned Treatment Works (POTW) 21 Chelan Falls Rd. Chelan, WA 98816
Contact at Facility	Name: Dan Nutley Telephone No. : 509 682 8052
Responsible Official	Name: Mike Cooney Title: Mayor Address: PO Box 1669 Chelan, WA 98816
Type of Treatment	Rotating biological contactors, Aerobic digestion, UV disinfection
Facility Location	Latitude: 47.809204 N Longitude: -119.980599 W
Discharge Waterbody Name and Location	Columbia River: Outfall No. 001 Latitude: 47.80928 N Longitude: -119.97724 W
Permit Status	
Administrative extension date of permit issued March 2010.	April 30, 2015
Application for Permit Renewal Submittal Date	May 15, 2014
Date of Ecology Acceptance of Application	May 16, 2014
Inspection Status	
Date of Last Sampling Inspection	No Date
Date of Last Non-sampling Inspection Date	September 3, 2015

Figure 1 Facility Location Map



Facility Description

The City of Chelan is located at the southeast end of Lake Chelan, just west of the Columbia River, approximately 37 miles north of Wenatchee, Washington. The main, 'secondary' treatment plant is located 2 miles southeast of the City, on the west bank of the river. The original, 'primary' treatment plant is located within the City limits. The POTW provides wastewater treatment to customers within the City and along the northern and southern shores of Lake Chelan.

History

Chelan's POTW was originally constructed and placed into operation as a trickling filter, secondary treatment facility. In 1977-78, the facility was upgraded, which included replacement of portions of the existing collection system, sealing of other portions of the collection system, and replacing the oxidation ditch with an RBC secondary treatment system. An NPDES permit was first issued on July 1, 1977.

An upgrade, completed in 2002, resulted in construction of a third secondary clarifier, installation of a UV disinfection system, a new sludge pumping facility, a new sludge dewatering facility, and an in-vessel sludge composting process. On February 17, 2005, Ecology approved an engineering report, which increased the treatment plant's design criteria. Capacity was again increased in 2011 with a new plan to maintain adequate capacity.

During the course of the current permit (2010-2015) cycle, the following improvements were made at the sewer plant:

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- Installed a new 480 volts 150 amp electrical feed from the operations building to the headwork's building, in conjunction with installation of two rotary grit screens with aerated grit chambers and odor control.
- Added a 2nd primary cell and splitter box.
- Wired one influent pump to the new electrical service.
- In-Channel Drum Screen and upgraded the headwork's structure with larger 16" Parshall flume..
- Upgraded the old wash tank to a bio solids storage tank with a blower and small air bubble diffusers.
- Upgraded some of the electrical panels and ground the headwork panels.
- Installed a new wasting pump and flow meter at the dewatering building and upgraded the operations building.
- Chelan also replaced an Allen Bradley panel view 600 with an Allen Bradley panel view 700.
- Upgraded electrical, installed a backup generator, and odor control at the transfer station.

Collection system status

Constructed in about 1915 the City of Chelan's original sanitary sewer system consisted of a series of trunks and laterals that served the present downtown area. In 1948 the City extended the collection system to include the surrounding developed area as well as the developed portion of the City on the south shore of Lake Chelan. Another major expansion of the sewer system took place in 1956 when the collection system was extended to the developed areas to the east, west, and north of the City. The City also owns and operates a limited storm water sewer system, constructed in the early 1970's, that serves the Central Business District and discharges into Lake Chelan.

The City's collection system consists of 22 miles of gravity sewers, 8 miles of force main, and 14 lift stations, of which two were added in 2002. Many of the older lift stations were constructed in the late 1950's and upgraded by the City in 1984 and during the early 2000's. The City replaced the Webster Avenue submerged lake crossing with the Webster Avenue Bridge crossing in 2013. The grinder pump was replaced with a C-22 pump station at the same time.

North Shore (City and LCRD)

The LCRD maintains a sewer system on the north side of the lake that serves the Manson and Lakeshore areas. The North Shore Interceptor was constructed in 1976 and consists of 7 miles of sewers and 7 lift stations.

The North Shore Interceptor force main has had numerous breaks, some of the incidents resulting in spills of sewage to the lake. In the summer of 1995, the LCRD replaced approximately 1,000 feet of the more problematic section of force main and it replaced another 2,000-foot segment in 1999. In approximately 2003, the Lake Chelan Reclamation District replaced the existing sewer line with 12-inch and 10-inch high density polypropylene lines to the pump station from Manson to Chelan. The City of Chelan also retrofitted the pump station in 2003.

South Shore (LCSD)

The City of Chelan treats sewage from the LCSD. Constructed in 1959 the LCSD collection system consists of more than three miles of asbestos-cement sewers that are buried along the south shore of the lake. The system utilizes five lift stations to convey sewage to the City's collection system.

In 1999 the PUD replaced the low-pressure asbestos-cement force main which serves six LCSD lift stations with a new high-density polypropylene (HDPE) pipe. The pipe is buried in the lake bottom and is under water during periods of high lake levels. Historically, this segment of sewer contributed significantly to the large amounts of infiltration that occurred in the system. The City estimated that replacement of this segment of pipe reduced infiltration to the system by approximately 160,000 gallons per day during the maximum month.

South Shore (City)

Aside from the Webster Avenue crossing improvement, which bypassed CC-1, there may be several lift stations equipped with outdated pumps and the City plans to upgrade or completely replace them as funding becomes available.

Urban Core

Although the collection system serving Chelan's urban core is generally adequate for the immediate future, the City plans to upgrade some 18-inch sewer pipes with 27-inch pipes within the 20-year planning horizon. In 2013, a new 16-inch HDPE sewer pipe was installed from the C-22 location to the Emerson St. and Wapato Avenue intersection. It is assumed other sections of sewer are operating at or near capacity and are scheduled to be replaced, again as funds become available.

Inflow and Infiltration

The July 8, 2013 Wasteload Assessment Report describes inflow and infiltration (I&I) as marginal for a system of this size. Due to the extreme variability in population between the summer and winter deriving an average I&I value against the design criteria is difficult. Based on the analysis the sewer system does experience some I&I, however, the relatively small amount of inflow does not adversely affect any of the waste treatment processes. The report estimates I&I at approximately 2% of inflow capacity with a quarter inch of rain event. In addition, during the summer months, with the Chelan Lake level maintained above the buried sewer lines infiltration may account for an additional 1.5% to 2%.

The rate of BOD loading is gradual and if current rates apply Chelan will not exceed design criteria well into 2030. The rate of TSS loading is a bit steeper and could exceed 85% of design sometime in the mid 2020's.

Treatment processes

Treatment processes at the transfer pump station include grit removal and influent screening. The effluent is pumped to the treatment plant at Chelan Falls. A 3.8 mile pipeline connects the transfer station and the treatment plant. Treatment processes at the treatment plant include, screening and grit removal, primary clarification, rotating biological contactors (RBCs), secondary clarification, ultraviolet (UV) disinfection, an outfall to the Columbia River, aerobic digesters, a sludge dewatering system and drying beds.

The 2000 *City of Chelan Wastewater Facility Plan* provided the descriptive information contained in this section, and much of the fact sheet. The following paragraphs briefly describe the capacity, overall condition and remaining useful life of the collection system and each existing unit process at the primary and secondary treatment plants. The assessments in the plan are based on design year of 2021. A more detailed and comprehensive description of the existing and proposed treatment works is contained in the *Facility Plan*.

Wastewater treatment begins with degritting and screening of influent at the primary treatment plant. The plant's headworks contains two aerated grit chambers and two rotary self-cleaning influent screens. Although there is currently no redundant grit handling equipment for use in the event of a mechanical failure, the assessment conducted for the *Facility Plan* found the existing structures and equipment associated with grit removal to be in good condition and should continue to provide years of relatively trouble-free use. However, the plan predicted the influent screens would reach design capacity in the year 2016 (p. 5-3).

Screened wastewater continues through an underground pipe to the lift station and then to the secondary plant. The flow meter consists of a 12-inch Parshall flume and an ultrasonic level sensor. By changing the calibration of the ultrasonic sensor, the existing influent flow meter will have adequate capacity through the design year 2021.

Screened influent flows into the transfer lift station for pumping to the secondary treatment plant. Partially treated wastewater enters the wet well of the station where 1 50-hp and 3 100-hp centrifugal pumps transfer it to the secondary treatment plant. In 2002, all four pumps are equipped with variable frequency drives and controls. The wet well is relatively small and has historically resulted in short cycling of the pumps. This is no longer a problem as the City equipped two of the pumps with variable frequency drives and controls in 2002.

Partially treated wastewater enters the secondary treatment plant through the Parshall Flume to the primary clarifier. Following primary clarification, wastewater is split evenly between 4 trains of RBCs with each train consisting of 4 RBCs. Each train of RBCs consists of two standard density and two high density media shafts with about 40 percent of their volume submerged in the flowing wastewater. Low pressure air provided by centrifugal blowers enhances treatment and provides air for the RBC air drive system. The design and permitted maximum monthly capacity of the complete treatment system including primary clarification is 5750 lbs. existing

RBC process is 2,200 lbs/day of BOD₅. Historically, the RBC system has received loads as high as 2,800 lbs/day. The plan recommends construction of additional capacity as part of the Phase II treatment plant upgrade. The plan concludes that, if properly operated and maintained, the existing RBCs should continue to provide many years of reliable service (p. 5-7).

Flows from each RBC are combined in a splitter box and evenly distributed among three secondary clarifiers.

The combined secondary effluent from the clarifiers flows through an underground pipe to a concrete flow measurement chamber equipped with a 12-inch Parshall flume, where operators can inject the backup high-concentration chlorine solution to begin the chlorine disinfection process. Flow continues through the backup chlorine contact tank splitter box where the flow is evenly distributed between two UV disinfection tanks. The UV system has a backup generator. An ultrasonic level sensor continuously measures the upstream water depth to determine the flow rate through the flume.

Approved Treatment Plant Upgrade

The City chose to implement improvements to its wastewater treatment facilities in two phases. Completion of Phase I improvements provides adequate capacity to accommodate projected flows and loadings for the foreseeable future. Completion of Phase II improvements during the 2010-2015 timeframe increased the rated capacity of the treatment facilities to accommodate flows and loadings by 50%. The upgrade of the main treatment process, the RBCs, is described in some detail in the following paragraphs.

The Phase I upgrade focused around expanding biological treatment capacity at the treatment plant. The City installed four additional standard density and four additional high density RBC shafts, including fiberglass covers, from the City of Puyallup. By constructing facilities and installing the eight additional RBCs, the upgraded secondary treatment plant can now treat approximately 3,862 lbs/ BOD₅ day of influent treated via the primary clarifier per maximum month. Total suspended solids (TSS) influent capacity is rated at 4439 lbs/Day TSS.

In addition, the City has enhanced the treatment capacity of the upgraded plant by recirculating secondary sludge from the clarifiers to the primary clarifier. Also operators can now recirculate secondary sludge to the front of the RBC bank, thereby wasting sludge regularly to maintain a stable mixed liquor concentration within the RBC tanks. This modification increases the amount of active biomass available to provide biological treatment, thus increasing treatment efficiency. This modification results in a BOD₅ potential influent loading capacity of 5,750 lbs/day. The new design required replacement of the existing air-operated diaphragm secondary sludge pumps with centrifugal sludge pumps, and installation of new sludge piping. The phase II upgrades will improve the plants other component parts to supple this additional capacity and the RBCs.

Completed improvements to other treatment plant processes as described in the *Facility Plan*, pages 6-5 to 6-15 include:

- Installation of new influent and effluent 12-inch Parshall flumes with ultrasonic level sensors to measure the flows in 2002.
- Modifying the existing grit chambers at the primary plant to optimize performance;
- Installation of two new primary clarifiers at the secondary plant, the first is installed and the second will be during Phase II.
- Upgraded transfer pump station at primary plant and a new 12-inch force main to convey sewage to the secondary plant.
- Installation of two new secondary clarifiers at the secondary plant, the first is installed and the second will be during Phase II.
- Installation of a vertical, low-pressure ultraviolet (UV) disinfection system is complete and expansion of the system will occur during Phase II.
- Modification of the diffuser to accommodate higher effluent flows is complete.

Phase II improvements included:

- Installation of screening and degritting systems at the treatment plant.

Degritting, screening, and transfer pumping now occur at the primary plant, and all other treatment processes occur at the transfer lift station. In addition, the facility will treat all sludge generated to Class B biosolids standards utilizing aerobic digestion. The City constructed two aerobic digestion tanks during Phase I.

The City built the upgraded treatment plant to allow the addition of further treatment processes to meet possible future NPDES permit requirements, such as complete nitrification, denitrification, and phosphorus removal. To address the first two possible requirements, it reserved space in the plant configuration to construct fixed film towers or anoxic tanks. In the case of phosphorus, provision was made for removal by chemical precipitation in the primary clarifiers, with space for chemical storage and feed equipment in the new headworks building, constructed at the treatment plant during Phase II (2000 *Facility Plan*, p. 6-34).

Solid wastes/Residual Solids

The treatment plant site contains a sludge dewatering facility, which includes a dewatering centrifuge, a sludge pump, a polymer feed system, dry solids conveyor, a cover for one of the existing drying beds, and supporting systems. The system is capable of processing the aerobically digested sludge generated by the treatment plant. After sludge is treated to Class B standards, it is applied at agricultural sites in Douglas County managed by Boulder Park Incorporated (BPI) in accordance with the King County/BPI *Site Specific Land Application Plan*.

The facility has complied with its Washington State Biosolids Permit.

Paved sludge drying beds are available at the treatment plant site. The City plans to use these drying beds only to dry liquid sludge in the event of a long-term mechanical failure of the sludge dewatering system.

Description of the receiving water

The City of Chelan discharges to the Columbia River. There are no nearby point source outfalls in the area. Significant nearby non-point sources of pollutants include agricultural and road surface runoff.

The ambient background data used for this permit includes the following, taken from Ecology's Environmental Assessment Program (EAP) Station 36A070 - Columbia River near the Vernita Bridge, EAP Station 53A070 - Columbia R @ Grand Coulee, and below the Rocky Reach Dam 1977-2008.

Table 2: Ambient Background Data

Parameter	Value used
Temperature (95 %tile annual) ¹	20.5° C
Temperature Special Columbia River Criterion	20° C
pH (Maximum / Minimum)	8.58 max 6.9 min
Dissolved Oxygen Minimum	9.1 mg/L min
Total Ammonia-N 90 th percentile(Vernita Bridge)	10 µg/L
Fecal Coliform 90 th percentile	5.8 colonies per/100ml
Turbidity 90 th percentile	2.08 NTU
Hardness 90 th percentile	76.9 mg/L as CaCO3
Alkalinity 90 th percentile	67.7 mg/L as CaCO3
Total Ammonia Maximum (Vernita Bridge)	41 µg/L
Nitrate Maximum	630 µg/L
Total Phosphates	140 µg/L

¹ DART data 2006-2015 at Rocky Reach Dam

Wastewater influent characterization

Loadings to the POTW were reported in DMRs submitted to Ecology and are compared with the applicable Phase I design criteria as follows:

Last permit term loadings to the POTW were reported in DMRs submitted to Ecology and are compared with the applicable Phase I design criteria as follows:

Table 3: Influent Characterization

Parameter	February 2005 to August 2009 Characterization		Design Criteria	Maximum Month % of Design Criteria
	Average	Highest Monthly Average	Monthly Average for the Maximum Month	
FLOW MGD	0.765	1.22	1.77	69
BOD ₅ , in lbs/day	1447	2983	3862	77
TSS, in lbs/day	1840	3635	4439	82
Parameter	January 2011 to February 2016 Characterization		Design Criteria	Maximum Month % of Design Criteria
	Average	Highest Monthly Average	Monthly Average for the Maximum Month	
FLOW MGD	0.665	1.060	2.64	40
BOD ₅ , in lbs/day	1021.8	1855.0	4,986	37.2
TSS, in lbs/day	1265.4	2297.0	6,315	36.4

Flow decreased by 13%, BOD loadings decreased by 29.4%, and TSS loadings decreased by 31.2 % from the past DMR in the recent DMR record (1/2013 – 2/2016). The design criteria increased, which coupled with decreases across the board, places the capacity of the plant well suited to meet growth for the next twenty years.

Wastewater effluent characterization

Chelan reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. The tabulated data below represents the quality of the wastewater effluent discharged from April 2009 through May 2014 contrasted with DMR data collected January 2013 to February 2016. The wastewater effluent is characterized as follows:

Table 4 Wastewater Effluent Characterization and Comparison with Previous Permit Term

Parameter	February 2005 to August 2009 Characterization			Existing Permit Limits		Percent of Existing Permit Limits ¹	
	Avg	Max Month Avg	Max Week Avg	Max Month Avg	Max Week Avg	Max Month Avg	Max Week Avg
Flow, in millions gallons per day (MGD)	0.810	1.26	1.39	Not limited	Not limited	Not limited	Not limited
BOD ₅ , in lbs/Day	77.7	163	200	368	552	44	36
TSS, in lbs/Day	74.2	136	262	368	552	40	47
Fecal Coliform Bacteria, in #colonies/100 mL	9.8	27	70	200	400	14	18
Ammonia, in mg/L	2.8	8	9.9	Not limited	Not limited	Not limited	Not limited
Critical Temperature °C ²	22.7	25	26	NA ³	NA	NA	NA
pH Std. Units	7.5 Max	5.6 Min		9 Max	6 Min	NA	NA
Parameter	January 2011 to February 2016 Characterization			Existing Permit Limits		Percent of Existing Permit Limits ¹	
	Avg	Max Month Avg	Max Week Avg	Max Month Avg	Max Week Avg	Max Month Avg	Max Week Avg
Flow, in millions gallons per day (MGD)	0.735	1.230	1.380	Not limited	Not limited	Not limited	Not limited
BOD ₅ , in lbs/Day	75.5	180.8	236	368	552	NA	NA
TSS, in lbs/Day	80.5	162	196	368	552	NA	NA
Fecal Coliform Bacteria, in #colonies/100 mL	11	NA	32	200	400	NA	NA
Ammonia, in mg/L	4.6	NA	25	Not limited	Not limited	Not limited	Not limited
Critical Temperature °C ²	22.8	24	25	NA ³	NA	NA	NA
pH Std. Units	7.5 Max	5.6 Min		9 Max	6 Min	NA	NA

Summary of compliance with previous permit issued

Chelan has consistently been in compliance with the permit conditions ever since 2013 with only one late submittal violation.

The following table summarizes compliance with report submittal requirements over the permit term.

Table 5 Permit Submittals

Submittals

Click on the submittal name to go to the Submittals report. This link will add an additional filter for this submittal type, you may need to uncheck other filters to see all versions of this submittal.

Submittal	Submittal Name	Status	Report Date ▼	Due Date	Received	Approved	Approved Date	Reviewer
Application for Permit Renewal (Individual Permit)	APPLICATION FOR PERMIT RENEWAL	Accepted	-	04/30/2014	04/30/2014	Y	05/16/2014	-
Other	COLLECTION SYSTEM EXFILTRATION PREVENT PLAN	Received	-	12/01/2010	11/23/2010	Y	11/29/2010	-
O&M - Operation And Maintenance Manual	OPERATION AND MAINTENANCE MANUAL	-	-	04/30/2015	-	-	-	-
Wasteload Assessment	Wasteload Assessment	Received	07/08/2013	09/01/2013	07/11/2013	N	07/11/2013	-
Wasteload Assessment	Wasteload Assessment	Received	04/30/2010	09/01/2013	05/07/2010	N	-	-
Signatory Requirements	SIGNATORY REQUIREMENTS - G1	Received	03/22/2010	04/30/2015	03/25/2010	N	-	-
Wasteload Assessment	Wasteload Assessment	Received	01/01/2010	09/01/2013	07/12/2013	N	-	-
Infiltration And Inflow Evaluation	INFILTRATION AND INFLOW EVALUATION	Received	01/01/2010	09/01/2013	07/12/2013	N	-	-
Download								
1								

State environmental policy act (SEPA) compliance

The State Environmental Policy Act (SEPA), as presented in WAC 197-11-960, requires all governmental agencies to ensure that applicable environmental concerns are addressed in the process of project planning and documentation. Projects that have potential environmental impacts must complete a SEPA Checklist to satisfy planning and disclosure requirements. The 2008 Sewer Plan included a SEPA Checklist that was prepared including these Phase II improvements.

III. Proposed Permit Limits

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).

Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC), or the National Toxics Rule (40 CFR 131.36).

Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Ecology does not usually develop limits for pollutants not reported in the permit application but may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology if significant changes occur in any constituent [40 CFR 122.42(a)]. Until Ecology modifies the permit to reflect additional discharge of pollutants, a permitted facility could be violating its permit.

A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology-approved design criteria for this facility's treatment plant were obtained from the September, 2008 *City of Chelan Wastewater Treatment Facilities Engineering Report* prepared by Grey and Osborne and are as follows:

Table 6 Design Criteria for the Chelan POTW

Parameter	Phase I	Phase II
Maximum monthly flow (MGD)	1.77	2.64
Maximum daily flow (MGD)	2.13	2.94
Peak hourly flow (MGD)	2.93	4.32
BOD ₅ influent loading, maximum month (lbs/day)	3,862	4,986
TSS influent loading, maximum month (lbs/day)	4,439	6,315

The limits contained in the proposed permit are based on Phase II upgrades contained in City of Chelan Plans and Specifications prepared by Gray and Osborne, Inc. and approved by Ecology February 16, 2012.

B. Technology-based effluent limits

Federal and state regulations define technology-based effluent limits for municipal wastewater treatment plants. These effluent limits are given in 40 CFR Part 133 (federal) and in chapter 173-221 WAC (state). These regulations are performance standards that constitute all known, available, and reasonable methods of prevention, control, and treatment (AKART) for municipal wastewater.

Table 7 Technology-Based Limits

Parameter	Limit
pH	The pH must measure within the range of 6.0 to 9.0 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
BOD ₅ (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L

Ecology derived the technology-based monthly average limit for chlorine from standard operating practices. The Water Pollution Control Federation's *Chlorination of Wastewater* (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/L chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, *Wastewater Engineering, Treatment, Disposal and Reuse*, Third Edition, 1991. A treatment plant that provides adequate chlorination contact time can meet the 0.5 mg/L chlorine limit on a monthly average basis. According to WAC 173-221-030(11)(b), the corresponding weekly average is 0.75 mg/L.

Table 8 Chlorine Technology-Based Limit

Parameter	Average Monthly Limit	Average Weekly Limit
Chlorine mg/L	0.5 mg/L	0.75 mg/L
Chlorine lbs/Day	11 lbs/Day	16.5 lbs/Day

Technology-based mass limits are based on WAC 173-220-130(3)(b), WAC 173-221-030(11)(b), WAC 173-220-130(1)(a) and (g), and WAC 173-221-040(1). Ecology calculated the monthly and weekly average mass limits for BOD₅ and Total Suspended Solids as follows:

$$\begin{aligned} \text{Average Monthly Mass Effluent Limit} &= \text{Influent Mass Design Loading Criteria (lb/day)} \times 0.15 \\ \text{Average Weekly Mass Effluent Limit} &= 1.5 \times \text{Average Monthly Mass Effluent TSS Limit} \end{aligned}$$

BOD₅

Monthly effluent mass loadings (lbs/day) were calculated as the **maximum monthly influent design loading (4,986 lbs/day) x 0.15 = 748 lbs/day**.

The weekly average effluent mass loading is calculated as 1.5 x monthly effluent loading = **1,122 lbs/day**.

TSS

Monthly effluent mass loadings (lbs/day) were calculated as the **maximum monthly influent design loading (6,315 lbs/day) x 0.15 = 947.3 lbs/day**.

The weekly average effluent mass loading is calculated as 1.5 x monthly effluent loading = **1,421 lbs/day**.

Technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b). Ecology calculated the monthly and weekly average mass limits for BOD₅ and Total Suspended Solids as follows:

$$\begin{aligned} \text{Mass Limit} &= \text{CL} \times \text{DF} \times \text{CF} \\ \text{where:} \\ \text{CL} &= \text{Technology-based concentration limits listed in the above table} \\ \text{DF} &= \text{Maximum Monthly Average Design flow (MGD)} \\ \text{CF} &= \text{Conversion factor of 8.34} \end{aligned}$$

Limit Calculation Based on Technological Concentration Limits 30 mg/L and 45 mg/L

BOD₅

Monthly effluent mass loadings (lbs/day) were calculated as the Maximum Monthly average concentration limit of 30 mg/L and the Daily Maximum limit of 45 mg/L times Maximum Monthly Flow Criteria 2.64 MGD

$$\begin{aligned} 30 \text{ mg/L} \times 2.64 \text{ MGD} \times \text{conversion factor } 8.34 &= 661 \text{ lbs/Day} \\ 45 \text{ mg/L} \times 2.64 \text{ MGD} \times \text{conversion factor } 8.34 &= 991 \text{ lbs/Day} \end{aligned}$$

TSS

Monthly effluent mass loadings (lbs/day) were calculated as the Maximum Monthly average concentration limit of 30 mg/L and the Daily Maximum limit of 45 mg/L times Maximum Monthly Flow Criteria 2.64 MGD

$$\begin{aligned} 30 \text{ mg/L} \times 2.64 \text{ MGD} \times \text{conversion factor } 8.34 &= 661 \text{ lbs/Day} \\ 45 \text{ mg/L} \times 2.64 \text{ MGD} \times \text{conversion factor } 8.34 &= 991 \text{ lbs/Day} \end{aligned}$$

Table 9 Technology-based Mass Limits

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
BOD ₅ Monthly Average	30	661
BOD ₅ Weekly Average	45	991
TSS Monthly Average	30	661
TSS Weekly Average	45	991

C. Surface water quality-based effluent limits

The Washington State surface water quality standards (chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

Numerical criteria for the protection of aquatic life and recreation

Numerical water quality criteria are listed in the water quality standards for surface waters (chapter 173-201A WAC). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numerical criteria for the protection of human health

The U.S. EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (EPA, 1992). These criteria are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2006) and of all marine waters (WAC 173-201A-210, 2006) in the state of Washington.

Antidegradation

Description--The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

Facility Specific Requirements--This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in chapter 173-201A WAC.
- For waters that do not meet assigned criteria, or protect existing or designated uses, Ecology will take appropriate and definitive steps to bring the water quality back into compliance with the water quality standards.
- Whenever the natural conditions of a water body are of a lower quality than the assigned criteria, the natural conditions constitute the water quality criteria. Where water quality criteria are not met because of natural conditions, human actions are not allowed to further lower the water quality, except where explicitly allowed in chapter 173-201A WAC.

Ecology's analysis described in this section of the fact sheet demonstrates that the proposed permit conditions will protect existing and designated uses of the receiving water.

In addition to the low impact to water quality caused by Chelan's POTW effluent, its operation is necessary and in the overriding public interest. The POTW provides for the prevention or remediation of environmental or public health threats through domestic wastewater treatment and sanitation.

The facility is not planning a major upgrade at this time and a Tier II analysis is not required.

The facility is under one ongoing total maximum daily load (TMDL) process, for DDT/PCB.

The facility is meeting Tier I requirements.

Mixing zones

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones the pollutant concentrations may exceed water quality numeric standards, so long as the discharge doesn't interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.) The pollutant concentrations outside of the mixing zones must meet water quality numeric standards.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART). Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and must not use more than 25% of the available width of the water body for dilution [WAC 173-201A-400 (7)(a)(ii-iii)].

Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 10 means the effluent is 10% and the receiving water is 90% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Each aquatic life *acute* criterion is based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years. Each aquatic life *chronic* criterion is based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions. These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two liters/day for drinking water.
- A one-in-one-million cancer risk for carcinogenic chemicals.

This permit authorizes a small acute mixing zone, surrounded by a chronic mixing zone around the point of discharge (WAC 173-201A-400). The water quality standards impose certain conditions before allowing the discharger a mixing zone:

1. Ecology must specify both the allowed size and location in a permit.

The proposed permit specifies the size and location of the allowed mixing zone (as specified below).

2. The facility must fully apply “all known, available, and reasonable methods of prevention, control and treatment” (AKART) to its discharge.

Ecology has determined that the treatment provided at the Chelan WWTP meets the requirements of AKART (see “Technology-based Limits”).

Ecology must consider critical discharge conditions.

Surface water quality-based limits are derived for the water body's critical condition (the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or designated waterbody uses). The critical discharge condition is often pollutant-specific or waterbody-specific. Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water.

Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at:
<https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html>.

Ecology used the following critical conditions to model the discharge at outfall No. 001 with Cormix GT 9.0.

- The seven day average low river flow with a recurrence interval of ten years (7Q10) 44,800 cfs.
- River depth of 20 feet at the 7Q10 period
- River Velocity of 1.0 ft per second
- Manning Roughness coefficient 0.030
- Channel width of 1,250 feet.
- Maximum average monthly effluent flow of 1.26 MGD for chronic and human health non-carcinogen
- Annual average flow of 0.735 MGD for human health carcinogen
- Maximum daily flow of 1.39 MGD for acute mixing zone
- Assumed a 20 °C ambient temperature and an extreme effluent temperature of 30 °C to demonstrate the unlikelihood of a temperature violation.
- Ambient pH maximum 8.6. Effluent max pH 7.9
- Ambient data at critical conditions near the outfall was taken from various sources including the USGS river monitoring station on the Okanogan River at Okanogan and Malott, DART river data at Rocky Reach Forebay, Ecology's

environmental assessment program and the previous permit companion fact sheet.

3. Supporting information must clearly indicate the mixing zone would not:

- Have a reasonable potential to cause the loss of sensitive or important habitat.
- Substantially interfere with the existing or characteristic uses.
- Result in damage to the ecosystem.
- Adversely affect public health.

Ecology established Washington State water quality criteria for toxic chemicals using EPA criteria. EPA developed the criteria using toxicity tests with numerous organisms and set the criteria to generally protect the species tested and to fully protect all commercially and recreationally important species.

EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for one hour. They set chronic standards assuming organisms are exposed to the pollutant at the criteria concentration for four days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of discharge.

The discharge plume does not impact drifting and non-strong swimming organisms because they cannot stay in the plume close to the outfall long enough to be affected. Strong swimming fish could maintain a position within the plume, but they can also avoid the discharge by swimming away. Mixing zones generally do not affect benthic organisms (bottom dwellers) because the buoyant plume rises in the water column. Ecology has additionally determined that the effluent will not exceed 33 degrees C for more than two seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

Ecology evaluates the cumulative toxicity of an effluent by testing the discharge with whole effluent toxicity (WET) testing.

Because this is a domestic wastewater discharge, the effluent contains fecal coliform bacteria. Ecology developed the water quality criteria for fecal coliforms (discussed below) to assure that people swimming (primary contact recreation) in water meeting the criteria would not develop gastro enteric illnesses. Ecology has authorized a mixing zone for this discharge and used a simple dilution model to determine the fecal coliform concentration at the edge of the chronic mixing zone.

Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics, and the discharge location. Based on this review, Ecology concluded that the discharge does not have a reasonable potential to

cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem, or adversely affect public health if the permit limits are met.

4. The discharge/receiving water mixture must not exceed water quality criteria outside the boundary of a mixing zone.

Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant and concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone if permit limits are met.

5. The size of the mixing zone and the concentrations of the pollutants must be minimized.

At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. The plume mixes as it rises through the water column therefore much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge. Ecology determined it is impractical to specify in the permit the actual, much more limited volume in which the dilution occurs as the plume rises and moves with the current.

Ecology minimizes the size of mixing zones by requiring dischargers to install diffusers when they are appropriate to the discharge and the specific receiving waterbody. When a diffuser is installed, the discharge is more completely mixed with the receiving water in a shorter time. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95th percentile pollutant concentration, the 90th percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

Because of the above reasons, Ecology has effectively minimized the size of the mixing zone authorized in the proposed permit.

6. Maximum size of mixing zone.

The authorized mixing zone does not exceed the maximum size restriction.

7. Acute mixing zone.

- **The discharge/receiving water mixture must comply with acute criteria as near to the point of discharge as practicably attainable.**

Ecology determined the acute criteria will be met at 10% of the distance of the chronic mixing zone at the ten year low flow.

- **The pollutant concentration, duration, and frequency of exposure to the discharge will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.**

As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration. Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration. The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organisms near the point of discharge (below the rising effluent).

- **Comply with size restrictions.**

The mixing zone authorized for this discharge complies with the size restrictions published in chapter 173-201A WAC.

8. Overlap of mixing zones.

This mixing zone does not overlap another functioning mixing zone.

D. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). Criteria applicable to this facility's discharge are summarized below in Table 5.

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for, the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The Aquatic Life Uses for this receiving water are identified below.

Table 10: Aquatic Life Uses & Associated Criteria

Salmonid Spawning, Rearing, and Migration	
Temperature Criteria – Highest 1 DAY MAX	20°C (63.5°F) Columbia River Special Criterion
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	Shall exceed 90 percent of saturation
Turbidity Criteria	<ul style="list-style-type: none"> • 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU
Total Dissolved Gas Criteria	Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection
pH Criteria	pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units

- The recreational uses are extraordinary primary contact recreation, primary contact recreation, and secondary contact recreation. The recreational uses for this receiving water are identified below.

Table 11: Recreational Uses and Associated Criteria

Recreational Use	Criteria
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL

- The **water supply uses** are domestic, agricultural, industrial, and stock watering.
- The **miscellaneous freshwater uses** are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

E. Water quality impairments

In September 2002, the U.S. Environmental Protection Agency (EPA) Region 10 issued a Preliminary Draft Temperature TMDL for the Columbia and Snake Rivers. This preliminary

draft TMDL identified the Columbia River dams as the primary contributor to thermal loads in the river system. The EPA has not finalized the TMDL or taken any further action.

Approximately 2 miles downriver of the Chelan wastewater plant, the Columbia River is listed impaired for 20 parameters including pesticides, DDTs, PCBs, and Mercury. Up river lies Lake Pateros with temperature impairment. The Chelan plant is not in an impaired reach of the Columbia.

F. Evaluation of surface water quality-based effluent limits for numeric criteria

Ecology has authorized a mixing zone in the permit: Outfall No. 001

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biochemical oxygen demand (BOD₅) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

With technology-based controls (AKART), predicted pollutant concentrations in the discharge exceed water quality criteria. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones by chapter 173-201A WAC.

The diffuser at Outfall No. 001 is 25 feet long with a diameter of 18 inches. The end of the 18-inch pipe is equipped with a manifold to which the diffuser is attached. The diffuser has a total of 4 side by side 8-inch inch diameter ports. The diffuser depth is 5 feet.

Outfall No. 001 Chronic Mixing Zone--WAC 173-201A-400(7)(a) specifies that mixing zones must not extend in a downstream direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports or extend upstream for a distance of over 100 feet, not utilize greater than 25% of the flow, and not occupy greater than 25% of the width of the water body.

The horizontal length of the chronic mixing zone is 100 feet in the downstream direction and 10 feet in the upstream direction with a width of 27 feet. The mixing zone extends from the river bottom to the water surface.

Outfall No. 001 Acute Mixing Zone--WAC 173-201A-400(8)(a) specifies that in rivers and streams a zone where acute toxics criteria may be exceeded must not extend beyond 10% of the distance towards the upstream and downstream boundaries of the chronic zone, not use

greater than 2.5% of the flow and not occupy greater than 25% of the width of the water body.

The acute mixing zone for Outfall No. 001 extends 10 feet in the downstream direction and 1 foot in the upstream direction with a width of 20.0 feet. The flow volume restriction resulted in a smaller chronic dilution factor than the distance downstream.

Ecology determined the impacts of dissolved oxygen deficiency, pH, fecal coliform, ammonia, metals, and temperature as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

Dissolved Oxygen--BOD₅ and Ammonia Effects--Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Biochemical Oxygen Demand (BOD₅) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand potential in the receiving water.

With technology-based limits, this discharge results in a small amount of biochemical oxygen demand (BOD₅) relative to the large amount of dilution in the receiving water at critical conditions. Technology-based limits will ensure that dissolved oxygen criteria are met in the receiving water.

pH--Ecology modeled the impact of the effluent pH on the receiving water using the calculations from EPA, 1988, and the chronic dilution factor tabulated above. **Appendix E** includes the model results.

Fecal Coliform—Chelan has demonstrated it can reliably meet the water quality standard for fecal coliforms for primary contact recreation in the discharge. Therefore, the proposed permit includes the primary contact recreation standard for fecal coliform as a performance-based (technology-based) effluent limit for fecal coliform bacteria colonies per 100 mls of effluent of 100/200.

Turbidity--Ecology evaluated the impact of turbidity based on the range of total suspended solids in the effluent and turbidity of the receiving water. Ecology expects no violations of the turbidity criteria outside the designated mixing zone provided the facility meets its technology-based total suspended solids permit limits.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require Ecology to place limits in NPDES permits on toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. Ecology does not exempt

facilities with technology-based effluent limits from meeting the surface water quality standards.

The following toxics were determined to be present in the discharge: ammonia and potentially chlorine in an emergency situation. Ecology modelled chlorine and ammonia for reasonable potential to exceed the water quality criteria. No reasonable potential exists for these two compounds.

Ammonia & Chlorine

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature and pH in the receiving freshwater. To evaluate ammonia toxicity, Ecology used the available receiving water information for ambient stations at the Grand Coulee dam and the Vernita Bridge.

Ecology determined that ammonia poses no reasonable potential to exceed the water quality criteria of chronic 1.77 mg/L and acute 0.248 mg/L at the critical condition using procedures given in EPA, 1991 (**Appendix D**) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

The Permittee does not use chlorine disinfection and has not for over ten years. Therefore chlorine use is not factored in the permit.

Temperature--The state temperature standards [WAC 173-201A-200-210 and 600-612] include multiple elements:

- Annual summer maximum threshold criteria (June 15 to September 15)
- Supplemental spawning and rearing season criteria (September 15 to June 15)
- Incremental warming restrictions
- Protections against acute effects

Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits.

- Annual summer maximum and supplementary spawning/rearing criteria
Each water body has an annual maximum temperature criterion [WAC 173-201A-200(1)(c), 210(1)(c), and Table 602]. These threshold criteria (e.g., 12, 16, 17.5, 20°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

Some waters have an additional threshold criterion to protect the spawning and incubation of salmonids (9°C for char and 13°C for salmon and trout) [WAC 173-201A-602, Table 602]. These criteria apply during specific date-windows.

The threshold criteria apply at the edge of the chronic mixing zone. Criteria for most fresh waters are expressed as the highest 7-Day average of daily maximum temperature (7-DADMax). The 7-DADMax temperature is the arithmetic average of seven consecutive measures of daily maximum temperatures. Criteria for marine waters and some fresh waters are expressed as the highest 1-Day annual maximum temperature (1-DMax).

The Columbia River has a daily maximum temperature criterion of 20 °C.

- Incremental warming criteria

The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii), 210(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment. These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

At locations and times when a threshold criterion is being exceeded due to natural conditions, all human sources, considered cumulatively, must not warm the water more than 0.3 °C above the naturally warm condition.

When Ecology has not yet completed a TMDL, our policy allows each point source to warm water at the edge of the chronic mixing zone by 0.3 °C. This is true regardless of the background temperature and even if doing so would cause the temperature at the edge of a standard mixing zone to exceed the numeric threshold criteria. Allowing a 0.3 °C warming for each point source is reasonable and protective where the dilution factor is based on 25% or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3 °C cumulative allowance (0.075 °C or less) for all human sources combined.

- Protections for temperature acute effects

Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C, unless a dilution analysis indicates ambient temperatures will not exceed 33°C two seconds after discharge.

General lethality and migration blockage: Measurable (0.3°C) increases in temperature at the edge of a chronic mixing zone are not allowed when the receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.

Lethality to incubating fish: Human actions must not cause a measurable (0.3°C) warming above 17.5°C at locations where eggs are incubating.

Ecology determined no reasonable potential exists for the effluent to violate the water temperature criterion. Therefore a permit temperature limit is not required.

Continuous Temperature Data Collection Not Required: Ecology has sufficient information on the temperature of the effluent to determine compliance with water quality criteria for temperature. The proposed permit does not require Chelan to continuously monitor effluent temperature; however a single grab sample taken at the hottest time of the day is required. Chelan may elect to use continuous monitoring and report the results to Ecology.

G. Human health

Washington's water quality standards include 91 numeric human health-based criteria that Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

Ecology determined the design criteria of the Chelan POTW is over 1 MGD, and therefore is required to conduct at least three (3) of priority pollutant scans during the permit term as listed in 40 CFR Part 423--126 Appendix A-Priority Pollutants. Methods and QA/QC procedures must be in accordance with 40 CFR Part 136.

H. Whole effluent toxicity

The water quality standards for surface waters forbid discharge of effluent that has the potential to cause toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

- *Acute toxicity tests measure mortality as the significant response to the toxicity of the effluent.* Dischargers who monitor their wastewater using acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.
- *Chronic toxicity tests measure various sub lethal toxic responses*, such as reduced growth or reproduction. Chronic toxicity tests often involve either a complete life cycle test on

an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

Using the screening criteria in WAC 173-205-040, Ecology determined that Chelan's effluent does not have the potential to cause aquatic toxicity. The proposed permit contains WET testing requirements as authorized by RCW 90.48.520 and 40 CFR 122.44, using procedures from WAC 173-205, in order to meet EPA NPDES for plant with a design criterion of 1 MGD or more application requirements. The proposed permit requires the facility to conduct WET testing at prescribed intervals during the permit term, to characterize both the acute and chronic toxicity of the effluent.

If the year of WET testing shows acute or chronic toxicity levels that have a reasonable potential to cause receiving water toxicity, then the proposed permit will:

- Set a limit on acute or chronic toxicity.
- Require this facility operator to conduct WET testing to monitor compliance with an acute toxicity limit, a chronic toxicity limit, or both.
- Specify the procedures the facility operator must use to come back into compliance if toxicity exceeds the limits.

Laboratories accredited by Ecology for WET testing know how to use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know how to calculate an NOEC, LC50, EC50, IC25, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (<https://fortress.wa.gov/ecy/publications/SummaryPages/9580.html>), which is referenced in the permit. Ecology recommends that each regulated facility send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

If the WET tests conducted during effluent characterization indicate no reasonable potential for effluent discharges to cause receiving water toxicity, the proposed permit limits do not apply. The facility must retest the effluent prior to submitting an application for permit renewal (to demonstrate that effluent toxicity has not increased).

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization. Chelan may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing and or chemical analyses after the process or material changes have been made. Ecology recommends that the Permittee check with it first to make sure that Ecology will consider the demonstration adequate to support a decision to not require an additional effluent characterization.

- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that toxicity in the effluent has increased.

I. Comparison of effluent limits with the previous permit issued on February 25, 2009

The proposed permit limits are basically identical to the final limits contained in the previous permit issued February 25, 2009, except for chlorine. Loading limits have been adjusted to reflect increased design criteria for flow, BOD, and TSS influent loading Chelan maintains the capability to disinfect the effluent via chlorine. While the possibility of needing chlorine is remote, the limit will allow the Permittee to discharge chlorinated effluent in emergency situations. The chlorine maximum daily limit has been change to weekly max average of 750 µg/L and the average monthly limit remains at 500 µg/L. The permit reapplication process does require additional monitoring for Priority Pollutants and Whole Effluent Toxicity (WET) testing during the proposed permit cycle.

Table 12 Comparison of Previous and Proposed Effluent Limits

		Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
Parameter	Basis of Limit	Average Monthly	Average Weekly	Average Monthly	Average Weekly
Biochemical Oxygen Demand (5-day)	Tech	30 mg/L 443 lbs/day	45 mg/L 664 lbs/day	30 mg/L 661 lbs/day	45 mg/L 991 lbs/day
Total Suspended Solids	Tech	30 mg/L 443 lbs/day	45 mg/L 664 lbs/day	30 mg/L 661 lbs/day	45 mg/L 991 lbs/day
pH	Tech	Daily minimum is equal to or greater than 6 and the daily maximum is less than or equal to 9.		Daily minimum is equal to or greater than 6 and the daily maximum is less than or equal to 9.	
Parameter		Average Monthly	Max Daily	Ave Monthly	Weekly Avg
Total Residual Chlorine	Technology	1.0 mg/L	0.5 mg/L	0.5 mg/L	0.75 mg/L
Parameter		Monthly Geometric Mean Limit	Weekly Geo Mean Limit	Monthly Geo Mean Limit	Weekly Geometric Mean Limit
Fecal Coliform Bacteria	Technology	200cfu /100ml	400cfu /100ml	100cfu /100ml	200cfu /100ml

Monitoring Requirements

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits.

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

A. Wastewater monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. A. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (Publication Number 92-09) for Secondary treatment, activated sludge with extended aeration.


Ecology had included some additional monitoring of nutrients, conventional pollutants, and temperature in the current permit to establish a baseline for this discharger. Ecology believes enough data has been collected to adequately characterize the effluent and will suspend this monitoring. At the end of the permit term Ecology will reevaluate the need for additional monitoring.

Monitoring of sludge quantity and quality is necessary to determine the appropriate uses of the sludge. Biosolids monitoring is required by the current state and local solid waste management program and also by EPA under 40 CFR 503.

B. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of chapter 173-50 WAC, Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters). Ecology accredited the laboratory at this facility for:

Table 13 Chelan Laboratory Certifications



DEPARTMENT of

ECOLOGY

State of Washington

Lab Search

[Home](#)
[LabName](#)
[Matrix](#)
[Analyte](#)
[Method](#)
[WA City](#)
[WA County](#)
[State](#)
[Accepts General Public/Commercial Samples](#)
[Advanced](#)
[Help](#)

Laboratory Name:

Chelan Wastewater Treatment Plant Laboratory

▼

Select Lab by Name

Copy Results to Clipboard

Chelan Wastewater Treatment Plant Laboratory

21 Chelan Falls Rd

Chelan, WA 98816

Contact: Dan Nutley Phone: (509) 682-8052

Tests internal samples only

Accreditation #:

Revision Date:

Expiration Date:

County:

EPA_ID:

W708-15

6/21/2015

06/20/2016

Chelan

WA00089

State	City	CompanyName	MatrixDescription	Matrix	Category	MethodName	MethodCode	AnalyteName	AnalyteID
WA	Chelan	Chelan Wastewater Treatment Plant Laboratory	Non-Potable Water	N	General Chemistry	SM 2540 D-97	20051201	Solids, Total Suspended	1960
WA	Chelan	Chelan Wastewater Treatment Plant Laboratory	Non-Potable Water	N	General Chemistry	SM 4500-H+ B-00	20105219	pH	1900
WA	Chelan	Chelan Wastewater Treatment Plant Laboratory	Non-Potable Water	N	General Chemistry	SM 4500-O G-01	20121408	Dissolved Oxygen	1880
WA	Chelan	Chelan Wastewater Treatment Plant Laboratory	Non-Potable Water	N	General Chemistry	SM 5210 B-01	20135006	Biochemical Oxygen Demand (BOD)	1530
WA	Chelan	Chelan Wastewater Treatment Plant Laboratory	Non-Potable Water	N	Microbiology	SM 9222 D (m-FC)-97	20210008	Fecal coliform-count	2530

Ecology Home | Accreditation Home | Contacts

LabSearch Version: 1.1

IV. Other Permit Conditions

A. Reporting and record keeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

B. Prevention of facility overloading

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the City of Chelan to:

- Take the actions detailed in proposed permit Special Condition S4.
- Design and construct expansions or modifications before the treatment plant reaches existing capacity.
- Report and correct conditions that could result in new or increased discharges of pollutants.

Special Condition S.4 restricts the amount of flow.

If a municipality intends to apply for Ecology-administered funding for the design or construction of a facility project, the plan must meet the standard of a “Facility Plan”, as defined in WAC 173-98-030. A complete “Facility Plan” includes all elements of an

“Engineering Report” along with State Environmental Review Process (SERP) documentation to demonstrate compliance with 40 CFR 35.3140 and 40 CFR 35.3145, and a cost effectiveness analysis as required by WAC 173-98-730. The municipality should contact Ecology’s regional office as early as practical before planning a project that may include Ecology-administered funding.

C. Operation and maintenance

The proposed permit contains Special Condition S.5 as authorized under RCW 90.48.110, WAC 173-220-150, chapter 173-230 WAC, and WAC 173-240-080. Ecology included it to ensure proper operation and regular maintenance of equipment, and to ensure that Chelan takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment.

D. Pretreatment

Duty to enforce discharge prohibitions

This provision prohibits the publicly owned treatment works (POTW) from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer.

- The first section of the pretreatment requirements prohibits the POTW from accepting pollutants which causes “pass-through” or “interference”. This general prohibition is from 40 CFR §403.5(a). **Appendix C** of this fact sheet defines these terms.
- The second section reinforces a number of specific state and federal pretreatment prohibitions found in WAC 173-216-060 and 40 CFR §403.5(b). These reinforce that the POTW may not accept certain wastes, which:
 - a. Are prohibited due to dangerous waste rules.
 - b. Are explosive or flammable.
 - c. Have too high or low of a pH (too corrosive, acidic or basic).
 - d. May cause a blockage such as grease, sand, rocks, or viscous materials.
 - e. Are hot enough to cause a problem.
 - f. Are of sufficient strength or volume to interfere with treatment.
 - g. Contain too much petroleum-based oils, mineral oil, or cutting fluid.
 - h. Create noxious or toxic gases at any point.

40 CFR Part 403 contains the regulatory basis for these prohibitions, with the exception of the pH provisions which are based on WAC 173-216-060.

- The third section of pretreatment conditions reflects state prohibitions on the POTW accepting certain types of discharges unless the discharge has received prior written

authorization from Ecology. These discharges include:

- a. Cooling water in significant volumes.
- b. Stormwater and other direct inflow sources.
- c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment.

Federal and state pretreatment program requirements

Ecology administers the Pretreatment Program under the terms of the addendum to the “Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10” (1986) and 40 CFR, part 403. Under this delegation of authority, Ecology issues wastewater discharge permits for significant industrial users (SIUs) discharging to POTWs which have not been delegated authority to issue wastewater discharge permits. Ecology must approve, condition, or deny new discharges or a significant increase in the discharge for existing significant industrial users (SIUs) [40 CFR 403.8 (f)(1)(i) and(iii)].

Industrial dischargers must obtain a permit from Ecology before discharging waste to the Chelan wastewater treatment plant [WAC 173-216-110(5)]. Industries discharging wastewater that is similar in character to domestic wastewater do not require a permit.

Routine identification and reporting of industrial users

The permit requires non-delegated POTWs to take “continuous, routine measures to identify all existing, new, and proposed significant industrial users (SIUs) and potential significant industrial users (PSIUs)” discharging to their sewer system. Examples of such routine measures include regular review of water and sewer billing records, business license and building permit applications, advertisements, and personal reconnaissance. System maintenance personnel should be trained on what to look for so they can identify and report new industrial dischargers in the course of performing their jobs. The POTW may not allow SIUs to discharge prior to receiving a permit, and must notify all industrial dischargers (significant or not) in writing of their responsibility to apply for a State Waste Discharge Permit. The POTW must send a copy of this notification to Ecology.

E. Solid wastes

To prevent water quality problems the facility is required in permit Special Condition S7 to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and state water quality standards. The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under chapter 70.95J RCW, chapter 173-308 WAC “Biosolids Management,” and chapter 173-350 WAC “Solid Waste Handling Standards.” The disposal

of other solid waste is under the jurisdiction of the Chelan/Douglas County Health Department.

Requirements for monitoring sewage sludge and record keeping are included in this permit. Ecology will use this information, required under 40 CFR 503, to develop or update local limits.

F. General conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual domestic wastewater NPDES permits issued by Ecology.

Permit Issuance Procedures

G. Permit modifications

Ecology may modify this permit to impose numerical limits, if necessary to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for groundwaters, based on new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies. Ecology may also modify this permit to comply with new or amended state or federal regulations.

H. Proposed permit issuance

This proposed permit meets all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of 5 years.

VI. References for Text and Appendices

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.

1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling*. USEPA Office of Water, Washington, D.C.

1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.

1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C.

Tsivoglou, E.C., and J.R. Wallace.

1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

December 2011. *Permit Writer's Manual*. Publication Number 92-109
(<https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html>)

Laws and Regulations (<http://www.ecy.wa.gov/laws-rules/index.html>)

Permit and Wastewater Related Information
(<http://www.ecy.wa.gov/programs/wq/permits/guidance.html>)

Water Pollution Control Federation.

1976. *Chlorination of Wastewater*.

Wright, R.M., and A.J. McDonnell.

1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(E2). (Cited in EPA 1985 op.cit.)

Appendix A--Public Involvement Information

Ecology proposes to reissue a permit to the Chelan POTW. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology will place a Public Notice of Draft on September 30, 2016 in the Wenatchee World to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Tells where copies of the draft permit and fact sheet are available for public evaluation (a local public library, the closest regional or field office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Asks people to tell us how well the proposed permit would protect the receiving water.
- Invites people to suggest fairer conditions, limits, and requirements for the permit.
- Invites comments on Ecology's determination of compliance with antidegradation rules.
- Urges people to submit their comments, in writing, before the end of the comment period.
- Tells how to request a public hearing about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

NOTICE: ANNOUNCEMENT OF AVAILABILITY OF DRAFT PERMIT
PERMIT NO.: WA0020605
APPLICANT: CITY OF CHELAN

The City of Chelan POTW has applied for renewal of National Pollutant Discharge Elimination System (NPDES) Permit No. WA0020605 in accordance with the provisions of Chapter 90.48 Revised Code of Washington (RCW), Chapter 173-220 Washington Administrative Code (WAC), and the Federal Clean Water Act.

Following evaluation of the application and other available information, a draft permit has been developed which would allow the discharge of treated domestic wastewater to a monthly maximum of 2.64 million gallons per day (mgd) to the Columbia River from its facility located at 21 Chelan Falls Road, Chelan, WA. All discharges to be in compliance with the Department of Ecology's Water Quality Standards for a permit to be issued.

A tentative determination has been made to issue a proposed permit based on the effluent limitations and special permit conditions that will prevent and control pollution. A final determination will not be made until all timely comments received in response to this notice have been evaluated.

PUBLIC COMMENT AND INFORMATION

The draft permit and fact sheet may be viewed at the Department of Ecology (Department) website: https://fortress.wa.gov/ecy/wqreports/public/f?p=110:302:3573634860216244::NO:RP:P302_PER

Fact Sheet for NPDES Permit No. WA0020605
City of Chelan POTW
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MIT_NUMBER:WA0020605. The application and other related documents are available at Ecology's Central Regional Office for inspection and copying between the hours of 8:00 a.m. and 4:30 p.m., weekdays. To obtain a copy or to arrange to view copies at the Central Regional Office, please call 509/575-2490 or write to the address below.

Interested persons are invited to submit written comments regarding the proposed permit. All comments must be submitted by October 30, 2016 to be considered for the final determination. E-mail comments should be sent to cynthia.huwe@ecy.wa.gov . Comments should be sent to:

Cynthia Huwe, Permit Coordinator
Department of Ecology
Central Regional Office
1250 West Alder Street
Union Gap, WA 98903-0009

Any interested party may request a public hearing on the proposed permit within 30 days of the publication date of this notice. The request for a hearing shall state the interest of the party and the reasons why a hearing is necessary. The request should be sent to the above address. Ecology will hold a hearing if it determines that there is significant public interest. If a hearing is to be held, public notice will be published at least 30 days in advance of the hearing date. Any party responding to this notice with comments will be mailed a copy of a hearing public notice.

If you require special accommodations or need this document in a format for the visually impaired, call Cynthia Huwe at 509-457-7105. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

Publication date of this Notice is September 30, 2016.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting*, which is available on our website at <https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html>.

You may obtain further information from Ecology by telephone, 509/457-7105 or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
1250 West Alder Street
Union Gap, WA 98903

The primary author of this permit and fact sheet is Richard Marcley.

Appendix B--Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	Department of Ecology Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	Pollution Control Hearings Board PO Box 40903 Olympia, WA 98504-0903

Appendix C--Glossary

1-DMax or 1-day maximum temperature -- The highest water temperature reached on any given day. This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

7-DADMax or 7-day average of the daily maximum temperatures -- The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

Acute toxicity --The lethal effect of a compound on an organism that occurs in a short time period, usually 48 to 96 hours.

AKART -- The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Alternate point of compliance -- An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site specific basis following an AKART analysis. An "early warning value" must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with WAC 173-200-060(2).

Ambient water quality -- The existing environmental condition of the water in a receiving water body.

Ammonia -- Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Annual average design flow (AADF -- average of the daily flow volumes anticipated to occur over a calendar year.

Average monthly (intermittent) discharge limit-- The average of the measured values obtained over a calendar month's time taking into account zero discharge days.

Average monthly discharge limit -- The average of the measured values obtained over a calendar month's time.

Background water quality -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD5 -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD₅ is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass -- The intentional diversion of waste streams from any portion of a treatment facility.

Categorical pretreatment standards -- National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties, which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

Chlorine -- A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic toxicity -- The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean water act (CWA) -- The federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance inspection-without sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance inspection-with sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

Composite sample -- A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction activity -- Clearing, grading, excavation, and any other activity, which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous monitoring -- Uninterrupted, unless otherwise noted in the permit.

Critical condition -- The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Date of receipt -- This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

Detection limit -- The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

Dilution factor (DF) -- A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Distribution uniformity -- The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Early warning value -- The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

Enforcement limit -- The concentration assigned to a contaminant in the groundwater at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a groundwater criterion will not be exceeded and that background water quality will be protected.

Engineering report -- A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal coliform bacteria -- Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab sample -- A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Groundwater -- Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

Industrial user -- A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Local limits -- Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

Major facility -- A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum daily discharge limit -- The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Maximum day design flow (MDDF) -- The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum month design flow (MMDF) -- The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum week design flow (MWDF) -- The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method detection level (MDL) -- See Method Detection Level.

Minor facility -- A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing zone -- An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The permit specifies the area of the authorized mixing zone that Ecology defines following procedures outlined in state regulations (chapter 173-201A WAC).

National pollutant discharge elimination system (NPDES) -- The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH -- The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

Pass-through -- A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

Peak hour design flow (PHDF) -- The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

Peak instantaneous design flow (PIDF) -- The maximum anticipated instantaneous flow.

Point of compliance -- The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

Potential significant industrial user (PSIU) -- A potential significant industrial user is defined as an Industrial User that does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

- a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;
- b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) -- The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to $(1, 2, \text{or } 5) \times 10^n$, where n is an integer. (64 FR 30417).

ALSO GIVEN AS:

The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in

Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

Reasonable potential -- A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

Responsible corporate officer -- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding \$25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Significant industrial user (SIU) --

- 1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;
- 2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

Slug discharge -- Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate that may cause interference or pass through with the POTW or in any way violate the permit conditions or the POTW's regulations and local limits.

Soil scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5,3, or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

Solid waste -- All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and

construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

Soluble BOD₅ -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD₅ test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD₅ test is sufficient to remove the particulate organic fraction.

State waters -- Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based effluent limit -- A permit limit based on the ability of a treatment method to reduce the pollutant.

Total coliform bacteria--A microbiological test, which detects and enumerates the total coliform group of bacteria in water samples.

Total dissolved solids--That portion of total solids in water or wastewater that passes through a specific filter.

Total maximum daily load (TMDL) --A determination of the amount of pollutant that a water body can receive and still meet water quality standards.

Total suspended solids (TSS) -- Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset -- An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water quality-based effluent limit -- A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

Appendix D--Technical Calculations

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Acute Mixing Zone

```
CORMIX Version 9.UGTD
HYDRO2:Version-9.0.0.0  September,2014

SITE NAME/LABEL:      Chelan
DESIGN CASE:          Acute Mix Zone
FILE NAME:            Y:\WPFILES\MARCLEY\Issued Permits 07-15\Oct 1 C
Using subsystem CORMIX2:  Multiport Diffuser Discharges
Start of session:      03/24/2016--12:56:31
*****
SUMMARY OF INPUT DATA:
-----
AMBIENT PARAMETERS:
Cross-section          = unbounded
Average depth          HA   = 6.10 m
Depth at discharge     HD   = 5.79 m
Ambient velocity       UA   = 0.3048 m/s
Darcy-Weisbach friction factor F = 0.0387
  Calculated from Manning's n = 0.03
Wind velocity          UW   = 2.24 m/s
Stratification Type    STRCND = U
Surface temperature    = 20.70 degC
Bottom temperature     = 20.70 degC
Calculated FRESH-WATER DENSITY values:
Surface density        RHOAS = 998.0580 kg/m^3
Bottom density         RHOAB = 998.0580 kg/m^3
-----
DISCHARGE PARAMETERS:  Submerged Multiport Diffuser Discharge
Diffuser type          DITYPE = unidirectional perpendicular
Diffuser length        LD   = 6.10 m
Nearest bank           = right
Diffuser endpoints     YB1  = 36.58 m;   YB2 = 42.67 m
Number of openings     NOPEN = 39
Number of Risers       NRISER = 39
Ports/Nozzles per Riser NPPERR = 1
Spacing between risers/openings SPAC = 0.16 m
Port/Nozzle diameter   DO   = 0.0518 m
  with contraction ratio = 1
Equivalent slot width   BO   = 0.0135 m
Total area of openings  TAO  = 0.0822 m^2
Discharge velocity     UO   = 0.74 m/s
Total discharge flowrate QO  = 0.060461 m^3/s
Discharge port height   HO   = 0.37 m
Nozzle arrangement     BETYPE = unidirectional without fanning
Diffuser alignment angle GAMMA = 90 deg
Vertical discharge angle THETA = 0 deg
Actual Vertical discharge angle THEAC = 0 deg
Horizontal discharge angle SIGMA = 0 deg
Relative orientation angle BETA = 90 deg
Discharge temperature (freshwater) = 25 degC
Corresponding density   RHO0  = 997.0456 kg/m^3
Density difference      DRHO  = 1.0124 kg/m^3
Buoyant acceleration    GP0   = 0.0099 m/s^2
Discharge concentration CO   = 5 deg.C
Surface heat exchange coeff. KS = 0.000002 m/s
Coefficient of decay     KD   = 0 /s
-----
***** REGULATORY MIXING ZONE SUMMARY *****
The plume conditions at the boundary of the specified RMZ are as follows:
Pollutant concentration   c = 0.026934 deg.C
Corresponding dilution   s = 185.7
Plume location:          x = 9.14 m
  (centerline coordinates) y = 0 m
                        z = 5.79 m
Plume dimensions:        half-width (bh) = 3.14 m
                        thickness (bv) = 5.87 m
Cumulative travel time:   29.8672 sec.
```

CHRONIC MIXING ZONE

```
CORMIX Version 9.0GTD
HYDRO2:Version-9.0.0.0  September,2014
SITE NAME/LABEL:      Chelan
DESIGN CASE:          Chronic Mixing zone
FILE NAME:            Y:\WPFILES\MARCLEY\Issued Permits 07-15\Oct 1
Using subsystem CORMIX2:  Multiport Diffuser Discharges
Start of session:      03/24/2016--14:18:04
*****
SUMMARY OF INPUT DATA:
-----
AMBIENT PARAMETERS:
Cross-section          = unbounded
Average depth          HA = 6.10 m
Depth at discharge     HD = 5.79 m
Ambient velocity       UA = 0.3048 m/s
Darcy-Weisbach friction factor F = 0.0387
  Calculated from Manning's n = 0.03
Wind velocity          UW = 2.24 m/s
Stratification Type    STRCND = U
Surface temperature    = 20.70 degC
Bottom temperature     = 20.70 degC
Calculated FRESH-WATER DENSITY values:
Surface density        RHOAS = 998.0580 kg/m^3
Bottom density         RHOAB = 998.0580 kg/m^3
-----
DISCHARGE PARAMETERS:  Submerged Multiport Diffuser Discharge
Diffuser type          DITYPE = unidirectional perpendicular
Diffuser length        LD = 6.10 m
Nearest bank           = right
Diffuser endpoints     YB1 = 36.58 m;   YB2 = 42.67 m
Number of openings     NOPEN = 39
Number of Risers       NRISER = 39
Ports/Nozzles per Riser NPPERR = 1
Spacing between risers/openings SPAC = 0.16 m
Port/Nozzle diameter   D0 = 0.0518 m
  with contraction ratio = 1
Equivalent slot width  B0 = 0.0135 m
Total area of openings TAO = 0.0822 m^2
Discharge velocity      U0 = 0.66 m/s
Total discharge flowrate Q0 = 0.053890 m^3/s
Discharge port height  H0 = 0.37 m
Nozzle arrangement     BETYPE = unidirectional without fanning
Diffuser alignment angle GAMMA = 90 deg
Vertical discharge angle THETA = 0 deg
Actual Vertical discharge angle THEAC = 0 deg
Horizontal discharge angle SIGMA = 0 deg
Relative orientation angle BETA = 90 deg
Discharge temperature (freshwater) = 25 degC
Corresponding density  RHO0 = 997.0456 kg/m^3
Density difference      DRHO = 1.0124 kg/m^3
Buoyant acceleration   GP0 = 0.0099 m/s^2
Discharge concentration C0 = 5 deg.C
Surface heat exchange coeff. KS = 0.000002 m/s
Coefficient of decay    KD = 0 /s
```


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***** REGULATORY MIXING ZONE SUMMARY *****

The plume conditions at the boundary of the specified RMZ are as follows:

Pollutant concentration	$c = 0.017647$ deg.C
Corresponding dilution	$s = 283.3$
Plume location:	$x = 91.44$ m
(centerline coordinates)	$y = 0$ m
	$z = 5.79$ m
Plume dimensions:	half-width (bh) = 4.11 m
	thickness (bv) = 6.10 m
Cumulative travel time:	299.8940 sec.

Instructions: Enter data on 'Input 1' tab and below with yellow fields. Spreadsheet uses pH and temperature at mixing zone boundaries, you can override this by entering your own data in these cells.
- Click here for more details -

Freshwater Un-ionized Ammonia Criteria Calculation

Based on Chapter 173-201A WAC, amended November 20, 2006

		mixed @ Acute Boundary	mixed @ Chronic Boundary	mixed @ Whole River
INPUT				
1. Receiving Water Temperature (deg C):	20.5	#DIV/0!	#DIV/0!	#DIV/0!
2. Receiving Water pH:	8.6	#DIV/0!	#DIV/0!	#DIV/0!
3. Is salmonid habitat an existing or designated use?	Yes	Yes	Yes	Yes
4. Are non-salmonid early life stages present or absent?	Present	Present	Present	Present
OUTPUT				
Using mixed temp and pH at mixing zone boundaries?	no			
Ratio	13.500	#DIV/0!	#DIV/0!	#DIV/0!
FT	1.400	#DIV/0!	#DIV/0!	#DIV/0!
FPH	1.000	#DIV/0!	#DIV/0!	#DIV/0!
pKa	9.387	#DIV/0!	#DIV/0!	#DIV/0!
Unionized Fraction	0.140	#DIV/0!	#DIV/0!	#DIV/0!
Unionized ammonia NH3 criteria (mg/L as NH ₃)				
Acute:	0.302	#DIV/0!	#DIV/0!	#DIV/0!
Chronic:	0.042	#DIV/0!	#DIV/0!	#DIV/0!
RESULTS				
Total ammonia nitrogen criteria (mg/L as N):				
Acute:	1.771	#DIV/0!		#DIV/0!
Chronic:	0.248		#DIV/0!	#DIV/0!

Data source:

Note: Use total ammonia, not unionized ammonia, in the reasonable potential calculation. Criteria are based on either total or unionized ammonia, depending on salmonid presence, but permittees measure total ammonia. This spreadsheet calculates the concentration of total ammonia in the effluent (as measured by permittee) that will result in the criteria concentration in the receiving water.

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CHELAN AMMONIA CRITERION AND REASONABLE POTENTIAL ANALYSIS

Reasonable Potential Calculation

[illegible]

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Instructions: Enter data on 'Input 1' tab and below with yellow fields. Spreadsheet calculates pH at mixing zone boundaries, you can override this by entering your own data in these cells.
- Click here for more details -

Calculation of pH of a Mixture of Two Flows

Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

INPUT	High Ambient pH		Low Ambient pH	
	@ Acute Boundary	@ Chronic Boundary	@ Acute Boundary	@ Chronic Boundary
1. Dilution Factor at Mixing Zone Boundary	186.0	283.0	186.0	283.0
2. Ambient/Upstream/Background Conditions				
Temperature (deg C):	20.50	20.50	20.50	20.50
pH:	8.60	8.60	6.90	6.90
Alkalinity (mg CaCO ₃ /L):	67.70	67.70	67.70	67.70
3. Effluent Characteristics				
Temperature (deg C):	25.00	25.00	25.00	25.00
pH:	9.00	9.00	6.00	6.00
Alkalinity (mg CaCO ₃ /L):	50.00	50.00	50.00	50.00
OUTPUT				OUTPUT
1. Ionization Constants				
Upstream/Background pKa:	6.38	6.38	6.38	6.38
Effluent pKa:	6.35	6.35	6.35	6.35
2. Ionization Fractions				
Upstream/Background Ionization Fraction:	0.99	0.99	0.77	0.77
Effluent Ionization Fraction:	1.00	1.00	0.31	0.31
3. Total Inorganic Carbon				
Upstream/Background Total Inorganic Carbon (mg CaCO ₃ /L):	68	68	88	88
Effluent Total Inorganic Carbon (mg CaCO ₃ /L):	50	50	162	162
4. Conditions at Mixing Zone Boundary				
Temperature (deg C):	20.52	20.52	20.52	20.52
Alkalinity (mg CaCO ₃ /L):	67.60	67.64	67.60	67.64
Total Inorganic Carbon (mg CaCO ₃ /L):	68.01	68.04	88.47	88.34
pKa:	6.38	6.38	6.38	6.38
RESULTS				RESULTS
pH at Mixing Zone Boundary:	8.60	8.60	6.89	6.89

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	283.0
Receiving Water Fecal Coliform, #/100 ml	6
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criteria, #/100 ml	14
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	7
Difference between mixed and ambient, #/100 ml	1
Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for fecal coliform.	

Calculation of Dissolved Oxygen at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	283.0
Receiving Water DO Concentration, mg/L	9.1
Effluent DO Concentration, mg/L	4.7
Effluent Immediate DO Demand (IDOD), mg/L	
Surface Water Criteria, mg/L	8
OUTPUT	
DO at Mixing Zone Boundary, mg/L	9.08
DO decrease caused by effluent at chronic boundary, mg/L	0.02
Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for dissolved oxygen.	

References: EPA/600/6-85/002b and EPA/430/9-82-011

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Instructions: Enter data on 'Input 1' tab and below with yellow fields.
Delete column if not needed.
-- Click here for more details --

Freshwater Temperature Reasonable Potential and Limit Calculation

Based on WAC 173-201A-200(1)(c)(i)---(ii) and the Water Quality Program Guidance. All data inputs must meet WQ guidelines. The Water Quality temperature guidance document may be found at:
<https://fortress.wa.gov/ecy/publications/summarypages/0610100.html>

	Core Summer Criteria	Supplemental Criteria
INPUT	July 1-Sept 14	Sept 15-July 1
1. Chronic Dilution Factor at Mixing Zone Boundary	283.0	#DIV/0!
2. 7DADMax Ambient Temperature (T) (Upstream Background 90th percentile)	19.0 °C	
3. 7DADMax Effluent Temperature (95th percentile)	24.0 °C	
4. Aquatic Life Temperature WQ Criterion in Fresh Water	20.0 °C	
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	19.1 °C	#DIV/0!
6. Incremental Temperature Increase or decrease:	0.0 °C	#DIV/0!
7. Maximum Allowable Incremental Temperature Increase:	1.1 °C	0.3 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	20.0 °C	0.3 °C
A. If ambient temp is warmer than WQ criterion		
9. Does temp fall within this warmer temp range?	NO	YES
10. Temperature Limit if Required:	---	#DIV/0!
B. If ambient temp is cooler than WQ criterion but within 28/(T_{amb}+7) and within 0.3 °C of the criterion		
11. Does temp fall within this incremental temp. range?	NO	---
12. Temp increase allowed at mixing zone boundary, if required:	---	---
C. If ambient temp is cooler than (WQ criterion-0.3) but within 28/(T_{amb}+7) of the criterion		
13. Does temp fall within this Incremental temp. range?	YES	---
14. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT	---
D. If ambient temp is cooler than (WQ criterion - 28/(T_{amb}+7))		
15. Does temp fall within this Incremental temp. range?	NO	---
16. Temp increase allowed at mixing zone boundary, if required:	---	---
RESULTS		
17. Do any of the above cells show a temp increase?	NO	NO
18. Temperature Limit if Required?	NO LIMIT	NO LIMIT

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AMBIENT DATA @ Grand Coulee

Grand Coulee										
date	time	FC (#/100ml)	FLOW (CFS)	NH3_N (mg/L)	NO2_NO3 (mg/L)	OP_DIS (mg/L)	OXYGEN (mg/L)	PH (pH)	TEMP (deg C)	
11/13/2013	9:05	1 U	106083	0.01 U	0.113	0.0036	9.1	7.94	13.53	
12/11/2013	9:40	1 U		0.01 U	0.127	0.0042	10.4	8.35	8.74	
1/22/2014	9:47	1 UJ		0.01 U	0.171	0.003 U	12.4	7.71	3.34	
2/18/2014	8:25	1 U		0.01 U	0.17	0.003 U	12.3	7.84	2.46	
3/18/2014	8:58	1 U		0.01 U	0.168	0.003 U	12.9	8.01	2.6	
4/14/2014	8:42	1 U		0.01 U	0.131	0.003 U	12.9	8.09	5.12	
5/13/2014	8:46	1 U		0.01	0.096	0.003 U	11.8	8.05	9.3	
6/17/2014	8:51	1 U		0.019	0.059	0.003 U	11.01	8.05	13.7	
7/22/2014	9:06	1 U		0.019	0.045	0.003 U	9.9	8.03	17.7	
8/19/2014	8:26	1 J		0.01 U	0.075	0.0032	8.5	7.89	18.9	
9/16/2014	8:44	1 UJ		0.01 U	0.068	0.003 U	8.4	7.96	19.2	
10/15/2012	16:00	1 U	78600	0.01 U	0.103	0.003 U	9	7.89	17.17	
11/5/2012	15:30	1 U	104450	0.01 U	0.114	0.0033	8.97	7.94	15.15	
12/3/2012	15:45	1 U	111950	0.01 U	0.13	0.0049	9.8	8	11.12	
1/7/2013	16:20	1 U	133733	0.01 U	0.165	0.0033	11.8	8.01	5.1	
2/4/2013	15:33	1 U	75265	0.01 U	0.139	0.003 U	12.56	8.05	3.67	
3/4/2013	15:30	1 U	80000	0.01 U	0.141	0.003 U	13.23	8.04	3.46	
4/1/2013	15:37	1 U	100630	0.01 U	0.213	0.003 U	12.3	8.1	4.88	
5/6/2013	16:40	1 U	158233	0.013	0.082	0.003 U	11.7 J	8.07	8.96	
6/3/2013	15:20	1 U	167333	0.016	0.059	0.003 U	11.31	7.53		
7/8/2013	16:05	1 U	148975	0.016	0.056	0.0032	10.25	7.93	15.36	
9/9/2013	16:05	1 U		0.01 U	0.074	0.003 U	8.6	7.92	20.39	
10/24/2011	8:30		126400							
11/28/2011	8:50	1 U	136500	0.01 U	0.098	0.0064				
12/12/2011	8:45	1 U	137500	0.01 U	0.111	0.0082	10.48	8.1	8.3	
1/9/2012	9:30	1 U	126100	0.012	0.131			8.05	4.5	
2/13/2012	9:30	1 U	160450	0.016	0.155	0.003 U	12.52	8.13 J	2.8	
3/19/2012	8:30	1 U	157600	0.014	0.187	0.003 U	12.52	8.25	3.3	
4/16/2012	7:00	1 U	158100	0.016	0.231	0.0053	12.52	7.96	5.6	
5/14/2012	8:00	1 U	172900	0.02	0.078	0.0044	12.12	7.94 J	9.4	
6/25/2012	8:45	59 J	276025	0.013	0.06	0.0034	11.3	7.97	12.2	
7/23/2012	8:20	1 U	240700	0.014	0.067	0.0037	10.55	8.02	15.7	
8/27/2012	8:00	1 U	125500	0.02	0.076	0.0067	11.61	7.87	18.4	
9/24/2012	8:15	1 U	101050	0.01 U	0.109	0.0067	8.47 J	7.87	18.08	
10/18/2010	16:00	1	55300	0.01 U	0.055		8.1	7.87	16.8	
11/1/2010	14:30	1 U	89000	0.01 U	0.061		8.6	7.49	15.7	
12/13/2010	14:30	1 U	32100	0.01	0.109		10.3	7.65	8	
1/10/2011	14:30	1 U	123900	0.01 U	0.134		11.6	8.31	4.6	
2/14/2011	15:05	1 U	112017	0.01 U	0.238		12.6	8.06	2.6	
3/21/2011	14:55	1 U	139075	0.01 U	0.127		11.9	7.83	3.2	
4/25/2011	14:30	1 U	134600	0.01 U	0.135		12.22	7.92	6.9	
5/23/2011	14:45	14	199975	0.016	0.097		11.2	7.6	10.1	
7/25/2011	14:15	1 U	159650	0.023	0.031		10.1	7.76	15.8	
8/22/2011	15:00	7	183300	0.026	0.047		10.9	7.93	19.2	
9/26/2011	13:55	1 U	107783	0.01 U	0.057		10.3	8.16	19.1	
10/5/2009	14:25	1 U		0.01 U	0.068	0.0044	7.6	7.84	18.6	
11/2/2009	13:20	1 J		0.01 U	0.073	0.0044	8.9	8.03	13.2	
12/7/2009	14:30	1 U		0.01 U	0.076	0.0035	10.19	8	7	
1/4/2010	13:30	1 U		0.01 U	0.117	0.0037	11.1	8.09	4.3	
2/1/2010	14:45	1 U		0.01 U	0.139	0.003 U	11	7.81	6.1	
3/1/2010	16:20	1 U		0.01 U	0.167	0.003 U	12.5	8.13		
4/5/2010	16:50	1 U		0.01 U	0.179	0.003 U	12.7	8		
5/3/2010	13:05	1		0.016	0.145	0.003 U	11.5	8.1	6.8	
6/7/2010	14:30	2		0.02	0.093	0.0035	10	7.8	11.6	
7/19/2010	13:50	3 U		0.012	0.05	0.003 U	9.19	7.84	16.6	
8/9/2010	14:30	1		0.01 U	0.039	0.0036	8.4	7.92	18.1	
9/13/2010	15:15	2		0.01 U	0.034	0.003 U	9.1		19.7	
		59	Max	0.026		Max	13.23 Max	8.35	20.39	
		1	Min	0.01		Min	7.6 Min	7.49	2.46	
		1.5	90 %tile	0.019		10 %tile	8.53		18.87	
		56	count	56					52	

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AMBIENT DATA @ Vernita Bridge

Vernita Bridge										
date	time	FC (#/100mi)	FLOW (CFS)	NH3_N (mg/L)	NO2_NO3 (mg/L)	OP_DIS (mg/L)	OXYGEN (mg/L)	PH (pH)	TEMP (deg C)	
10/15/2013	12:34	1 U	59200 J	0.01 U	0.125	0.0046	10.5	8.23	15.73	
11/5/2013	13:11	63	60100 J	0.01 U	0.148	0.0052	11	8.24	13.33	
12/4/2013	13:33	1 U	67800 J	0.01 U	0.178	0.0054	11.6	8.23	8.24	
1/14/2014	13:15	1 U	111000 J	0.01 U	0.168	0.0041	12.6	8.04	4.84	
2/12/2014	12:58	1 U	67000 J	0.01 U	0.241	0.003 U	13.4	8.17	3	
3/12/2014	9:50	1 U	109000 J	0.01 U	0.184	0.003 U	13.8	8.07	3.9	
4/22/2014	12:50	3	152000 J	0.01 U	0.113	0.003 U	13.5	8.25	7.58	
5/7/2014	12:45	1 U	167000 J	0.01 U	0.109	0.003 U	12.6	8.15	11	
6/11/2014	13:07	1 U	175000 J	0.01 U	0.146	0.003 U	11.1	8.06	15.2	
7/15/2014	12:31	15	171000 J	0.01 U	0.05	0.003 U	10.9	8.23	18.7	
8/13/2014	13:30	35	156000 J	0.01 U	0.051	0.003 U	10.25	8.25	20.6	
9/10/2014	12:52	1 U	67900 J	0.01 U	0.097	0.003 U	10	8.42	19.6	
10/17/2012	12:20	1 U	56900 J	0.013	0.126	0.0032	10.6	8.21	15.7	
11/7/2012	12:20	1 U	57800 J	0.01 U	0.143	0.0046	11.06	8.05	13.8	
12/12/2012	10:32	1 U	146000 J	0.01 U	0.145	0.0055	11.6	7.97	10.3	
1/16/2013	12:50	1 U	124000 J	0.01 U	0.166	0.003	13.97	8.08	3.97	
2/13/2013	12:08	1 U	70200 J	0.01 U	0.168	0.003 U	13.3	8.04	4	
3/13/2013	12:50	1 U	68600 J	0.01 U	0.163	0.003 U	13.27	8.03	5.2	
4/10/2013	13:01	1 U	190000 J	0.01 U	0.175	0.003 U	14.1	7.98	7.3	
6/12/2013	13:30	32	219000 J	0.01 U	0.056	0.003 U	11.7	8.12	14.94	
7/17/2013	12:55	2	144000 J	0.01 U	0.088	0.003 U	10.69	8.15	18.5	
8/14/2013	13:00	8	129000 J	0.012	0.089	0.0076	9.8	8.08	21.12	
9/18/2013	12:40	1 U	67700 J	0.01 U	0.108	0.0054	9.6	8.2	19.93	
10/12/2011	10:45	15	62100 J	0.01 U	0.095	0.0056	9.8	7.78 J	15.7	
11/16/2011	9:30	5	59000 J	0.01 U	0.106	0.0055	10.69	8.15 J	10.9	
12/7/2011	9:45	3	131000 J	0.041	0.122	0.005	10.89	8.22 J	8.6	
1/11/2012	9:30	1 U	114000 J	0.01 U	0.145		12.4	7.85	4.6	
2/8/2012	9:35	1 U	124000 J	0.01 U	0.143	0.003 U	13.46	8.13	3.1	
3/7/2012	10:05	1 U	112000 J	0.01 U	0.14	0.003 U	13.73	8.21	3.6	
4/4/2012	9:45	1 U	175000 J	0.01 U	0.189	0.003 U	14.1	8.29	5.2	
5/9/2012	10:45	2	222000 J	0.01 U	0.085	0.0042	13.16	8.13	11.2	
6/6/2012	10:30	5	177000 J	0.01 U	0.078	0.003 U	11.9	8.13	12.5	
7/11/2012	11:15	13	269000 J	0.01 U	0.054	0.0037	11.34	7.81	16	
8/8/2012	11:28	1 U	183000 J	0.01 U	0.093	0.003 U	10.54	8.03	18.8	
9/12/2012	14:55	1 U	90300 J	0.01 U	0.152	0.0033	10.85	8.04	18.9	
10/4/2010	14:55	35 J	93700 J	0.01 U	0.04	0.003 U	10	8.3	18.3	
11/2/2010	13:55	1	56400 J	0.01 U	0.11	0.005	10.8	8.25	14.7	
12/14/2010	8:45	1 U	67100 J	0.01 U	0.21	0.0053	10.9	7.96	8.3	
1/4/2011	14:00	1 U	130000 J	0.013	0.119	0.0037	12.2	8.17	4.6	
2/8/2011	14:50	1 U	139000 J	0.01 U	0.168	0.003 U	14	8.22	3.1	
3/8/2011	14:45	1 U	118000 J	0.01 U	0.155	0.003 U	14.1 J	8.3	3.6	
4/5/2011	15:15	1 U	189000 J	0.01 U	0.128	0.003 U	14.6	8.14	5.7	
5/3/2011	13:45	2	157000 J	0.01 U	0.102	0.003 U	13.3	8.36	9.6	
6/7/2011	14:50	2	281000 J	0.01 U	0.073	0.0047	12.08	8	12.8	
7/12/2011	13:15	6	254000 J	0.01 U	0.062	0.003 U	11.65	8.14	15.5	
8/9/2011	11:45	4	161000 J	0.01 U	0.044	0.0044	10.4	8.19	18.5	
9/13/2011	15:15	1	77500 J	0.011	0.156	0.0042	9.9	8.18	20.3	
10/5/2009	14:28	1		0.01 U	0.128	0.003 U	11.01	8.46	16.8	
11/3/2009	14:50	1		0.01 U	0.082	0.0043	11.8	8.25	13.7	
12/7/2009	14:58	1 U		0.01 U	0.083	0.003 U	11.91	8.19	7.7	
1/6/2010	14:10	1 U		0.01 U	0.13	0.0036	12.46	8.26	5	
2/3/2010	15:00	1 U		0.01 U	0.137	0.0033*	13.4	8.37	4.7	
3/3/2010	14:25	1 U		0.01 U	0.148	0.003 U	13.63	8.4	5.4	
4/5/2010	14:17	1 U		0.01 U	0.143	0.003 U	13.33	8.51	7.6	
5/3/2010	14:45	2		0.01 U	0.15	0.003 U	11.91	8.32	10.3	
6/9/2010	14:45	5		0.01 U	0.111	0.003 U	11.9	8.07	13.9	
7/19/2010	14:00	3		0.01 U	0.052	0.003 U	10.8	8.31	17.8	
8/9/2010	15:40	3		0.01 U	0.043	0.0039	10.4	8.26	20.3	
9/13/2010	14:15	6			0.045	0.003 U	10.6	8.56	18.5	
		63		Max	0.041		Max	14.6 Max	8.56	
		13.4		90%tile	0.01		10%tile	10.2 min	7.78	
		59		count	59		count	59	59	

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DMR DATA

Surface Water Body		Chelan POTW																				
Outfall 001																						
Monitoring Point 001 Effluent																						
Parameter	Ammonia (Total)	BOD	BOD	BOD	BOD	BOD	Fecal Coliform	Fecal Coliform	Flow	Flow	Hardness	Solids (Residue) (Total suspended TSS)	Solids (Residue) (Total suspended TSS)	Solids (Residue) (Total suspended TSS)	Solids (Residue) (Total suspended TSS)	Solids (Residue) (Total suspended TSS)	Temperature (Measured)	Temperature (Measured) Critical Season	Temperature (Measured)	Temperature (Measured) Critical Season	pH	pH
Units	mg/L	Lbs/Day	Lbs/Day	mg/L	mg/L	Percent	#/100ml	#/100ml	MGD	MGD	Milligrams/L (mg/L)	Lbs/Day	Lbs/Day	mg/L	mg/L	Percent	Degrees C	Degrees C	Degrees C	Degrees C	Standard Units	Standard Units
Statistical Base	Monthly Maximum	Ave Monthly	Weekly Ave	Ave Monthly	Weekly Ave	Minimum	7 Day Median	Weekly Geometric Mean	Average	Maximum	Quarter Maximum	Average Monthly	Weekly Average	Average Monthly	Weekly Average	Average Monthly	Average	Average	Maximum	Maximum	Maximum	Minimum
Limits	-/-	-/443	-/664	-/30	-/45	85/-	-/200	-/400	-/-	-/-	-/-	-/443	-/664	-/30	-/45	85/-	-/-	-/-	-/-	-/-	-/9	6/-
Benchmarks	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
Design Limit																						
Date	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
1/1/2011	3.2	54	84	11	15	93	12	17	0.640	0.870		71	95	15	18	94	12				7.5	6.4
2/1/2011	2.9	45	57	10	12	95	12	28	0.580	0.650	54	43	55	9	12	98	11				7	6.2
3/1/2011		59	72	10	12	94	12	17	0.710	0.940		66	90	11	15	97	12				7	6.3
4/1/2011	16	57	76	10	12	94	6	16	0.720	0.810		74	98	13	17	96	13				7.1	6.7
5/1/2011	1.7	81	114	13	14	92	5	11	0.800	1.240		100	147	15	18	95	17				7.3	6.3
6/1/2011	1.4	91	101	13	17	93	2	9	0.850	1.030	60	79	136	11	17	97	20				7.2	6.7
7/1/2011	5.6	102	151	11	15	94	16	32	1.180	1.380		162	181	17	18	97	22	22	22	22	7.3	7.2
8/1/2011	10.9	177	236	17	21	92	14	31	1.230	1.370	58	159	196	15	19	97	23	23	24	24	7.3	7.1
9/1/2011	6.9	76.6	111	10.2	13	94	6	6	1.8674	0.930		118.4	220	16.2	33	93	22.4	22.4	23	23	7.3	6.8
10/1/2011	5.9	92.25	115	15.5	17	87	12	25	0.713	0.890		150.75	203	25	30	92	19.2		22		7.2	6.6
11/1/2011	7.6	78.25	93	16.5	19	94	4	7	0.587	0.680	59.2	74.75	89	15.75	18	90	14.9		18		7.3	6.5
12/1/2011	7.3	72.8	86	14.8	19	88	6	10	0.580	0.760		50.4	62	10.4	13	93	12.3		14		7.4	6.5
1/1/2012	2.3	58	64	11	12	93	7	18	0.610	0.780		55	85	10	14	95	11.0		13		7.1	6.5
2/1/2012	3.6	46	70	9	15	95.75	3	8	0.623	0.790	58	38.75	63	8.75	12	98	12.8		15		7.2	6.6
3/1/2012	2.1	77.6	88	13.8	15	96.2	1	2	0.689	0.930		86.8	114	15.4	21	96.2	11.5		12		6.8	6.6
4/1/2012	2.6	88.75	103	15.75	19	94.25	4.4405	14	0.696	0.980		117.25	190	20.75	34	89.25	13.6		14		7.1	6.6
5/1/2012	3.2	77	106	13.6	19	93.8	3.70734	10	0.737	1.100	12	90.2	112	16	20	95.4	14.5		18		7.3	6.8
6/1/2012	2.8	89	115	13	17	94	2	1	0.865	1.020		117	152	17	23	94	20.0		21		7.2	6.6
7/1/2012	4.2	116	139	13	15	93	2	1	1.148	1.290		144	196	16	21	93	22.4	22.4	23	23	7.2	6.7
8/1/2012	3.6	181	217	19	26	90	7	1	1.175	1.310	74	139	202	14	20	95	23.6	23.6	24	24	7.2	7
9/1/2012	2	120	147	16	21	91	5	10	0.900	1.210		85	94	11	13	95	21.5	21.5	23	23	7.3	6.8
10/1/2012	2.6	102	122	19	24	89	6	15	0.613	0.740		109	146	20	25	92	19.0		20		7.1	6.7
11/1/2012	2.2	74	97	15	19	93	5	12	0.613	0.710		95	126	19	26	97	16.1		18		6.9	6.2
12/1/2012	1.8	53	69	11	14	92	1	4	0.610	0.810		61	65	12	14	98	12		13		6.9	6.2
1/1/2013	3.2	59	77	13	16	92	6	3	0.580	0.710		57	73	12	15	93	11		12		7.2	6.6
2/1/2013	2.2	44	53	10	12	94	7	2	0.560	0.650		58	98	13	21	95	12		13		7.2	6.4
3/1/2013	6.8	69	81	14	16	92	12	5	0.580	0.680		79	108	16	19	96	14		15		7.3	6.7
4/1/2013	2.9	69	81	14	16	92	12	7	0.610	0.710		79	108	16	19	96	14		15		7.3	6.7
5/1/2013	3.4	79	95	14	19	92	10	4	0.720	1.070		80	90	14	16	93	19		19		7.2	6.6
6/1/2013	2.7	89	100	11	14	94	6	8	0.850	1.090		109	136	15	17	95	21		21		7	6.6
7/1/2013	3.3	104	133	13	19	94	6	14	1.080	1.300		109	143	13	16	93	23	23	24	24	7.3	6.9
8/1/2013	5.5	123	177	15	21	92	20	8	1.080	1.190		103	135	12	16	95	23	23	24	24	7.3	7.1
9/1/2013	5.8	62	69	9	10	94	16	11	0.890	1.150		98	113	15	20	91	23	23	24	24	7.2	6.9
10/1/2013	3	59	74	10	14	95	12	7	0.650	0.780		73	95	14	18	92	19		22		7.2	6.8
11/1/2013	4.2	40	52	9	11	96	6	7	0.580	0.920		52	62	12	13	94	16		17		7	6.7
12/1/2013	3.8	46	59	11	13	95	8	23	0.540	0.640		63	72	15	17	94	11		13		7.3	6.7
1/1/2014	5.1	50	75	11	17	94	5	9	0.540	0.680		56	72	13	17	94	11		12		7.4	6.9
2/1/2014	4	40	46	9	11	96	3	8	0.550	0.690		64	95	15	20	93	10		11		7	6.7
3/1/2014	4.2	47	53	10	11	95	2	7	0.590	0.640		70	87	15	18	92	14		15		7.1	6.7
4/1/2014	3.5	70	91	14	17	93	2	7	0.640	0.720		78	89	16	19	94	15		16		7.1	6.8
5/1/2014	3	57	63	11	13	96	3	14	0.670	0.990		73	110	14	22	95	17		19		7.2	6.5
6/1/2014	4.2	70	91	12	14	94	12	14	0.750	0.920		86	118	16	24	93	21		22		7.3	7
7/1/2014	3.9	102	129	12	16	94	19	24	1.040	1.220		120	142	15	17	94	22	22	22	22	7.2	6.9
8/1/2014	3.9	149	161	18	18	93	14	15	1.060	1.240		98	152	12	17	95	23	23	23	23	7.2	6.9
9/1/2014	4.2	73	80	12	13	94	8	13	0.770	1.080		67	93	11	15	97	21	21	22	22	7.2	6.9
10/1/2014	4.4	53	62	10	11	94	8	12	0.610	0.730		56	74	11	13	96	20		21		7.2	6.8
11/1/2014	3.2	55	62	12	14	94	13	7	0.540	0.680		50	57	11	13	96	15		18		6.9	6.7
12/1/2014	3.4	51	68	11	14	94	10	10	0.530	0.710		61	64	13	14	94	12		13		7.1	6.6
1/1/2015	2.8	46	53	11	13	94	11	14	0.530	0.730		59	55	12	12	95	10		10		6.9	6.6
2/1/2015	2.8	45	49	11	11	94	2	3	0.530	0.640		44	53	10	12	95	12		12		6.9	6.5
3/1/2015	4.5	63	84	14	18	93	10	9	0.560	0.710		56	89	13	19	95	13		14		6.9	6.4
4/1/2015	3.4	73	81	16	17	93	8	14	0.590	0.680		77	101	16	22	92	15		16		6.9	6.5
5/1/2015	5.4	94	113	17	21	92	10	21	0.730	1.090		98	146	18	27	93	17		20		7	6.6
6/1/2015	6.9	108	180	16	27	90	6	9	0.870	1.050		108	128	16	19	93	22		23		7.2	6.5
7/1/2015	6.2	127	153	15	18	93	4	6	1.060	1.300		72	94	9	11	94	24	24	25	25	7.3	7
8/1/2015	2.6	80																				

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Monitoring Point IN1	Influent											
Parameter	Flow	Flow	TSS	TSS	TSS	TSS	Total BOD5	Total BOD5	Total BOD5	Total BOD5	pH	pH
	Million Gallons/Day (MGD)	MGD	Lbs/Day	Lbs/Day	mg/L	mg/L	Lbs/Day	Lbs/Day	mg/L	mg/L	Standard Units	Standard Units
Units												
Statistical Base	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Maximum	Minimum
Limits	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -
Benchmarks	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -
Design Limit												
Date	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
1/1/2013	0.51	0.64	746	1184	182	284	650	813	160	203	7.1	6.8
2/1/2013	0.5	0.61	1462	2018	376	550	653	717	165	187	7.1	6.8
3/1/2013	0.53	0.6	1676	1924	366	417	806	961	176	192	7.2	6.9
4/1/2013	0.6	0.68	1013	1229	231	283	867	1110	192	242	7.1	6.8
5/1/2013	0.69	1.07	1144	1426	210	231	976	1142	182	203	7.1	7
6/1/2013	0.82	1.07	1908	2650	267	320	1356	1681	196	240	7.2	7
7/1/2013	1.05	1.28	1495	2637	186	304	1714	2281	215	263	7.3	7
8/1/2013	1.06	1.16	2282	3783	273	432	1451	1575	176	188	7.2	7.1
9/1/2013	0.86	1.12	1181	1809	177	241	1071	1299	165	210	7.2	7.1
10/1/2013	0.62	0.71	950	1158	188	248	1007	1091	198	218	7.2	7
11/1/2013	0.56	0.9	794	972	185	233	955	1201	225	300	7.2	6.9
12/1/2013	0.53	0.62	1017	1072	241	252	968	1250	230	295	7.2	7
1/1/2014	0.53	0.67	988	1430	228	343	782	909	181	200	7.2	7
2/1/2014	0.54	0.69	1066	1748	248	403	889	1128	208	260	7.2	6.9
3/1/2014	0.58	0.63	885	1177	187	252	979	1070	206	225	7.2	6.9
4/1/2014	0.6	0.68	1291	1887	273	404	926	998	195	210	7.2	6.9
5/1/2014	0.62	0.95	1322	1495	291	332	1161	1331	255	285	7.1	6.9
6/1/2014	0.71	0.89	1237	1302	236	252	1062	1187	201	225	7.2	6.9
7/1/2014	0.96	1.18	1744	2231	231	273	1502	1952	201	263	7.1	6.9
8/1/2014	0.99	1.24	2297	3235	298	451	1855	2042	237	255	7.1	6.9
9/1/2014	0.72	1.01	2004	3227	350	530	1022	1187	181	195	7.1	6.9
10/1/2014	0.58	0.7	1402	2065	290	427	832	943	176	195	7.1	6.9
11/1/2014	0.53	0.72	1078	1357	239	319	930	999	202	235	7.1	6.9
12/1/2014	0.55	0.7	1104	1662	242	369	840	999	183	203	7.3	7
1/1/2015	0.53	0.74	999	1479	237	362	858	1212	203	285	7.2	7
2/1/2015	0.53	0.64	1254	2544	299	610	809	952	192	233	7.2	7
3/1/2015	0.55	0.7	1134	2183	256	476	901	1013	207	233	7.2	7
4/1/2015	0.57	0.65	1143	1657	251	368	1031	1233	229	255	7.1	7
5/1/2015	0.64	1	1203	1516	248	308	1010	1376	209	275	7.1	7
6/1/2015	0.8	0.98	1421	1985	232	280	1082	1237	179	215	7.1	6.9
7/1/2015	0.99	1.24	1135	1513	147	193	1564	1935	203	255	7.2	6.9
8/1/2015	0.8	1.02	1647	2240	238	292	1442	1957	206	255	7.2	6.9
9/1/2015	0.7	0.9	926	1547	159	229	887	1047	157	195	7.2	6.9
10/1/2015	0.59	0.68	833	1257	177	274	707	812	151	165	7.1	6.9
11/1/2015	0.53	0.82	1185	1378	278	324	819	936	192	220	7.1	6.9
12/1/2015	0.59	0.77	1045	1543	216	272	958	1361	198	240	7.1	6.9
1/1/2016	0.59	0.73	1016	1572	242	349	700	824	157	190	7.1	6.9
2/1/2016	0.61	0.73	1057	1298	219	273	805	988	166	188	7.3	6.9
Min	0.500	0.600	746.0	972.0	147.0	193.0	650.0	717.0	151.0	165.0		6.8
Max	1.060	1.280	2297.0	3783.0	376.0	610.0	1855.0	2281.0	255.0	300.0	7.3	
Avg	0.665	0.845	1265.4	1799.7	241.9	335.8	1021.8	1230.2	193.6	228.8		
stdv	0.164	0.209	381.6	646.3	52.9	97.0	290.2	377.3	23.7	34.4		
95th %	0.999	1.240	2045.7	3228.2	352.4	533.0	1586.5	1969.8	231.1	286.5		

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Monitoring Point 002	Yearly Effluent											
Parameter	Dissolved Oxygen	Dissolved Oxygen	Nitrate + Nitrite (Total)	Nitrate + Nitrite (Total)	Oil & Grease	Oil & Grease	Phosphorus (Total)	Phosphorus (Total)	Solids (Residue) (Total Dissolved Solids (TDS))	Solids (Residue) (Total Dissolved Solids (TDS))	TKN	TKN
Units	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)
Statistical Base	Annual Maximum	Annual Maximum	Annual Maximum	Annual Maximum	Annual Maximum	Annual Maximum	Annual Maximum	Annual Maximum	Annual Maximum	Annual Maximum	Annual Maximum	Annual Maximum
Limits	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -
Benchmarks	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -
Design Limit												
Date	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
1/1/2011												
2/1/2011	7.6		m		m		m		m		m	
3/1/2011	6.7		m		m		m		m		m	
4/1/2011	m		m		m		m		m		m	
5/1/2011	m		m		m		m		m		m	
6/1/2011	6.3		m		m		m		m		m	
7/1/2011	m		m		m		m		m		m	
8/1/2011	4.7		14.2		2.2		4.54		226		13.3	
9/1/2011	m		m		m		m		m		m	
10/1/2011	m		m		m		m		m		m	
11/1/2011	7		m		m		m		m		m	
12/1/2011	m		m		m		m		m		m	
1/1/2012		9.3		13.9		1.9		4.62		222		11.8
1/1/2013		8.4		13.4		2.3		6.5		264		27.6
1/1/2014		6		26.1		2.3		4.27		264		12.2
1/1/2015		6.2		15.4		4		6		248		13.2
Min	4.7	6	14.2	13.4	2.2	1.9	4.54	4.27	226	222	13.3	11.8
Max	7.6	9.3	14.2	26.1	2.2	4	4.54	6.5	226	264	13.3	27.6
Avg	6.46	7.48	14.2	17.2	2.2	2.63	4.54	5.35	226	249.5	13.3	16.2
Median	6.7	7.3	14.2	14.65	2.2	2.3	4.54	5.31	226	256	13.3	12.7
95th %	7.48	9.17	14.2	24.5	2.2	3.75	4.54	6.43	226	264	13.3	25.44

Appendix E--Response to Comments

No comments were received by the Department of Ecology.

APPENDIX C

CITY STANDARDS APPLICABLE TO SANITARY SEWER

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SEWER MAIN EXTENSIONS**GENERAL:****INTRODUCTION:**

The items herein contained are the sewerage system standards, conditions, and specifications of the City of Chelan. These are minimums only and may be increased or altered to fit particular situations. Any material, design, standard, or testing not specifically addressed within this document shall be as per the current edition of American Public Works Association Standard Specifications for Road, Bridge, and Municipal Construction and/or Washington State D.O.E. Criteria for Sewage Works Design which are hereby adopted by this reference as if fully set forth herein. (See CMC 13.06.050 F)

STANDARDS AND CONDITIONS:

- A. When extension of the existing sewer system is required for service, an Agreement for Sewer Main Extension shall be entered into between the Developer and the City, substantially in the form which is attached hereto and incorporated herein by this reference as Appendix B, Exhibit 1.
- B. To initiate the Developer Extension process the Developer shall submit a sewer plan prepared by a Professional Civil engineer licensed in the State of Washington. Plan/Profile drawing shall be produced on mylar copy and CD electronic format.
- C. The licensed professional civil engineer shall certify that the design and construction of the sewerage collection system meets or exceeds all applicable standards.
- D. Obtaining necessary permits will be the responsibility of the Developer.
- E. Where franchises, easements or deeds to property are required it shall be the responsibility of the Developer to provide same and submit appropriate documentation to the City.
- F. Easements shall be as per Section 10 of this code.
- G. The Developer shall supply a certified "As-built" drawing meeting all standards established in Appendix B
- H. The Developer is required to supply insurance and bonding as per Section 13 of this code.
- I. Connection between the City's existing system and the new sewerage collection system shall be made by the Developer at the expense of the Developer.
- J. All main lines must be designed to provide for proper collection of sewerage from all lands served by the development. Extensions shall be required through and to the extremes of the property for future service as determined by the City.
- K. Pressure and leakage testing shall be accomplished as per specifications contained herein before final acceptance.
- L. Final acceptance shall not constitute acceptance of any unauthorized or defective work or material. The City shall not be barred from requiring the developer to reimburse the City for the removal, adjustment, replacement, repair or disposal of any unauthorized or defective work or material or from recovering costs for any such work or material.
- M. Sewer hook-ups shall be made by the lot owner. Sewer service shall not begin prior to payment by

of all applicable hook-up fees.

- N. Sewer Main Extension projects shall be conveyed to the City for operation and maintenance upon final project acceptance.
- O. For existing platted lots, the City may enter into latecomer agreements with Developers prior to installation of sewer mains and appurtenances, to provide for the reimbursement of a pro-rata share of the cost of construction by the sewer service users of any real estate who have not contributed to the original cost of such facilities and who subsequently connect to the sewerage collection system, pursuant to Chapter 12.28 of the Chelan Municipal Code as it now exists or as may be hereafter amended.
- P. Interim On-Site Septic Systems
 1. On-site septic systems are allowed in unincorporated areas (i.e., outside city limits) within the City's Urban Growth Area where a public, sanitary or combined sewer is not available within 750 feet of the property line in the following cases only:
 - a. In the case of single family residential land divisions, provided:
 - i. The parcel to be divided shall be at least 20 acres in size;
 - ii. The parcel may be divided into no more than four lots; and
 - iii. Each lot must be at least five acres in size.
 - b. To serve agricultural tourism uses and small-scale craft beverage production uses.
 2. On-site septic systems for agricultural tourism uses and small-scale craft beverage production uses must be abandoned if the agricultural tourism or small-scale craft beverage production use is discontinued.
 3. The property owner shall sign an agreement not to protest a future local improvement district (LID), late comer agreements or other pro rata sharing of costs to construct and extend public sewer to the property.
 - a. Said agreement shall describe the property, shall be recorded with the Chelan County auditor's office, and shall constitute a covenant running with the property. The agreement and all provisions of the on-site septic system approval shall bind the owner and all other persons subsequently acquiring any right, title or interest in or to the property.
 - b. In addition to the cost of constructing and extending public sewer to the property, the owner shall be required to pay all applicable General Facilities Charges.
 4. The property owner shall sign an agreement not to protest annexation of the property to the city. Said agreement shall allow the city to execute a petition for annexation on behalf of the owner if the owner does not do so when requested by the city; and shall describe the property, be recorded with the Chelan County auditor's office, and constitute a covenant running with the property. The agreement and all provisions of the on-site septic system approval shall bind the owner and all other persons subsequently acquiring any right, title or interest in or to the property.
 5. Future roadway development:
 - a. In the case of land divisions, the layout of the parcels shall accommodate future urban growth, providing for road access to all parcels created by the division and to neighboring properties.
 - b. In all cases, building setbacks from the front and, where applicable, side property lines must be adequate to accommodate future development of a street meeting the City's standards, which may include sidewalks, parking lanes, bicycle lanes, planter strips, and utility easements.
 - c. The City may impose requirements for future urban development,

- including requiring dedication of easements for future roadway and utility development.
- d. The property owner shall sign an agreement not to protest a future LID or other pro rata sharing of costs to construct and extend public streets to and adjacent to the property. Said agreement shall describe the property, shall be recorded with the Chelan County auditor's office, and shall constitute a covenant running with the property. The agreement shall bind the owner and all other persons subsequently acquiring any right, title or interest in or to the property.
6. The property owner shall comply with all requirements of the city's comprehensive land use plan, zoning and building codes, and development standards when dividing, developing, or redeveloping the property. In particular:
- a. On-site septic systems must comply with Chapter 14 CMC, Critical Areas.
 - b. The property owner shall improve the city right-of-way adjacent to the property in conformance with the City's standards or, in cases in which concurrent street improvement is not required (e.g., where access via private road is allowed), shall execute a waiver of protest for an LID to construct any street improvements required for access to or through adjacent property.

SPECIFICATIONS:**EXTENSIONS:**

All extensions to the sewer system must conform to the design standards of the City. The system must be capable of future expansions, if required, and be constructed of permanent materials. The following are required:

1. Plans and Specifications. The installation of sewer extensions shall be in accordance with construction plans and specifications approved by the City.
2. Sewer pipes shall be P.V.C. or ductile iron. City shall approve type.
3. Manholes shall be precast, 48" I.D. and shall generally conform to A.S.T.M. specification for equivalent size reinforced concrete sewer pipe. Outside drop structures shall be constructed of ductile iron. Inside drop structures may be constructed of ductile iron or P.V.C. pipe and fittings.
4. Pressure mains shall be ductile iron, P.V.C., or H.D.P.E.
5. All joints for sewers or pressure mains shall be of the rubber gasket type.
6. Pipe sizes shall be selected as required by standard engineering practice and shall conform to the overall sewerage plan of the City.
7. Minimum depth of sewer main and side sewer stubs shall be 4 feet over the top of pipe.
8. The sewer grades shall be sufficient to maintain a velocity of 2 feet per second at design flow. Minimum grade shall be one-half of one percent (0.005) for 8" diameter pipe, 0.008 for 6" and/or be in accordance with the Washington DOE "Criteria for Sewage Works Design".

9. Manhole covers shall be IFCO Number 619 or approved equivalent. Manhole cover surface shall be raised style B, lifting device shall be style 2 with one inch diameter pick hole. Where specified, locking cover shall be style 1.

GENERAL GRAVITY SEWER PIPE:

1. All material shall be new and undamaged. Unless otherwise approved by the City, the same manufacturer of each item shall be used throughout the work.
2. Where reference is made to an ASTM, AWWA or APWA designation, it shall be the latest revision at the time of construction, except as noted on the plans or special provisions of the plans.

PVC PIPE:

P.V.C. pipe shall conform with the provisions of ASTM D-3034, SDR35 unless otherwise specified. Rubber gaskets for P.V.C. pipe shall conform with ASTM 3034.

DUCTILE IRON PIPE:

1. Ductile iron pipe shall be standard thickness Class 50 cement lined unless otherwise specified and shall conform to the standards of USA Standard A-21.51 (AWWA C-151).
2. Rubber gasket pipe joints to be push-on-joint (Tyton) or mechanical joint (M.J.) in accordance with USA Standard A21.11 (AWWA C-111), unless otherwise specified.
3. Flanged connection shall conform to USA Standard B16.1.
4. Standard thickness cement lining shall be in accordance with USA Standard A21.4 (AWWA C-104).
5. The Contractor shall furnish certification from the manufacturer of the pipe and gasket being supplied that all specified tests have been made and the results thereof comply with the requirements of this standard.

DUCTILE IRON FITTINGS:

1. Ductile iron fittings shall be short body for pressure rating of 150 psi, unless otherwise noted. Metal thickness and manufacturing process shall conform to applicable portions of USA Standard A21.10, A21.11, B16.2 and B16.4.
2. Standard cement lining in accordance with USA Standard A21.4 (AWWA C-104).
3. Rubber gaskets for push-on-joint (Tyton) or mechanical joint (M.J.) in accordance with USA Standard A21.11 (AWWA C-111).
4. Gasket material for flanges shall be neoprene, Buna N chlorinated butyl, or cloth-inserted rubber. Type of ends shall be specified as push-on-joint (Tyton), mechanical joint (M.J.), plain end (P.E.), flanged (Fl.) or threaded (TH.).

GATE VALVES:

1. The minimum requirements for all gate valves shall, in design, material and workmanship, conform to the Standards of AWWA C-509.
2. Buried gate valves shall be iron body, bronze mounted, double disc, nonrising stem,

operation stems equipped with standard two (2) inch operation nut, and O-ring stem seals, suitable for installation with the type and class of pipe being installed. Ends to be as specified.

CHECK VALVES:

Check valves shall be for 150 psi working pressure, unless otherwise specified. Valve shall have adjustable tension lever and spring to provide nonslamming action under all conditions unless otherwise specified. Check valves shall be equal to Rensselaer List 340.

BOLTS IN PIPING:

Bolts shall be stainless steel or cast iron, zinc or chromium plated.

BEDDING AND BLOCKING CONCRETE:

Concrete shall be mixed from materials acceptable to the City and shall have a 30-day compressive strength of not less than 1,500 psi. The mix shall contain four (4) sacks of cement per cubic yard and shall be of such consistency that the slump is between 1 inch and 5 inches.

DETECTABLE MARKING TAPE:

Identifying tape shall be installed 12" to 18" above pipe crown over all pipe located within public street right-of-ways. Pipe locator ribbon shall be two inches (2") wide, plastic coated aluminum and shall be clearly marked, "CAUTION BURIED SEWER LINE" continuously along the length of the ribbon with minimum 1-1/2 inch letters. The ribbon shall be green in color for sewer pipe.

METHODS OF CONSTRUCTION:**PIPE LAYING:**

1. Pipe laying shall be in accordance with the latest edition of APWA Construction Manual for Municipal Public Works, Volume 3.
2. The first section of pipe not less than 300 feet in length installed by each crew shall be tested in order to qualify the crew and/or material. Successful installation of this section as determined by the City shall be a prerequisite to further pipe installation of said crew.
3. Each pipe shall be laid with bells upgrade with the invert of the pipe to the alignment and grade shown on the plans. Care shall be exercised to insure close concentric joints and a smooth invert. Open ends of pipe or fittings shall be temporarily blocked and covered when laying is not in progress.
4. Trench shall be kept dewatered during pipelaying.
5. Adjustment to the line and grade shall be done by scraping away or filling in and tamping approved pipe bedding material under the body of the pipe. Adjustment to the line and grade by wedging and blocking shall not be permitted.
6. The pipe shall be lowered into the trench by means of ropes, tripod, crane or any other suitable means. The pipe shall not be dropped or handled roughly. The pipe shall be checked for cracks and defects prior to use, and any defective pipe shall be rejected.
7. Wyes shall be installed as shown on the Standard Details as contained herein and at such

locations as are shown on the plans or as otherwise directed by the City. These items shall not be covered until the City has recorded their exact location.

8. Pipe laying shall start from the lowest point unless otherwise approved by the City.

PRESSURE SEWER PIPE:

1. All materials shall be new and undamaged. Unless otherwise approved by the City, the same manufacturer of each item shall be used throughout the work.
2. Where reference is made to an AWWA, APWA or ASTM designation, it shall be the latest revision at the time of construction, except, as noted on the plans or special provisions of the plans.
3. Non-metallic pressure sewer pipe shall have tracer wire attached to pipe as per these standards. Access points to tracer wire shall be as directed by Public Works.

PRESSURE SEWER MAINS:

1. P.V.C. pressure pipe shall conform to AWWA C-900. Joints shall be made up as recommended by the pipe manufacturer for pressure pipe. Shall be class 200 minimum.
2. Ductile iron pipe shall conform to AWWA C-100. Joints shall be made up as recommended by the pipe manufacturer for the particular joint as specified.
3. Pressure sewer mains shall be laid so that no high point exists except at the discharge manhole or an air release assembly. Valves with O-ring seals shall be opened and shut under pressure to check operation without leakage. Two-piece cast iron valve boxes shall be set as directed by the City.

JOINTS:

1. Joints shall not be covered until examined and approved by the City. Only pipe layers experienced with the type of gasket being used shall be allowed to lay the pipe. The City may demand proof of such experience before pipe laying may begin or be continued.
2. Joint material shall be used in accordance with the recommendations of the manufacturer. Pipe handling after the gasket has been affixed shall be carefully controlled to avoid bumping the gasket and thus knocking it out of position or loading it with dirt or other foreign material. Any gasket so disturbed shall be removed and replaced, cleaned and relubricated, if required, before the joint is attempted.
3. Care shall be taken to properly align the pipe before joints are seated. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling or crane as required to minimize lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Pipe deflection and straightening shall be held to a very minimum once the joint is seated to prevent creep of the joint.
4. Sufficient pressure shall be applied in making the joint to assure that the joint is seated as defined in the standard installation instructions provided by the pipe manufacturer. Sufficient restraint shall be applied to the line to assure the joints, once seated, are held so, by tamping approved pipe bedding material under and alongside the pipe or otherwise. At the end of the day's work, the last pipe shall be blocked in such a manner as may be required to prevent creep during down time.

ALIGNMENT & GRADE TOLERANCE:

1. The maximum tolerance from true line and grade shall be as follows:
 - a. Maximum deviation from established line and grade shall not be greater than one thirty-second (1/32) inch per inch of pipe diameter and not to exceed one-half (1/2) inch per pipe length.
 - b. No adverse grade in any pipe length will be permitted.
 - c. The difference in deviation from established line and grade between two successive joints shall not exceed 1/3 of the amounts specified above.
 - d. Refer to DOE Drainage Design Manual for maximum deflection.

TRENCH EXCAVATION:

Trenching shall be as per Section One of this code

SHORING:

The Developer shall provide and install shoring as necessary to protect workmen, the work, existing utilities, and other properties.

TUNNELING:

Tunneling may be ordered by the City or agency having jurisdiction over the roadway. The Developer may tunnel in lieu of trenching for deep cuts.

JACKING OR BORING - ROADWAY CROSSINGS:

The Developer may use any method which provides satisfactory results and is acceptable to the governmental agency having control of the road and to the City, provided that the Developer restores the crossing to its original condition. Normally, these crossings require the placing of steel, cast iron or concrete pipe casing by jacking or tunneling and laying the sewer line within the casing.

PIPE BEDDING:

Pipe bedding shall be as per Section One of this code.

CONCRETE BLOCKING AND ENCASEMENT:

Blocking shall be installed at changes in direction and in a manner acceptable to the City. Blocking and encasement of pipe shall be as shown in Standard Detail for water lines or as otherwise directed by the City.

FOUNDATION GRAVEL:

Foundation gravel shall be coarse graded gravel or crushed rock passing a 3-inch mesh. Pit run passed through a 3-inch screen thoroughly compacted may be used provided that it is, in the opinion of the City, properly graded and otherwise suitable.

MANHOLES:

1. Manholes shall be constructed as shown in Standard Details for manholes and drop manholes. Manholes shall be precast reinforced concrete. Manhole ring and covers shall be adjusted to the elevation required by the City prior to final acceptance of the work. Invert

elevations in shall be one tenth of a foot (0.1 foot) higher than invert elevations going out.

2. The manhole base slab shall be placed on firm soil. If the foundation material is inadequate, the Developer shall use foundation gravel, bedding gravel or concrete under the normal base to support the manhole.
3. All joints and connections to manholes shall be made with cement mortar or other approved jointing material and shall be watertight. Joints and connection shall be finished on interior and exterior of manhole. There shall be a 3/4 inch thick smooth plaster finish on the inside and outside of leveling concrete blocks at top of manholes.
4. Manholes shall be placed at every angle point, street and alley intersection, and catch basin junction, and in no case shall manholes be spaced greater than 500 feet apart. A connection serving more than one building lot shall require a manhole.
5. Where manholes are installed over an existing sewer main, the manhole base shall be poured-in-place on firm soil or foundation material as described above. Sewer main inside manhole will not be cut away until approved by City.

INSTALLATION STAKING:

The Developer shall furnish grade, cut and finish staking for the excavation and installation of sanitary sewer mains, manholes and appurtenances.

CLEANING AND FLUSHING:

1. Prior to pipe testing, all pipes shall be cleaned and flushed.
2. All debris flushed out shall be removed at the first manhole where its presence is noted. In the event cemented or wedged debris, or a damaged pipe exists, the Developer shall remove the debris and replace the damaged pipe.

TESTING OF GRAVITY SEWERS:

Method of testing gravity sewers and manholes shall be at the option of the City engineer.

WATER TEST:

1. Tests for watertightness shall be made by the Developer in the presence of the City. A test shall be made of every section of the sewer, including the side sewers, after completion of backfill. Where the groundwater table is so high as to preclude a proper exfiltration test, an infiltration test may be used.
2. The exfiltration test shall be made by plugging the inlets of the lower manhole and filling the test section with water to a height of six (6) feet above the crown of the sewer at the upper end of the sewer being tested.
3. In no case shall the static level be less than six (6) feet above the water table at the upper end of the sewer being tested. Where the static pressure on the lower manhole would exceed 15 feet, the Developer shall test the sewer between manholes in two or more sections. The Developer shall provide for sectional testing by installing tees in the main line. The tees shall be of a type that permit plugging of both the upper and lower run of the tee. The required static water head

shall be obtained by installing vertical lengths of pipe in the tee or from the upper end of the sewer pipe being tested at shallow manholes.

4. At the discretion of the Public Works Director, the Developer shall provide a groundwater observation well at each manhole for determining the level of groundwater during the test. The observation well shall consist of one-inch plastic pipe installed vertically adjacent to the manhole. The lower end of the test well shall be placed in a one (1) cubic yard pocket of washed gravel and shall be at the same elevation as the invert of the manhole. The upper end of the test well shall be a maximum of two (2) feet below the finished grade elevation and left exposed until completion of the test.
5. The time of exfiltration tests shall be a minimum of one (1) hour. The leakage during the test shall not exceed the flowing allowances:

ALLOWABLE LEAKAGE - EXFILTRATION						
Allowable Leakage in gal/100 linear feet/hr. Head above crown on lower end of test section.						
Pipe	6 Ft.	8 Ft.	10 Ft.	12 Ft.	14 Ft.	16 Ft.
6	0.6	0.7	0.7	0.8	0.8	0.9
8	0.8	0.9	1.0	1.0	1.1	1.2
10	1.0	1.1	1.2	1.3	1.4	1.5
12	1.2	1.3	1.4	1.6	1.7	1.8
15	1.5	1.7	1.8	2.0	2.1	2.3
18	1.8	2.0	2.2	2.3	2.5	2.7
24	2.4	2.6	2.9	3.1	3.4	3.6
Repair by chemical grouting will not be allowed.						

6. For static head above the basic six feet at the crown of the sewer at the lower end of the test section, the allowable leakage shown above shall be increased at a ratio of 5 percent per foot increase.
7. Where the groundwater exceeds a height of six feet above the crown of the sewer at the upper end of the test section, the section shall be tested by infiltration. The infiltration test shall be conducted by placing a plug in the inlet sewer at the upper manhole and inserting an approved measuring device in the inlet sewer at the lower manhole. Prior to making measurements, care shall be taken to assure that the flow over or through the measuring device is constant. A minimum of four measurements shall be made over a period of one hour.

AIR TESTING:

1. The following procedures shall be used in conducting the low pressure air test. The Developer shall furnish all facilities and personnel for conducting the test under the

observation of the City. The equipment and personnel shall be subject to the approval of the City.

2. The Developer may desire to make an air test prior to backfilling for his own purposes. However, the acceptance air test shall be made after backfilling has been completed and compacted.
3. All wyes, tees, or end of side sewer stubs shall be plugged with flexible joint caps, or acceptable alternate, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension. No double plugs shall be allowed.
4. Immediately following the pipe cleaning, the pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 4.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further.
5. The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 3.0 pounds per square inch is greater than the average back pressure above the center of the pipe. The following chart shall determine the time requirement:

Size of Pipe	Seconds per Lineal Foot of Pipe
4 inch	0.11
6 inch	0.25
8 inch	0.46
10 inch	0.72
12 inch	1.04
15 inch	1.63
18 inch	2.35
21 inch	3.20
24 inch	4.18

6. The use of air pressure for testing sewer lines creates hazards that must be recognized. The Developer shall be certain that all plugs are securely blocked to prevent blow outs. A supply air regulator shall be installed on the air supply line to the sewer that shall permit a maximum of 10 psi in the line to be tested. All pressure shall be relieved from the sewer section being tested prior to removal of test plugs.

TESTING OF PRESSURE SEWER MAINS:

Prior to acceptance of the project, the pressure line shall be subjected to a hydrostatic pressure test equal to three times the maximum working pressure at the high point of the line. Any leaks or imperfections developing or occurring under the test pressure shall be remedied by the developer

before final acceptance of the project. Leakage measurement method shall be performed by the Developer and approved by the City. Test pressure shall be maintained while the entire installation is inspected. The developer shall provide all necessary equipment and shall perform all work connected with the tests. Insofar as is practical, test shall be made with pipe joints and fittings exposed for inspection. Maximum leakage allowable shall be .05 gallons per hour per inch of pipe diameter per 100 feet of pipe.

SIDE SEWERS:

1. See Chelan Municipal Code 13.06.030.

SEWER CONNECTION INSPECTIONS

Sewer connection inspections are required as per the Public Works right-of-way permits. All connection inspections require a report filed with Public Works using the City Standard Form in Appendix B, Exhibit 5.

SEPTIC TANKS:

1. See Chelan Municipal Code 13.06.040.

PUMP STATIONS:

1. Pump stations shall only serve those properties which cannot otherwise be served by conventional gravity sewers or septic tanks.
2. Pump stations to be maintained by the City shall be approved for design by the City.
3. Pump stations shall be approved on an individual basis by the City.

TELEVISION INSPECTION

Upon completion, and prior to acceptance, of installation or repair of any sewer main, all sewer mains shall be video and television inspected by the City. This inspection and recording shall be performed in the presence of the City inspector and the Developer. Any defects in material or workmanship discovered shall be repaired by the Developer prior to acceptance. The City will charge the Developer a reimbursement fee to cover all required man hour costs.

TYPICAL BUILDING SEWER CONNECTION:

MATERIALS ALLOWED: (Main to property line)

PVC pipe and fittings ASTM D-3034 (molded gasket type bell, usually 20 foot length).

GENERAL REQUIREMENTS:

1. Service to single family residences shall be 4" diameter minimum. All others shall be 6" diameter minimum or larger as per Department of Ecology requirement.
2. A cleanout is required just outside the building on new construction. An additional cleanout is required at intervals of not more than 100' from the sewer main or after each 135° of

accumulated bend of fittings.

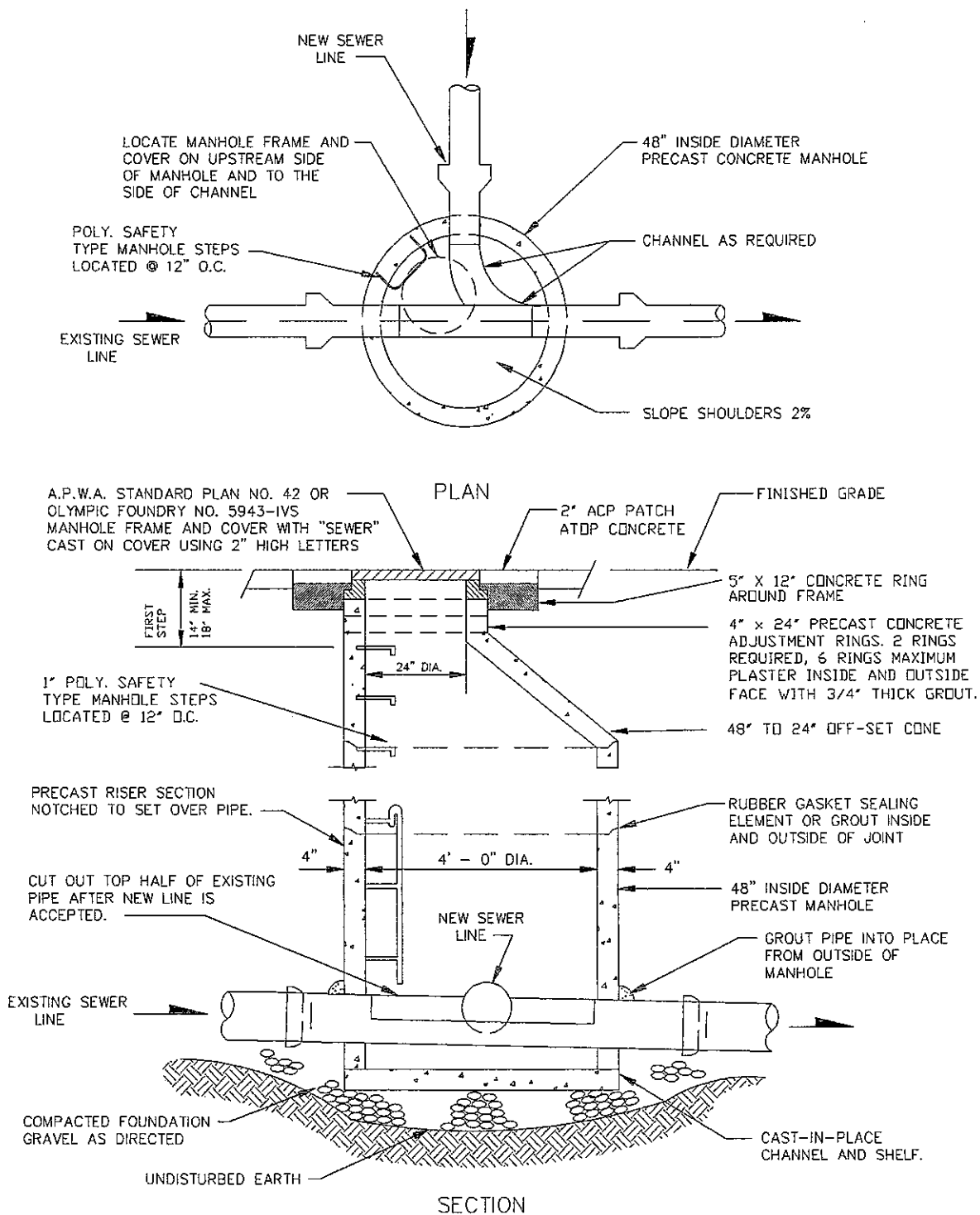
3. If installation is near a tree, cutting off gasketed bell and using glue couplings may be required by City engineer.
4. Pipe must be installed bell up.
5. Minimum slope 2%, no maximum.
6. If the lowest floor served is lower than the lowest manhole lid in the street, a backflow valve must be installed.
7. Pipe must be bedded and any rock contacting pipe must be no larger than 1".
8. Abandoned septic tanks must meet requirements of the current or as hereafter amended plumbing code.
9. Property owner shall have maintenance responsibility for the entire sewer lateral from the main to the residence.
10. Storm sewers may not under any circumstances be connected to the sanitary sewer system.
11. Developer shall install sewer laterals from the main to the property line. The end of the lateral shall be at least four feet (4') deep unless building lot requires an unusual depth. The lateral shall be capped and marked with a white painted treated 2 x 4 extending from in front of the cap bottom vertically to at least 24" above ground level. An eighteen inch long #4 rebar shall then be driven flush with the ground marking the 2 x 4 location.

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SEWER DESIGNS

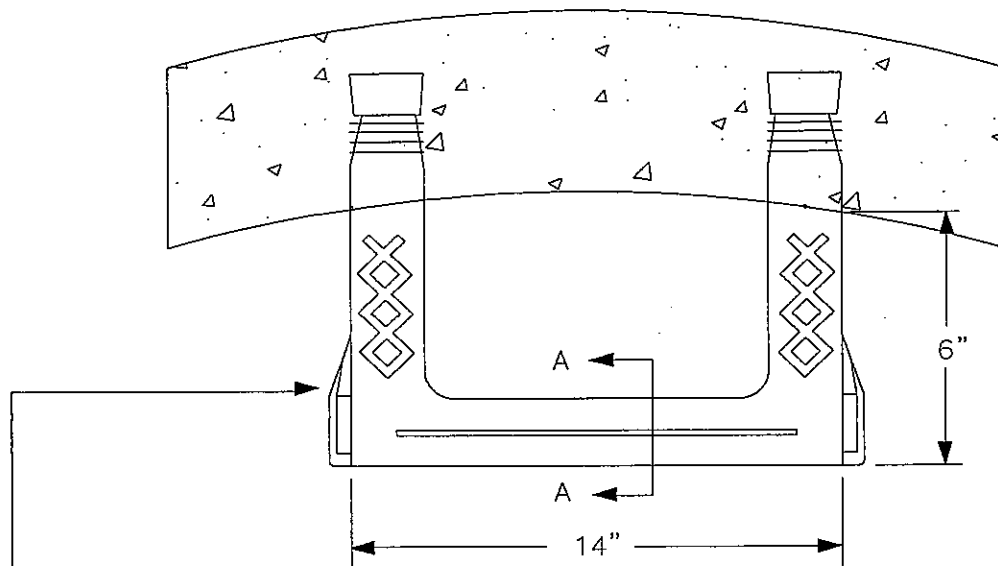
NEW MANHOLE ON EXISTING SEWER



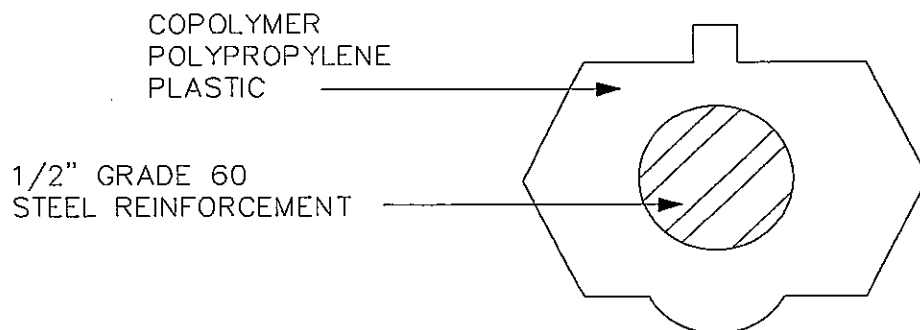
ID-033

MANHOLE STEP

Note: Embedment depth to meet manufacturer's specifications.



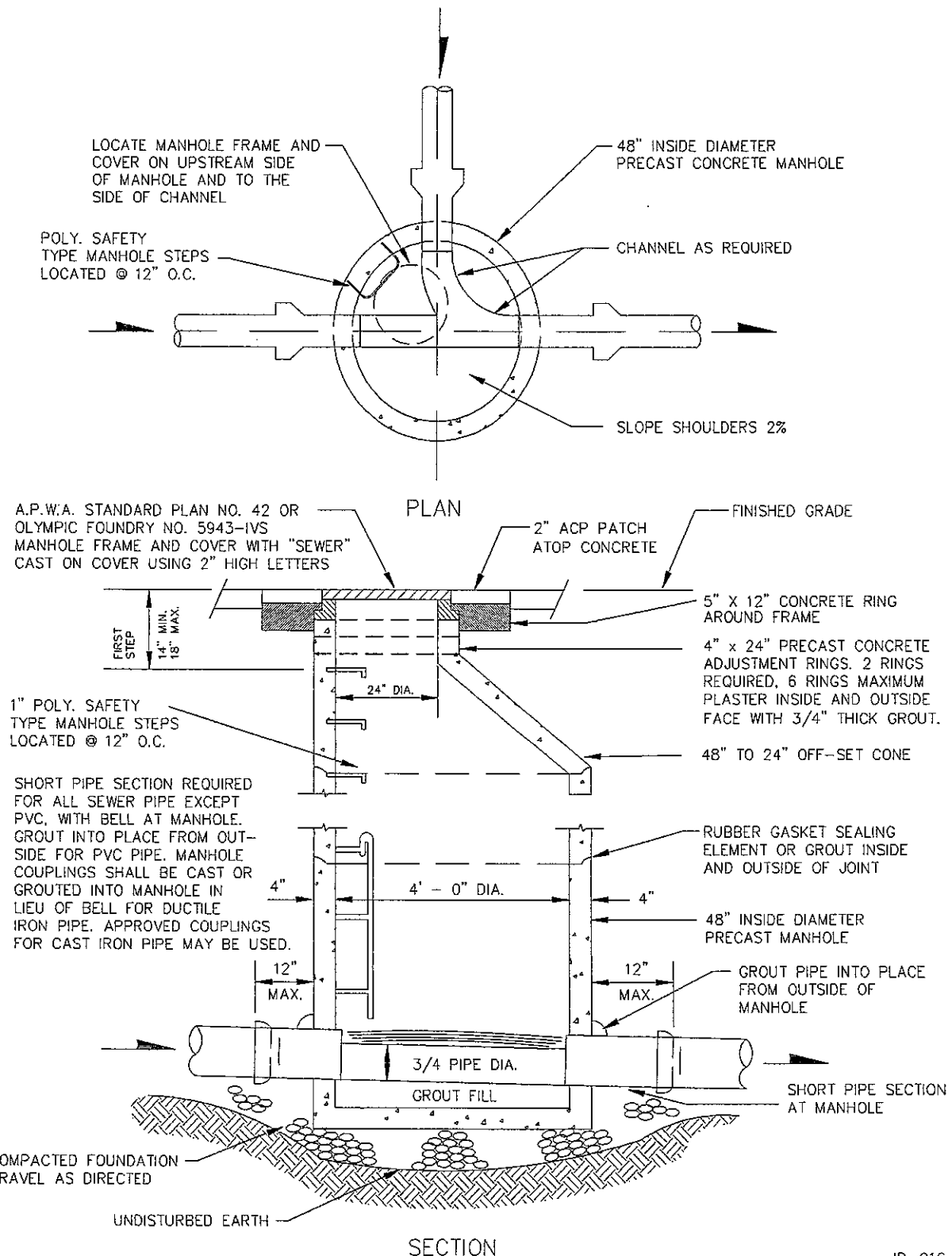
'MA INDUSTRIES, INC.'
1/2" GRADE 60 STEEL
REINFORCED COPOLYMER
POLYPROPYLENE PLASTIC
PS2-PF MANHOLE STEPS



SECTION A-A
N.T.S.

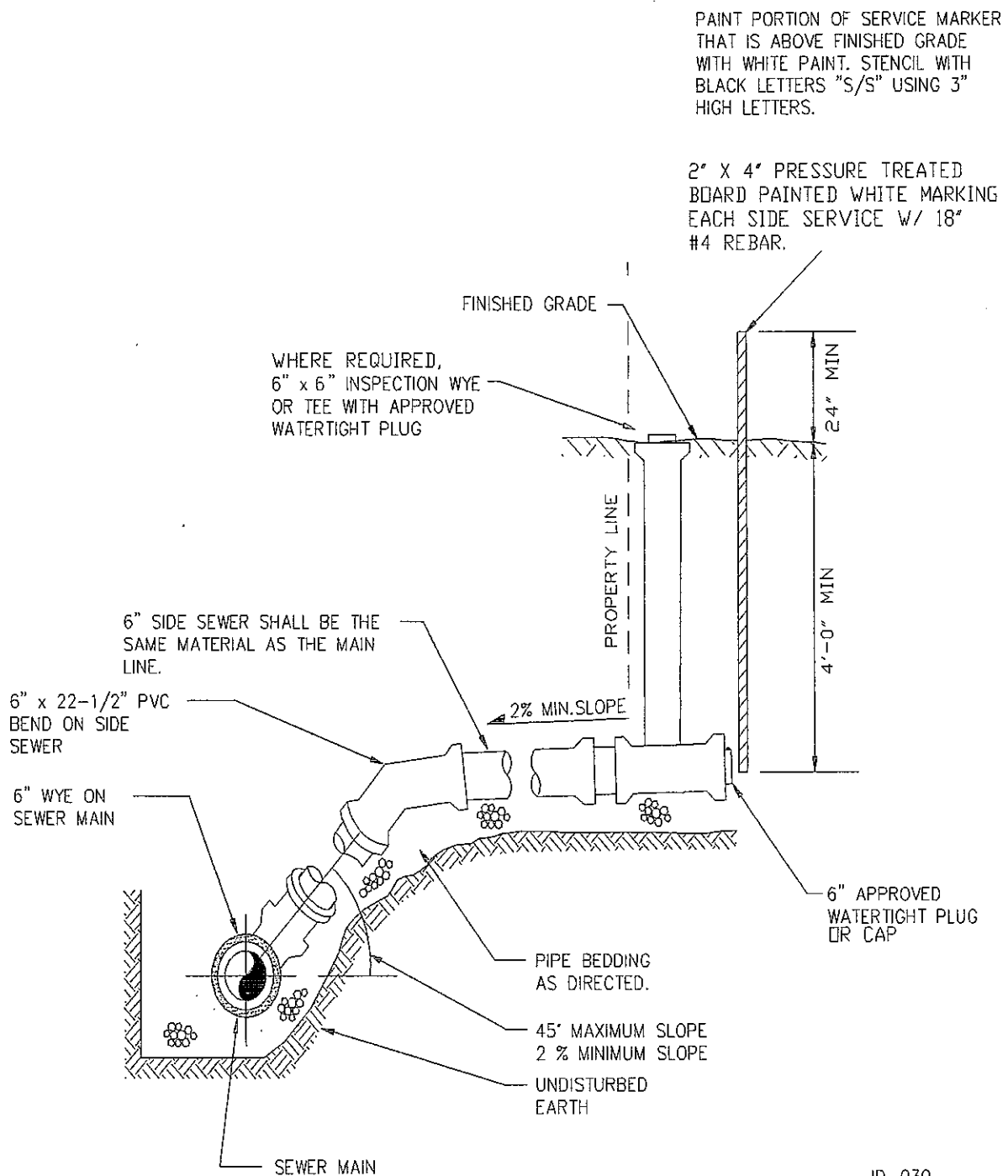
ID-034

TYPICAL PRECAST MANHOLE



ID-016

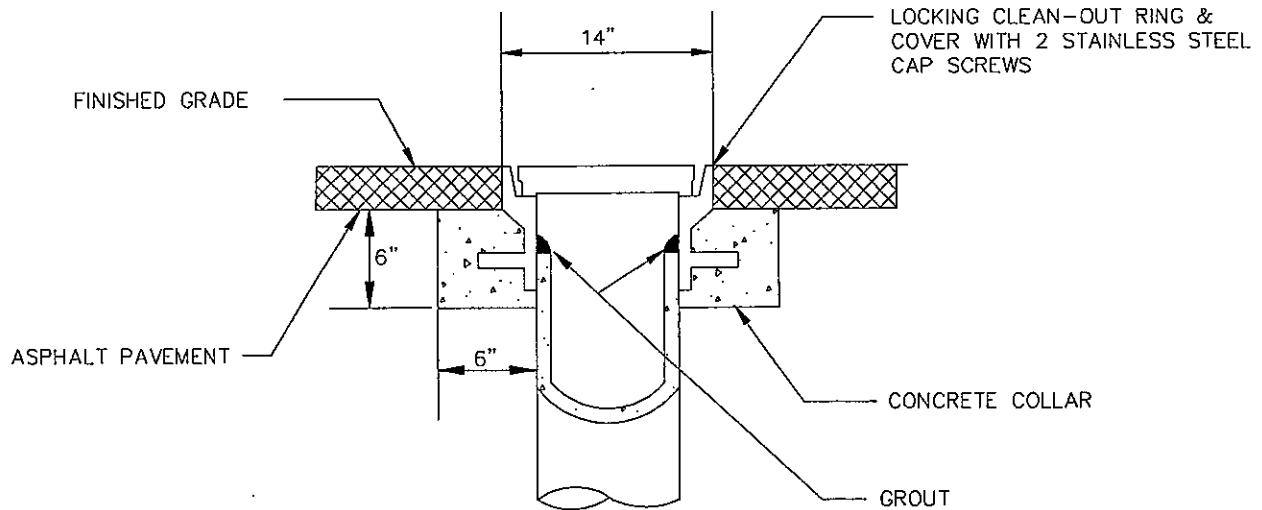
SIDE SEWER DETAILS



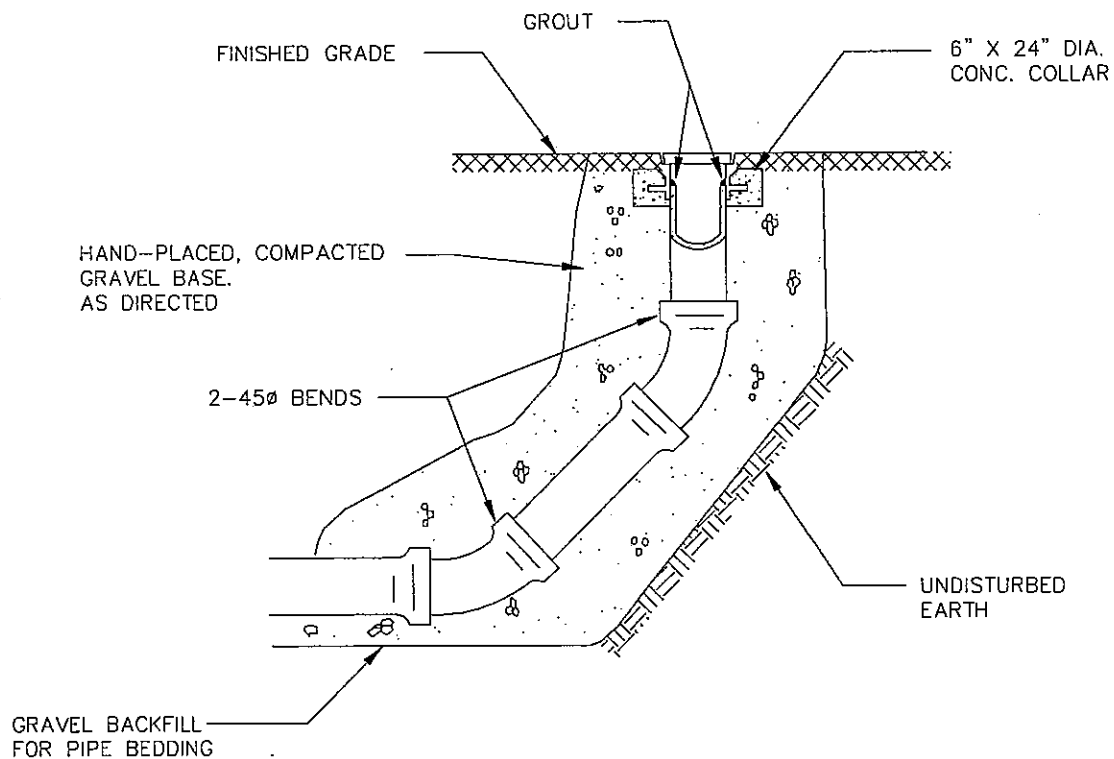
ID-030

NOTES:

- 1) PROVIDE CONCRETE BLOCK BENEATH SEWER TEE FOR SLOPES EXCEEDING 15%
- 2) IF LOWEST FLOOR SERVED IS LOWER THAN MANHOLE LID, A CHECK VALVE MUST BE INSTALLED AT PROPERTY LINE

SANITARY SEWER CLEANOUT - 8" MIN.

STREET USE

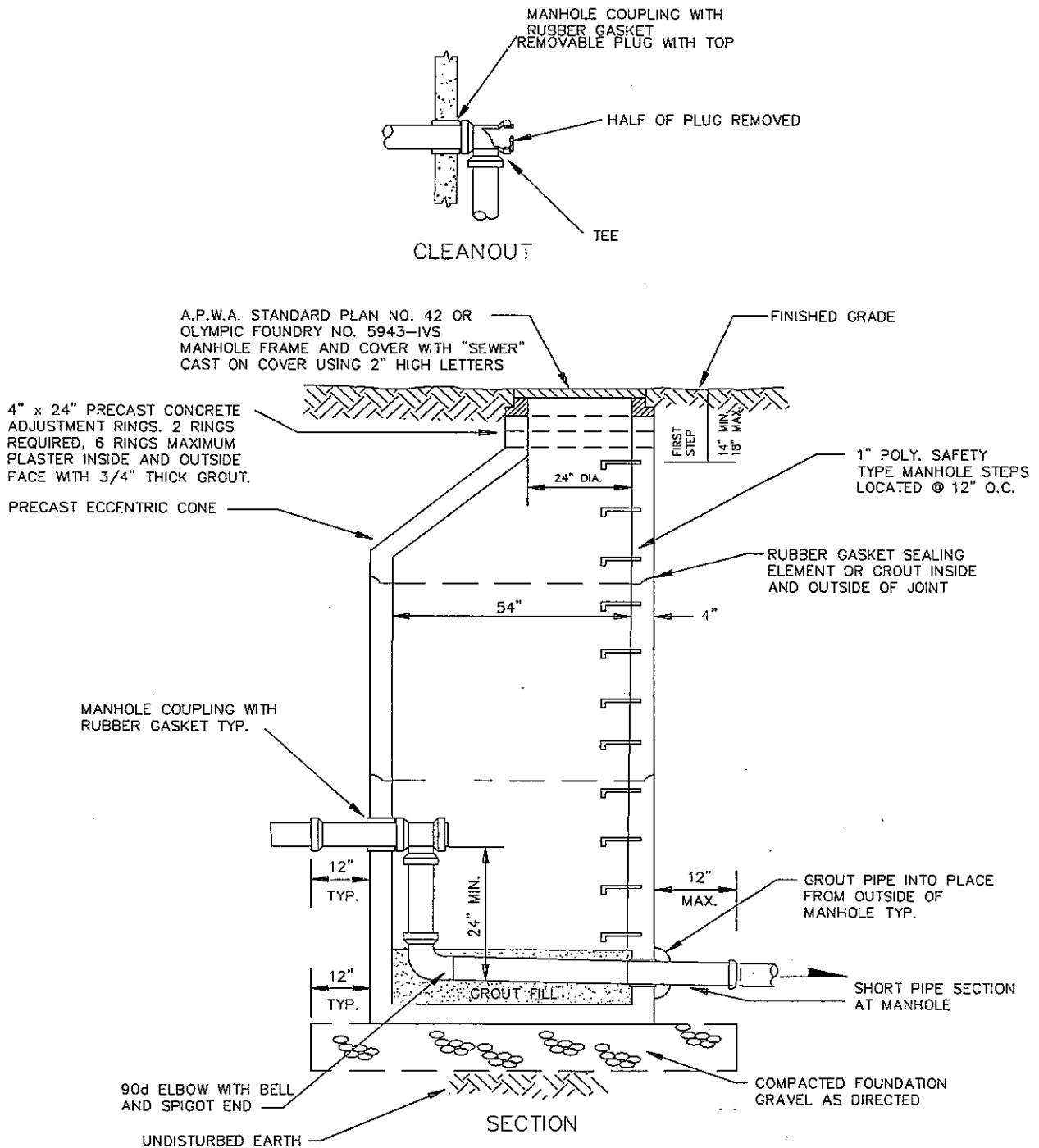


NON STREET USE

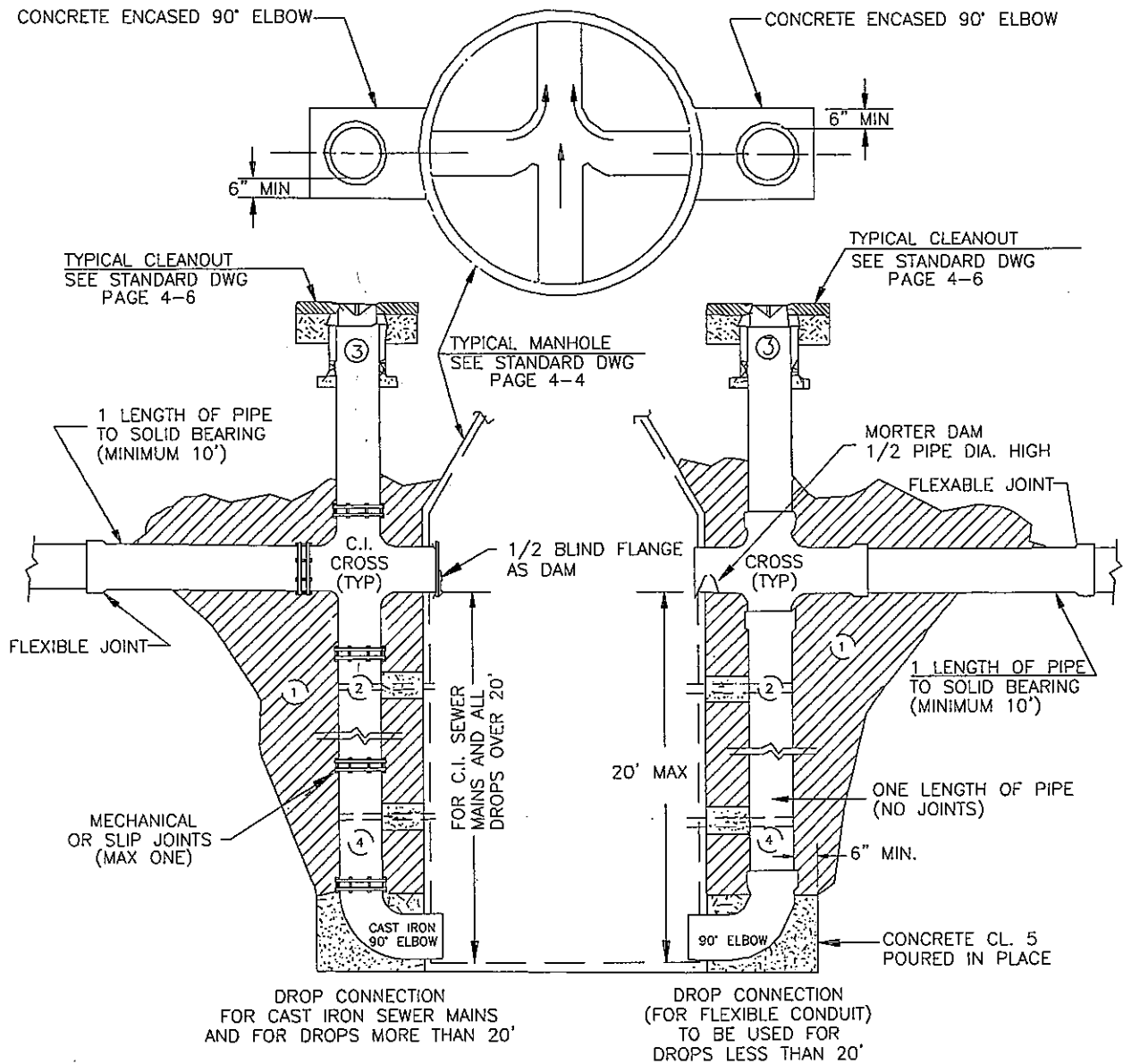
ID-005

INSIDE DROP SANITARY SEWER MANHOLE

Note: See page 4-4 for channel finishing requirements.



ID-036

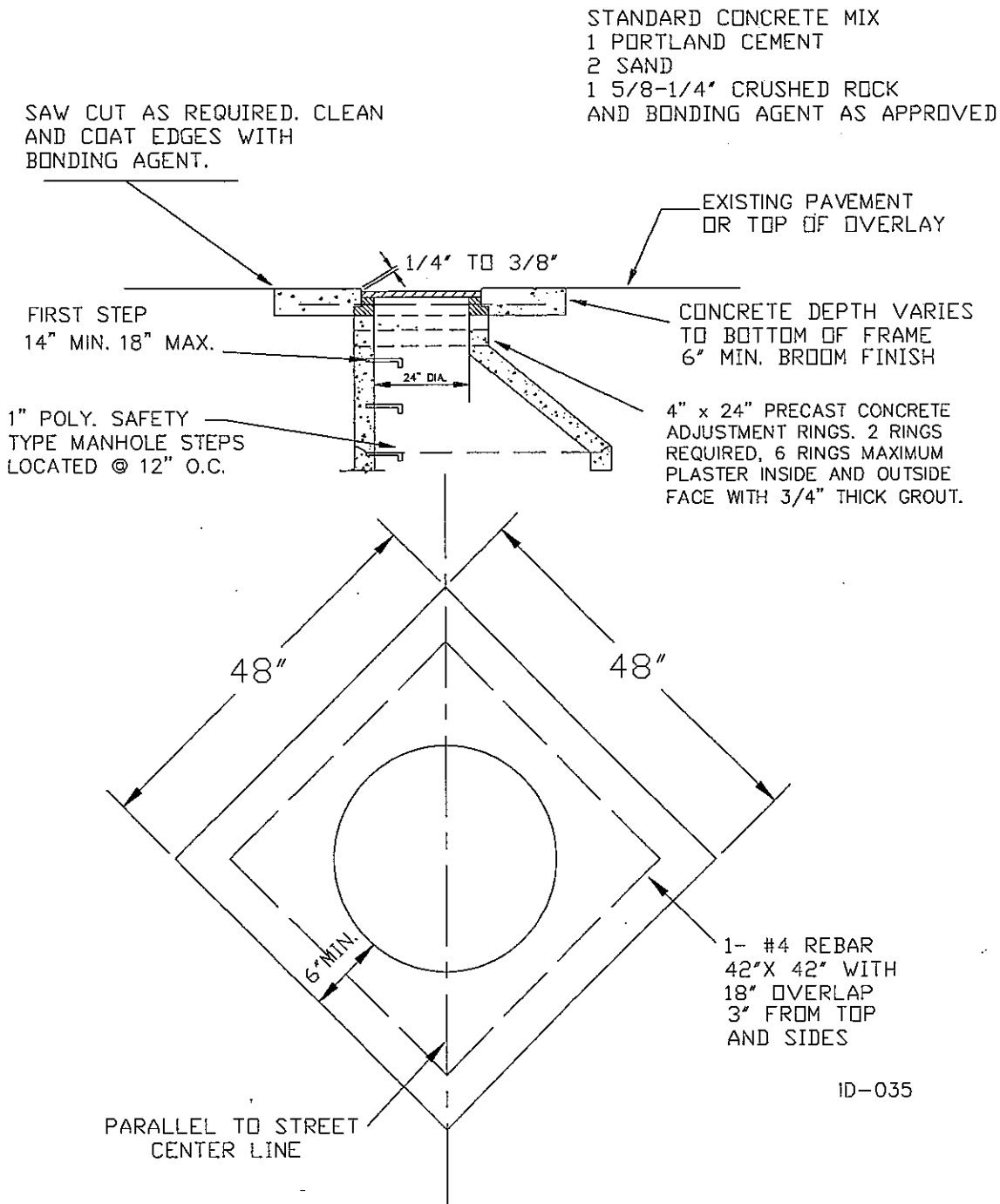
OUTSIDE DROP SANITARY SEWER MANHOLE**NOTES:**

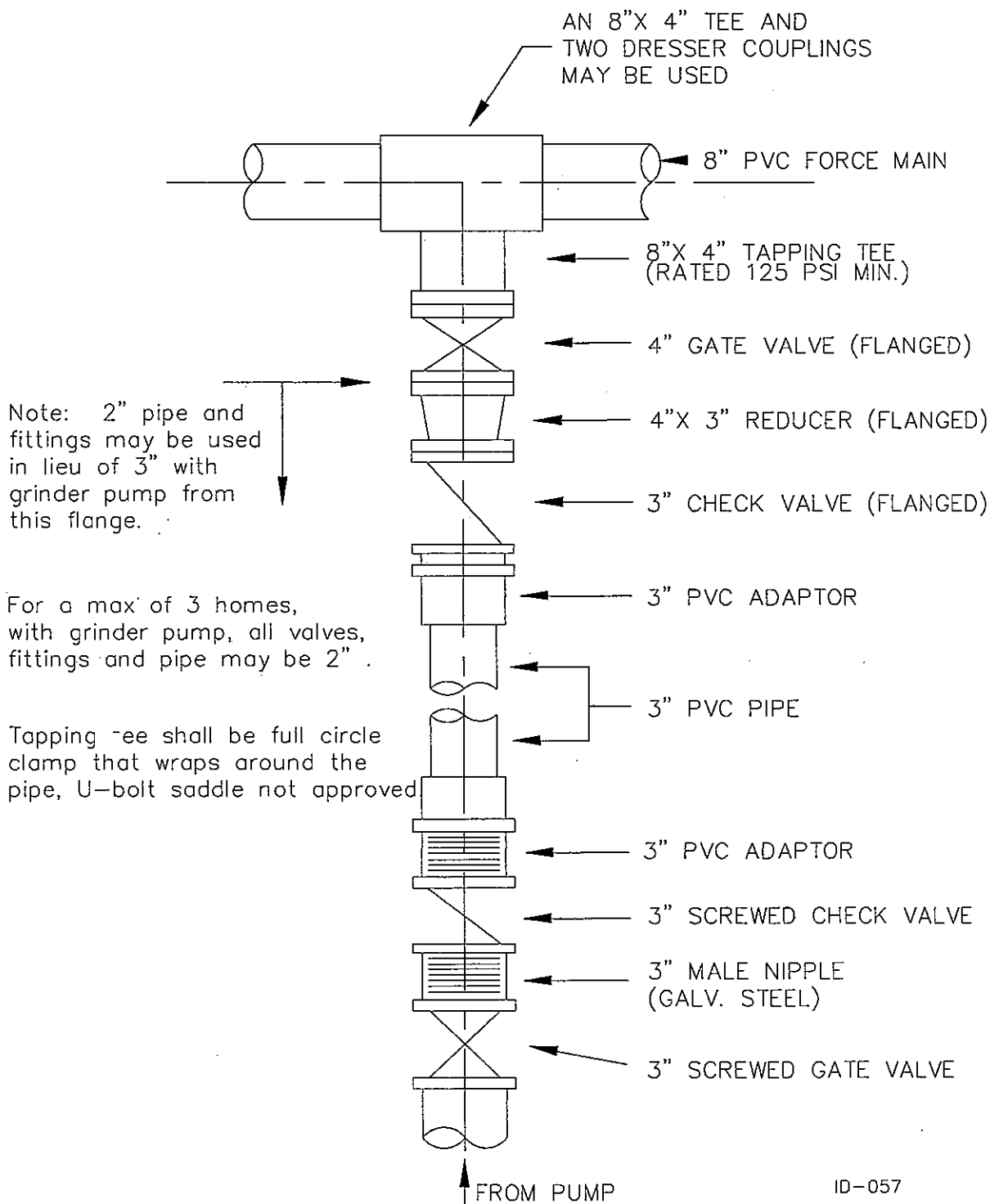
1. SELECT NATIVE BACKFILL MATERIAL OR IMPORTED BACKFILL MATERIAL COMPACTED PER SPECIFICATIONS
2. STAINLESS BANDS WITH CONCRETE SPACER TO MANHOLE (5' MAX. SPACING, 1' MIN.)
3. SEE STD DWG PAGE 4-6 FOR CLEANOUT DETAILS (NOT SHOWN)
4. DROP CONNECTION PIPE DIAMETER AND FITTINGS SHALL BE EQUAL TO OR GREATER THAN THE DIAMETER OF THE SEWER MAIN.
5. SEE PAGE 4-4 FOR CHANNELING FINISH REQUIREMENTS.
6. ALL OUTSIDE DROP M.H. SHALL BE CONSTRUCTED WITH DUCTILE IRON PIPE.

ID-118

MANHOLE GRADE ADJUSTMENT DETAIL (For existing manholes)

- NOTE:** 1. Remove existing frame & lid, bricks, conc. collar and top riser section. Install new reinforced concrete manhole riser section (field verify height) and maximum of four concrete adjustment rings (16") and existing frame and collar.



FORCE MAIN SERVICE CONNECTION

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GENERAL CONDITIONS

Construction shall be in accordance with the current City development standards and APWA/WSDOT Standard Specifications; except as specifically superseded by the approved plans or special condition of the permit. The following conditions or restrictions must be followed:

Should any damage be done to the roads during the time of construction and installation or in the maintenance and/or operations of said facilities, the road(s) shall be restored by the permittee(s), their successors or assigns, to as good a condition as it was before such damage occurred. Should the grade, width or location of the road(s) be changed or altered in any way so as to require the removal of said facilities, the permittee(s), their successors or assigns, shall forthwith move and relocate said facilities without any redress against the City.

The permittee shall indemnify, defend and hold harmless the City, its officers, agents and employees, from and against any and all claims, losses or liability, including attorneys fees, arising from injury or death to persons or damage to property occasioned by the construction, installation, operation, location, maintenance, or any other cause related to the improvement for which this permit is granted. With respect to this permit and to claims against the City, its officers, agents and employees, the permittee expressly waives its immunity under Title 51 of the Revised Code of Washington, the Industrial Insurance, Act, for injuries to any employee the permittee may have, and agrees that the obligation to indemnify, defend and hold harmless provided for in this paragraph extends to any claim brought by or on behalf of any employee of the permittee. This waiver has been mutually negotiated by the parties as part of the permitting process and is given, as is the indemnification agreement contained within this paragraph, as consideration for issuance of a right-of-way use permit by the City. This paragraph shall not apply to any damage or injury resulting from the sole negligence of the City, its agents or employees. The extent any of the damages or injuries referenced by this paragraph were caused by or resulted from the concurrent negligence of the City, its agents or employees, this obligation to indemnify, defend and hold harmless is valid and enforceable only to the extent of the negligence of the permittee, its officers, agents or employees, if any.

The acceptance of the conditions upon which this permit is granted shall be evidenced by the beginning of the installation of said facilities as set forth herein.

CONSTRUCTION REQUIREMENTS AND GENERAL SPECIFICATIONS

1. No open cut crossing of City roads or streets shall be made without the approval of the City engineer (notice of five working days required). Depending on location, boring may be required.
2. Signing, flagging and traffic control shall be in accordance with the Manual of Uniform Traffic Control Devices. One lane of traffic shall remain open at all times. Roadway shall be open for two-way traffic at the end of each day, with temporary

surfacing as approved by the City Engineer. Should a total road closure appear necessary, application for a road closure permit must be filed with the Public Works office at least five (5) working days prior to the anticipated closure. Application must be accompanied with dust control plan, detour plans, hours of closure, and signing/traffic control plans.

3. Asphalt shall be cut in a solid straight line. After excavating trench and installing utility, all backfill material must be free draining granular material, free of debris and clay. This material to be compacted by a mechanical compactor (approved by the City engineer) to 95% of maximum density (modified proctor) in six inch lifts followed by placement of six (6) inches in 5/8" minus crushed stone top course. After placing a tack coat on the edges of the existing pavement, three (3) inches of class B shall be placed and compacted to match the existing surface. Pavement sections are subject to a two year workmanship warranty; to be replaced if excessive settling or mechanical breakdown develops.
4. When the excavation is located in a graveled shoulder, backfill shall be placed and compacted as specified in paragraph 4 above, and surfaced with a minimum of six (6) inches of compacted 5/8" minus crushed stone surfacing.
5. When multiple open cut utility crossings are proposed at intervals of 200 feet or less, between adjacent crossing, a full width asphalt resurfacing of the roadway pavement section will be required for the entire length of roadway between crossing extending to ten (10) feet either side of crossings. Existing crossing will be considered when establishing overlay requirements in addition to work contemplated under current utility permit application.
6. Existing drainage ditches, culverts, etc. shall be kept clean at all times. Temporary diversion of any drainage system will not be permitted without the consent of the City engineer. Any drainage culvert tile, catch basins, manholes, etc., disturbed by excavation shall be replaced with new material or repaired as directed by the City engineer. Temporary erosion/sedimentation control measures shall be employed to protect adjacent property and storm drain facilities.
7. If in the opinion of the City engineer, weather conditions are so bad as to make the traveled roadways unsafe for the traveling public or detrimental to the restoration of the roads, excavation shall cease immediately and clean up shall be promptly accomplished.
8. Maximum amount of open trench on streets shall be 200 lineal feet unless authorized otherwise by the City engineer. At the end of each day, all ditches must be backfilled or covered with steel plates and barricaded with flashing warning lights to prevent people or animals from falling into the trench.
9. All pipe or other material strung along City right-of-way must be placed a safe distance from the traveled roadway in such a manner as to avoid rolling onto the roadway, or creating a traffic hazard.

10. Final cleanup including complete restoration of shoulders, cleaning of ditches, culverts and catch basins, and removal of loose material from back slopes of ditches shall not exceed 500 lineal feet behind excavating operations. Street surfaces shall be kept cleaned at all times with the use of a power broom or other approved means.
11. No excess material or unsuitable material shall be wasted on City right-of-way without the express written consent of the City engineer.
12. The Developer shall use special care to protect existing survey monuments or control points and it is the obligation of the Developer to notify the City engineer of the possibility of them being disturbed by his work.

If any of the markers and/or reference points are disturbed or damaged, the Developer shall have them reset by a registered Land Surveyor. The surveyor shall record or file all required documents with the County or the State Department of Natural Resources as may be appropriate, at the Developer's cost.

Standard cast iron monument cases will be required for all GPS and brass cap monuments and will be furnished by the Developer at no cost to the City. The Developer shall bear the cost of installation, by his surveyor, of such cases in a manner satisfactory to the City engineer.

13. Yard improvements within the right-of-way shall be restored to as close to original condition as feasible. This includes but is not limited to features such as landscaping, rockeries, lamp post, mailboxes and fences. This permit does not authorize or regulate work on private property, private easements or vacated and "ancient" rights-of-way without public easements. Any private property damages or liability incurred are the sole responsibility of the Contractor.
14. Notify the City engineer immediately prior to starting work and upon completion, the applicant shall call the City engineer for an inspection of work at (509) 682-8030. All items noted during the inspection shall be corrected to meet with the City engineer's approval.
15. No equipment, except equipment with rubber tires, shall be permitted to operate on any road. Damage to any road will be repaired by the Developer, at his expense, to restore the road to the original condition.
16. Completion of construction of a facility within City road right-of-way by permit or franchise obligates the Developer, successors, and assigns to perpetually maintain said facility or utility for its full period of existence and to cause to be repaired any subsidence, settlement or other condition of damage or hazard to the City road resulting therefrom.

LAND DIVISION**LOTS**

Access: Every new lot shall be provided with satisfactory access to a street and shall be platted so as to provide acceptable driveway grades of less than 18%. A maximum of 18% grade shall be allowed for a continuous length of up to 100 feet.

Width and Depth: All lots shall have a minimum width and depth sufficient to meet the Chelan zoning ordinance width and depth requirements for the particular zone in which the property is located.

Slope: As slope increases, lot sizes shall increase to partially or completely avoid the problems of drainage, siltation, flood control, potential land slides and accessibility which frequently are attributable to over development of slope areas. Slope shall be calculated based on the average topography of individual lots. The following slope chart shall be used as a guide to determine minimum lot size and frontage.

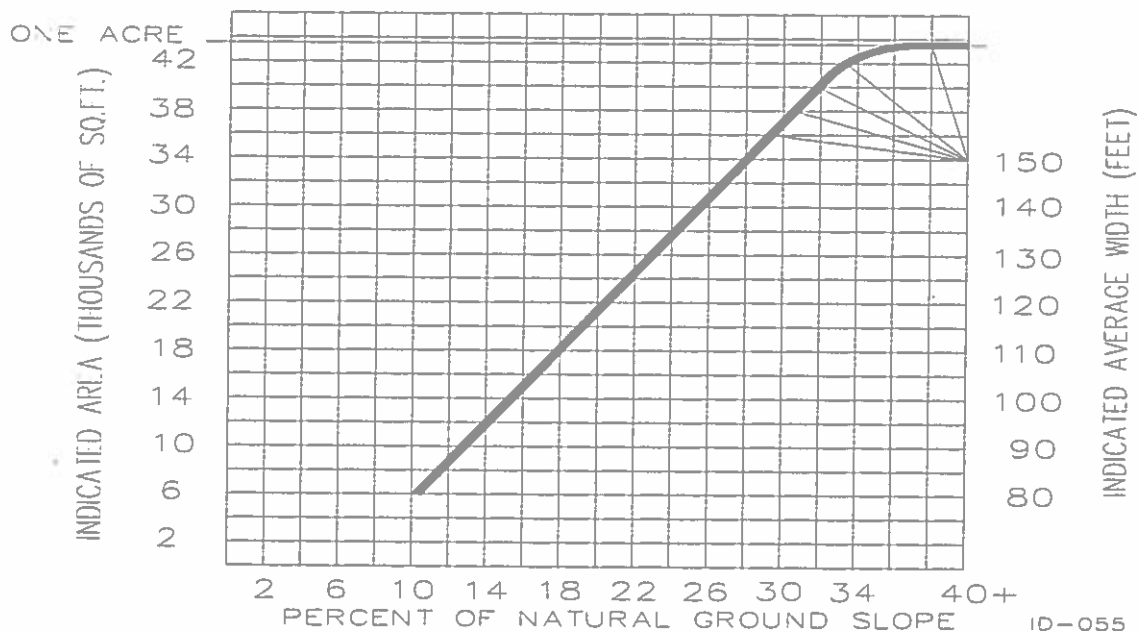


Chart Example: For a lot whose natural ground slope is 23%, the indicated area is 26,000 square feet and the indicated average width is 130 feet. Relief from slope requirements may be obtained only if adequate provisions are made for parking, health regulations, building siting, soil stabilization and utility easements.

A slope analysis shall be submitted showing an access plan to any individual lot not meeting the criteria of the slope chart.

Corners At Street Intersections: At street intersections in residential areas, lot corners shall be rounded by an arc. Radii shall be per the Street Standards Section.

Line Angles: Side lot lines shall be straight lines running within twenty degrees of perpendicular to the road upon which the lots front. Side lot lines on curved roads should run at or near radially to the curve.

Reverse Frontage: No residential lots shall have street frontage along two opposite boundaries unless topographical features or the need to provide separation of the lots from arterials, railways, commercial activities or industrial activities justify the designing of reverse frontage lots.

BLOCKS

In general, blocks shall be as long as is reasonable and consistent with the topography and the needs for convenient access, circulation, control and safety of street traffic and the type of land use proposed. For residential subdivision, the block length ordinarily shall not exceed one thousand three hundred twenty feet or be less than four hundred feet.

Except for reverse-frontage parcels, the width of blocks shall ordinarily be sufficient to allow for two tiers of lots of depths consistent with the type of land use proposed. This width should not be less than two hundred feet for the sum of two lot depths.

In residential subdivisions, a through pedestrian walk right-of-way not less than ten feet wide shall be provided at the midpoint of any block exceeding six hundred feet in length where such a walk is deemed essential to provide circulation or pedestrian access to schools, parks, shopping centers and other community facilities.

SURVEY MONUMENTATION

Survey shall comply with RCW 58.20, City Municipal Code Title 16, and this Section. For each 500,000 square feet of new development state plane coordinates shall be calculated for at least one monument. Developments of four or more lots shall establish or tie to at least one such monument. The intent of this requirement is to facilitate entry of plat and development data into Public Works data base. The state plane coordinates are not intended to be a legally binding representation of property locations.

EASEMENT PREPARATION STANDARDS

1. **SUMMARY:** This procedure establishes a uniform method for the preparation of all City easements.
2. **SCOPE:** This procedure applies to all easements to be granted to the City.
3. **GENERAL:** When City utilities are to be constructed on private property, an easement must be granted to the City. The City Public Works Department will generally process, record, and file all City easements. Easements prepared by applicant consultants must be reviewed and approved by the City before recording and filing by the applicant. The Standard City easement format is in Appendix B, Exhibit 4.

1. **EASEMENT PREPARATION.** All easements not shown on a plat must be prepared by a licensed land surveyor or licensed engineer. The descriptions contained in the easement document shall be prepared by a Washington licensed land surveyor or licensed engineer who shall seal or affix their name to the legal description. Legal descriptions must contain the full legal description of the real property upon which the easement is located as recorded in the Chelan County Auditor's records. In addition, the Chelan County Assessor's parcel number must be provided.

All easements must be prepared on 8½" x 11" paper. Every easement shall include an easement number in the lower right corner of each page. This number will be assigned by the City Public Works Department.

An easement drawing will be attached to each easement. The easement drawing shall include: (1) the name of the grantors, (2) the easement number provided by the City Public Works Department, and (3) the general purpose of the easement, (i.e., all City utility purposes, water, sewer, drainage, well protection, access, etc.) The drawing shall be to a suitable scale on size 8½" x 11" paper. The drawing must show the entire parcel and shall contain enough information to clearly identify both the parcel and easement. The easement must be tied to a platted corner or a section corner. Easement areas shall be delineated by cross-hatching. Each drawing shall be sealed and signed by the submitting licensed land surveyor or licensed engineer.

2. **RETRIEVAL.** Original easements will be on file with the City clerk and copies will be on file in the City Public Works Department. To obtain copies of easements, please contact the City Public Works Department. Easements are filed numerically by section, township, and range so the legal description of the real property involved is necessary for a prompt retrieval of any easement.

UTILITIES EASEMENTS

Easements for all facilities such as high voltage electric transmission lines, drainage canals, pondage areas, etc., shall be of such width as is adequate for the purpose. Minimum linear easement width shall be 20 feet unless directed otherwise by the City engineer. Easement for utilities at greater depths than 7 feet may require greater width.

UTILITIES

Undergrounding: Utility lines, including but not limited to those for electricity, communications and street lighting, serving and located within the subdivision, shall be placed underground.

Public: Where alleys are not provided, easements for public utilities shall be provided along rear lot lines and side lot lines where necessary including any necessary access easement. Where easements are necessary, they shall be a minimum of twenty feet in width, unless directed otherwise by the City Engineer. For safety concerns, where possible, the width of rear and side lot line easements shall be equally shared by abutting lots and shall be continuous and aligned from block to block within the subdivision and with adjoining subdivisions. Additional width will be required where multiple utilities or depth and separation so require.

UTILITY SERVICES

1. All utility lines including electric, telephone, fire alarm and television cables shall be placed underground prior to paving.
2. Easements for maintenance of all utilities, both on and off site, shall be provided to the City, to the satisfaction of the City Engineer prior to final plat approval.

COMMON UTILITY TRENCHES

Common Utility trenches shall generally not be allowed with water, sewer, and storm lines. Utility lines shall generally be located as per drawing 10-11. Common trenches may be allowed for phone, electric, cable TV, gas, and other non-City utilities if approved by each individual utility. Water and sewer lines shall be separated as required by the Department of Ecology and the Department of Health.

Under extreme unusual conditions, common trenches may be necessary and allowed as approved by the City engineer. Crossings and connections with existing lines may also require individual evaluation for variation approval by the City engineer.

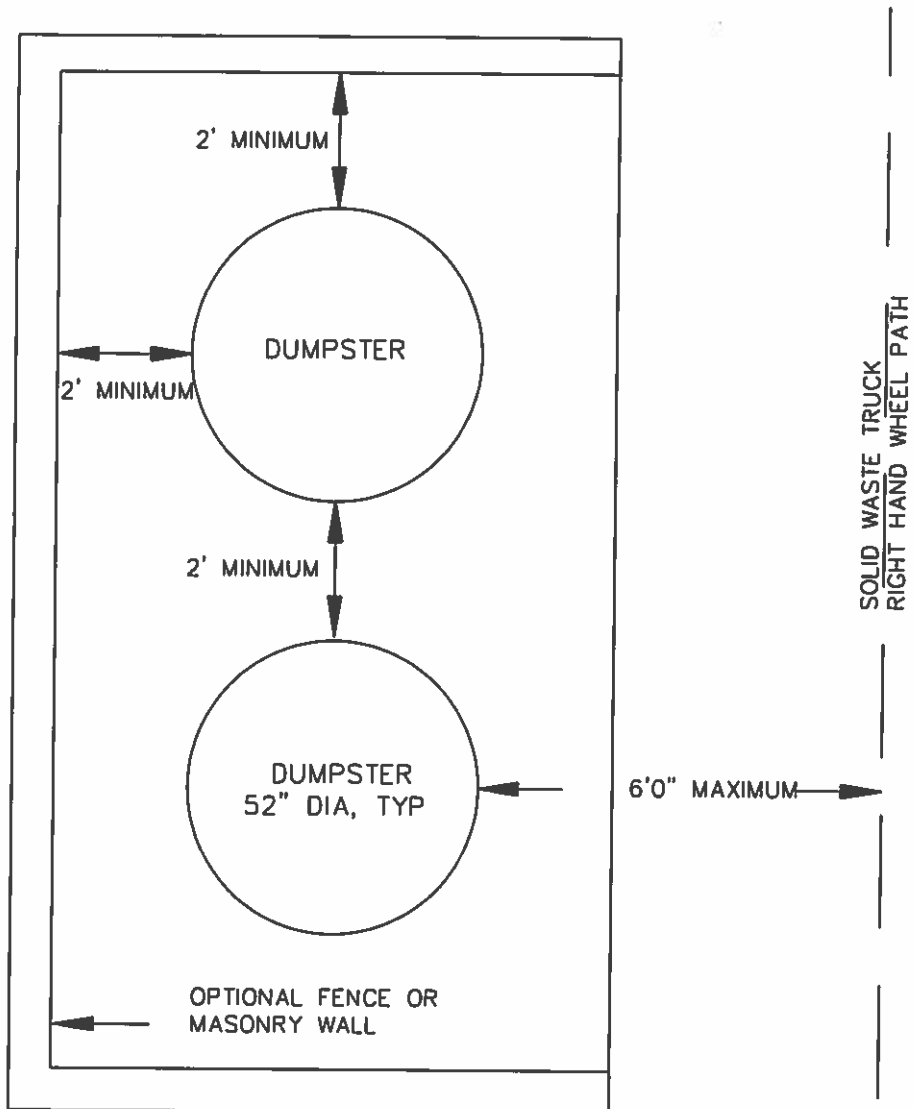
PROJECT REVIEW AND INSPECTION

Whenever the City Engineer and/or the Public Works Director determine that the magnitude and/or complexity of any public improvement being constructed by a private developer, as a condition of a land use permit or approval, requires full or part-time on-site inspection, the City Engineer and/or the Public Works Director shall have the authority to provide or contract with a duly qualified inspector to provide inspection services for the City in connection with such construction. All costs of such inspection services incurred by the City shall be paid by the developer. The fee must be deposited in advance with the City prior to issuance of a construction permit.

City personnel shall strive to assist developers with such information as is readily available or easily obtained. Costs for investigative research or project review requiring more than two man hours, or which will require an outside consultant (such as City attorney, or City consulting engineer) shall be borne by the requesting developer. Prior to performing such research or review, the City may require the developer to execute a reimbursement agreement.

SOLID WASTE REQUIREMENTS

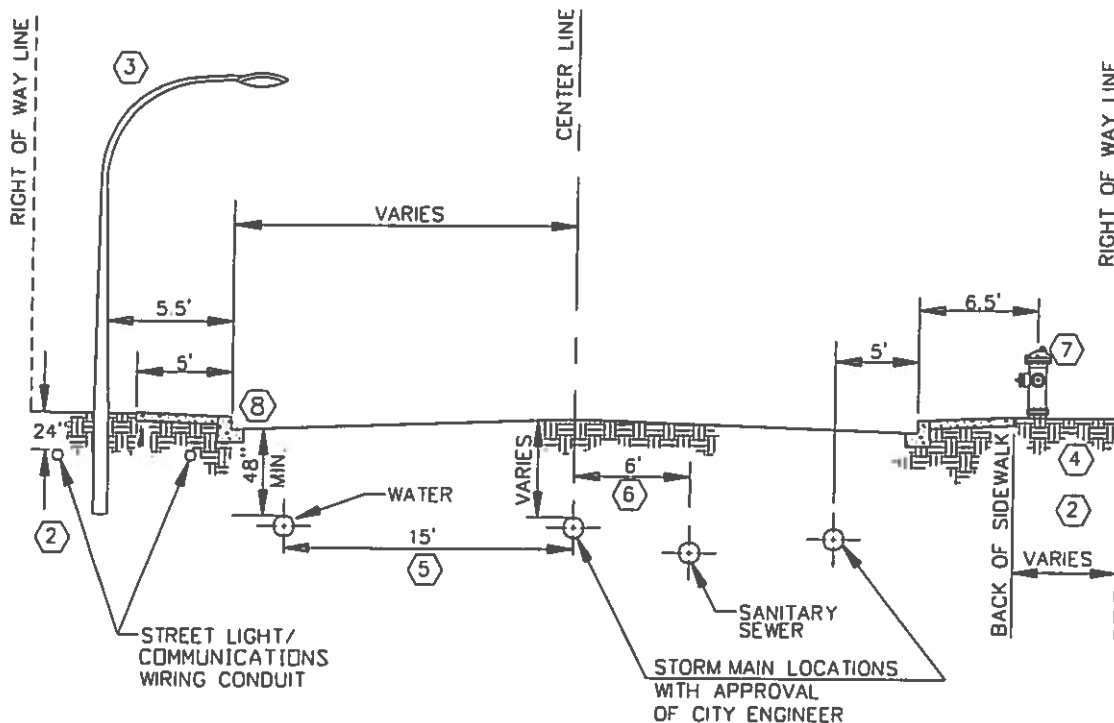
1. All multi-family and commercial development must provide recycling facilities.
2. Multifamily housing shall be served by commercial solid waste containers (dumpsters) at a ratio not less than 0.15 CY per ERU per living unit.
3. Commercial solid waste containers or Commercial Accounts with four or more 30-gallon cans must be placed on a concrete slab (fenced if required by City Engineer) easily accessible to the solid waste packer truck. The location shall provide side drive-by and side loading, no back-in locations will be allowed. See City of Chelan Standard Detail "Dumpster Pad and Enclosure" for typical construction details.

DUMPSTER PAD AND ENCLOSURE

ID-056

- NOTES:
1. SOLID WASTE TRUCK REQUIRES:
 - a) NO BACKING UP
 - b) 45' CLEAR RADIUS TO TURN
 2. ONE PAD PER BUILDING UNLESS OTHERWISE APPROVED BY CITY ENGR
 3. PAD MUST MATCH EXISTING PAVEMENT/LOT GRADE
 4. PAD MAY BE CONCRETE OR ASPHALT
 5. ENCLOSURE IS OPTIONAL
 6. NO OBSTRUCTIONS OVERHEAD OF THE PAD ARE ALLOWED
 7. ALTERNATE GEOMETRY MAY BE APPROVED IF OWNER PROVIDES DUMPSTER DOLLIES AND IF OWNER IS RESPONSIBLE FOR POSITIONING DUMPSTERS BEFORE AND AFTER PICKUP.

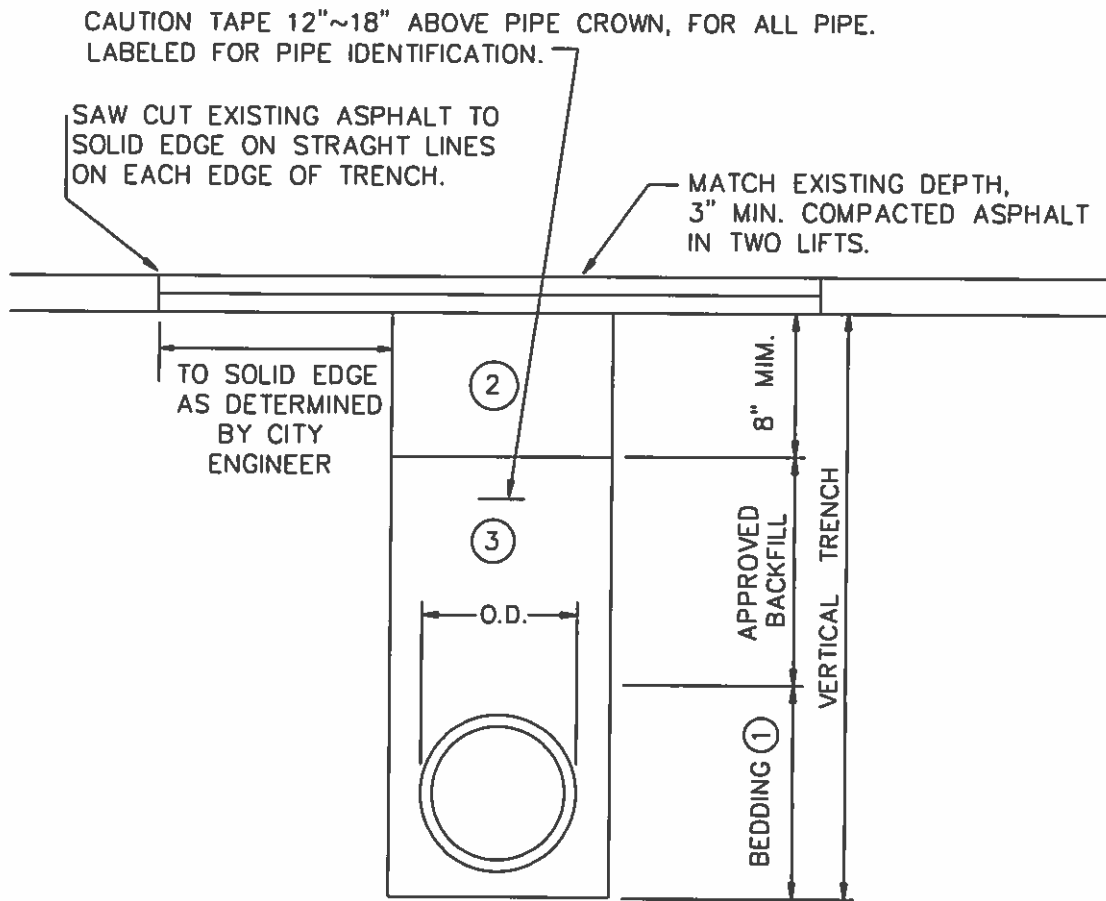
TYPICAL CITY UTILITY LOCATION FOR NEW STREET CONSTRUCTION



ID-101

Notes:

- Developer or contractor is required to call Utility Locate at (800) 424-5555 a minimum of 48 hours prior to digging within the limits of City right-of-way for the location marking of all underground utilities.
- Typical locations for other proposed public utilities shall be in greenway behind sidewalk, City engineer may approve exceptions. A minimum horizontal separation of 3 feet shall be maintained from City water mains and a minimum 5 foot horizontal separation shall be maintained from City sewer and storm sewer mains.
- Street light poles typically will be installed on alternating sides of the street and spaced as indicated on detail page 11-9.
- Water meter boxes will be installed at the back of new or existing sidewalks.
- Potable water lines typically shall be installed 15 feet from and parallel to the centerline of the right-of-way on the north or east side.
- Sanitary sewer line typically shall be installed 6 feet from and parallel to the centerline of the right-of-way on the south or west side.
- Fire hydrants typically will be installed on alternating sides of the street and spaced per requirements of Section 1 of these standards.
- If conflicts require alternate water or sewer main locations, approval shall be obtained from the City Engineer for the location. A minimum 3 foot separation from the face of curb is required.

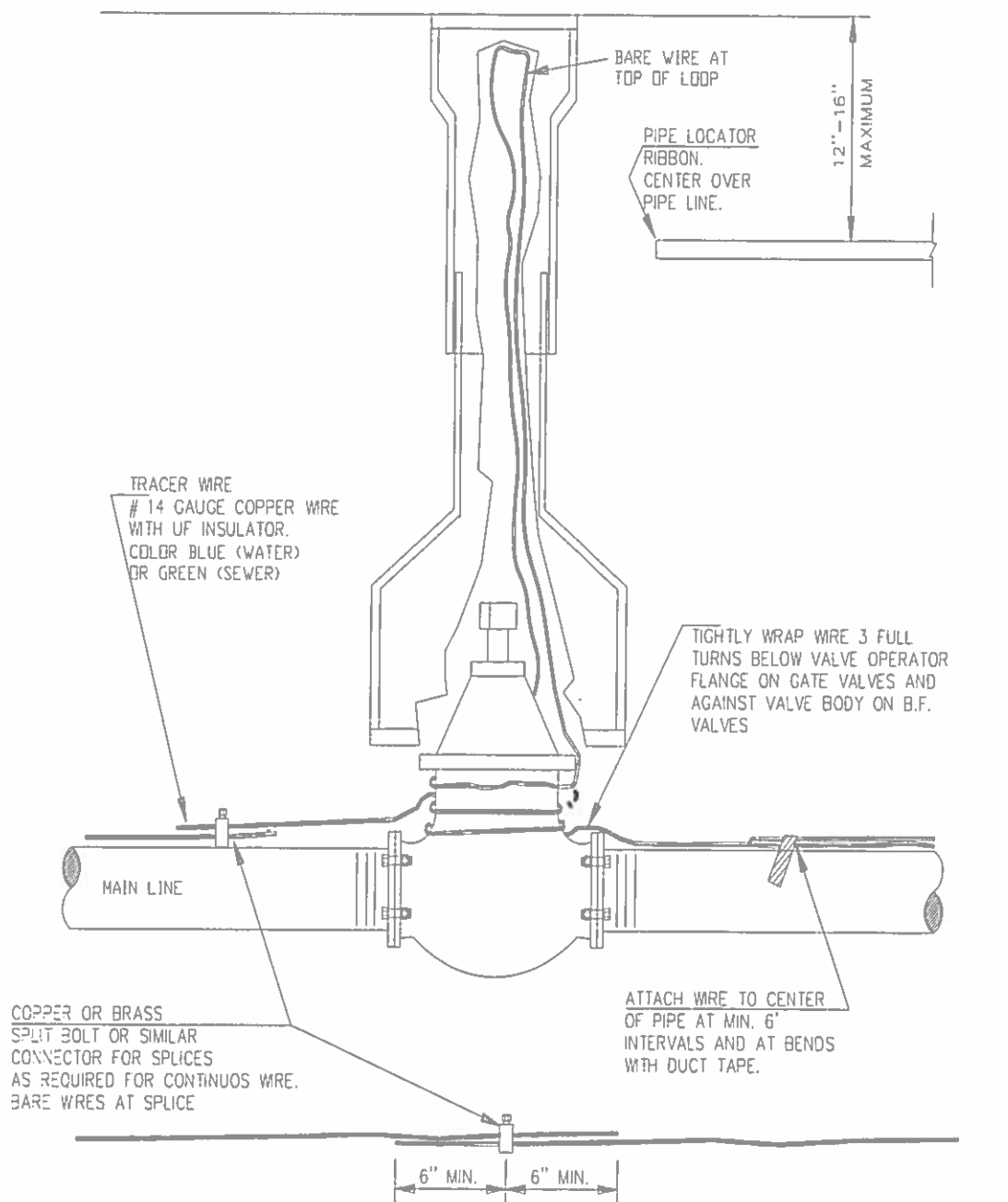
UTILITY TRENCH REPAIR STANDARD

ID-113

- NOTES:
1. BEDDING FOR FLEXIBLE PIPE SHALL BE A MINIMUM THICKNESS OF 4" UNDER THE PIPE AND 6" OVER THE CROWN.
 2. COMPACTED CRUSHED SURFACING TOP COURSE.
 3. SELECT BACKFILL SHALL BE 5/8-0 CRUSHED ROCK. *CONTROLLED DENSITY FILL (CDF) MAY BE REQUIRED BY THE CITY ENGINEER AS NEEDED.
 4. BACKFILL MECHANICALLY COMPACTED TO 95% MAX. DENSITY IN 6" LIFTS..
 5. 4' MIN. COVER ON ALL WATER AND SEWER MAINS.
 6. TRENCH EXCAVATION SAFTY SYSTEM PER WASHINGTON INDUSTRIAL SAFETY AND HEALTH ACT.
- * CDF SHALL CONSIST OF:
- 1.5 SACK CEMENT
 - 1750 LBS. PEAGRAVEL
 - 1750 LBS. SAND
 - 6 OZ./100 WEIGHT WATER REDUCING AGENT
 - 4" TO 5" SLUMP

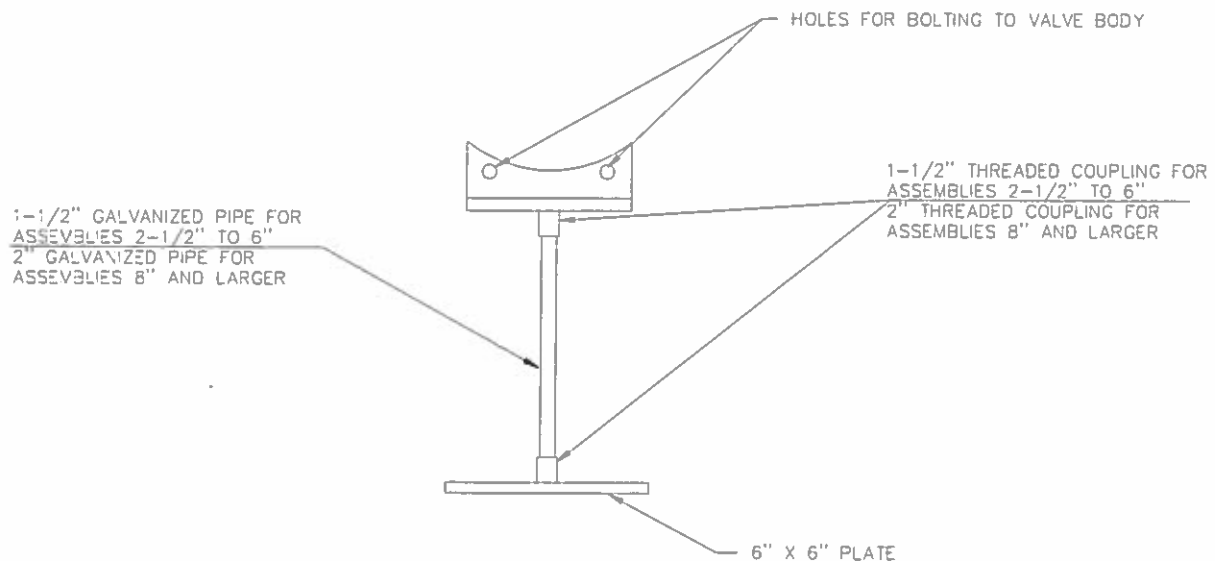
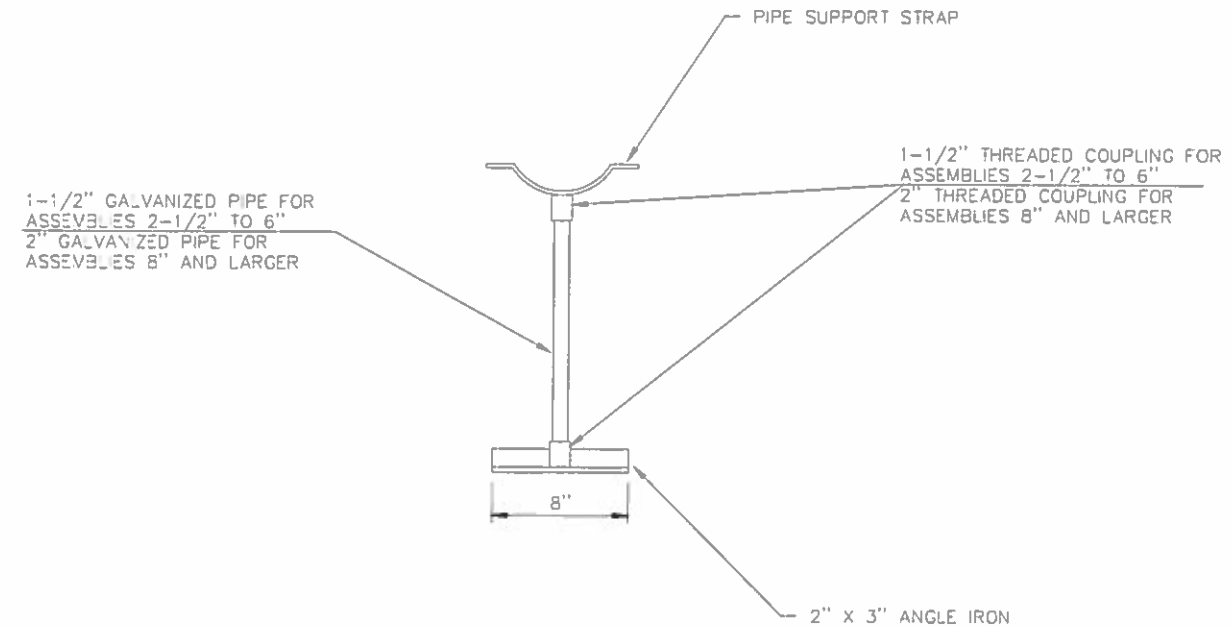
CDF SHALL BE APPROVED BY THE CITY ENGINEER FOR SPECIFICATIONS AND USE.

TRACER WIRE INSTALLATION

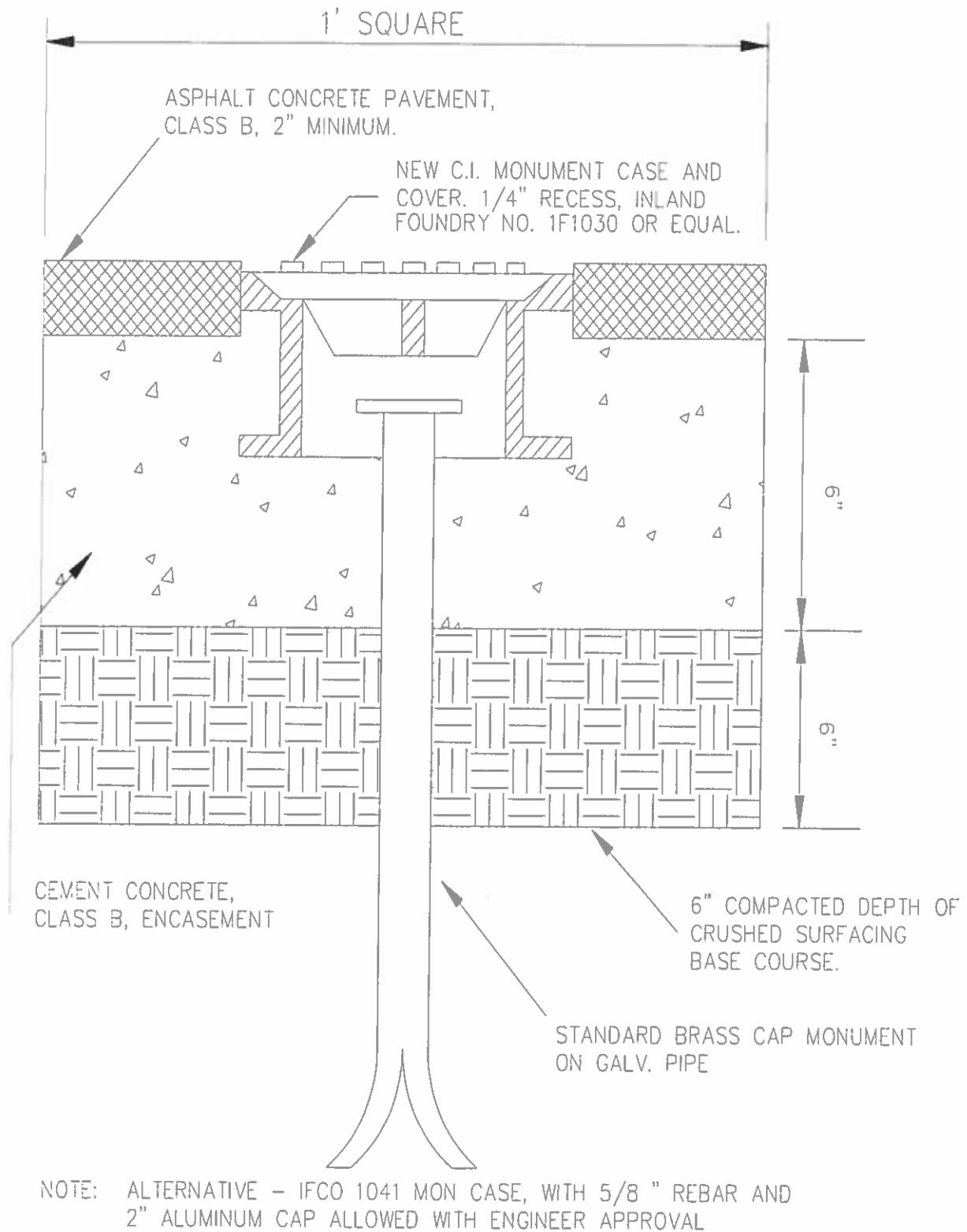


TRACER WIRE SHALL BE INSTALLED ON **ALL** MAIN LINES INSTALLED IN A NON-LINEAR ALIGNMENT.
 TRACER WIRE IS REQUIRED ON BOTH METALLIC AND PLASTIC PIPE.
 WIRE LOOP SHALL BE BROUGHT TO SURFACE AT EACH ACCESS POINT SUCH AS WATER VALVE BOX, SEWER FLUSH PORT, ETC

ID-105

PIPE SUPPORTSPIPE SUPPORTS

ID-078

TYPICAL MONUMENT CASE (NEW)

ID-044

APPENDIX D

SEWERCAD DATA

City of Chelan Sewer Collection Hydraulic Model (2020 GSP)
Basic Entity Data

Label	Manholes			
	X (ft)	Y (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)
A-1	1,840,222.44	307,286.98	1,107.23	1,093.68
A-2	1,840,205.57	307,298.59	1,105.81	Unknown
A-3	1,840,255.15	307,291.35	1,110.12	1,100.92
A-4	1,840,546.61	307,297.58	1,300.00	Unknown
A-5	1,840,834.90	307,268.54	1,123.49	Unknown
A-6	1,840,284.08	307,397.26	1,114.14	1,106.14
A-7	1,840,323.22	307,487.87	1,116.69	1,106.39
A-8	1,840,186.77	307,616.32	1,300.00	Unknown
A-9	1,840,326.09	307,616.70	1,120.75	1,109.45
A-10	1,840,526.66	307,611.73	1,123.13	Unknown
A-11	1,840,848.38	307,604.01	1,126.45	Unknown
A-12	1,840,333.70	307,908.69	1,125.82	1,111.22
A-13	1,840,003.47	308,030.08	1,126.70	1,112.45
A-14	1,839,943.47	308,052.46	1,126.94	1,112.65
A-15	1,839,664.12	308,155.03	1,128.16	1,113.56
A-16	1,839,301.79	308,288.35	1,127.50	1,114.80
A-17	1,839,220.42	308,375.22	1,126.83	1,115.10
A-18	1,839,198.84	308,471.28	1,125.53	1,115.35
A-19	1,839,197.12	308,828.36	1,124.47	1,116.27
A-20	1,839,197.70	308,876.86	1,124.59	1,116.44
A-21	1,839,947.00	308,224.12	1,127.24	Unknown
A-22	1,839,623.80	308,343.14	1,128.23	Unknown
A-23	1,839,952.89	308,488.96	1,128.75	Unknown
A-24	1,839,963.45	308,941.99	1,128.80	Unknown
A-25	1,839,488.17	308,878.04	1,125.57	Unknown
A-26	1,839,860.88	308,809.56	1,128.11	Unknown
A-27	1,839,489.55	308,564.24	1,125.40	Unknown
A-28	1,839,492.71	308,473.99	1,300.00	Unknown
A-29	1,839,854.29	308,479.08	1,128.01	Unknown
A-30	1,840,341.18	308,271.56	1,129.65	Unknown
A-31	1,840,348.41	308,600.37	1,131.03	Unknown
A-32	1,840,181.90	308,605.26	1,300.00	Unknown
A-33	1,840,352.49	308,755.56	1,132.83	Unknown
A-34	1,840,465.93	308,754.28	1,134.27	Unknown
A-35	1,840,464.97	308,930.17	1,134.98	Unknown
A-36	1,840,888.29	308,918.84	1,143.19	Unknown
A-37	1,840,483.44	309,132.64	1,300.00	Unknown
A-38	1,839,195.38	309,217.33	1,126.73	1,117.53
A-39	1,839,658.60	309,220.35	1,129.00	1,119.10
A-40	1,840,128.74	309,223.94	1,131.40	Unknown
A-41	1,840,458.24	309,222.82	1,136.15	Unknown
A-42	1,840,961.29	309,197.52	1,151.39	Unknown
A-43	1,839,657.33	309,379.15	1,128.70	1,119.60
A-44	1,840,125.78	309,376.56	1,135.57	Unknown
A-45	1,840,453.99	309,374.41	1,154.56	Unknown
A-46	1,840,457.03	309,457.98	1,300.00	Unknown
A-47	1,839,201.33	309,540.94	1,126.37	1,119.24
A-48	1,839,628.40	309,543.82	1,132.03	1,121.63
A-49	1,840,092.77	309,553.99	1,148.60	Unknown
A-50	1,840,460.50	309,555.70	1,175.31	Unknown
A-50A	1,840,459.22	309,670.07	1,187.26	Unknown
A-51	1,840,887.85	309,548.44	1,210.58	Unknown
A-51A	1,840,997.94	309,550.12	1,219.21	Unknown
A-52	1,839,180.46	309,719.94	1,129.13	1,124.00
A-53	1,839,083.22	309,796.89	1,300.00	1,126.50
A-54	1,838,869.17	309,910.81	1,136.45	1,132.00
A-55	1,838,562.26	310,073.17	1,144.68	1,139.00
A-56	1,838,269.37	310,152.89	1,154.03	1,145.00
A-57	1,838,982.05	310,170.32	1,300.00	Unknown
A-58	1,838,861.20	310,172.32	1,177.43	Unknown
A-59	1,838,781.00	310,245.59	1,300.00	Unknown
A-60	1,839,087.77	310,191.39	1,300.00	Unknown

City of Chelan Sewer Collection Hydraulic Model (2020 GSP)
Basic Entity Data

Manholes				
A-61	1,838,768.32	310,081.98	1,300.00	Unknown
A-62	1,838,864.32	310,081.50	1,166.82	Unknown
A-63	1,838,865.83	310,022.80	1,300.00	Unknown
A-64	1,839,043.50	309,990.55	1,300.00	Unknown
A-65	1,838,871.49	309,980.52	1,300.00	Unknown
A-66	1,840,188.98	307,459.32	1,112.23	Unknown
A-67	1,840,317.50	308,767.73	1,132.82	Unknown
A-68	1,839,637.81	309,551.31	1,132.30	1,122.10
A-69	1,839,191.85	309,514.16	1,126.54	1,118.69
A-70	1,840,331.96	309,222.79	1,300.00	Unknown
A-UNK001	1,840,330.54	309,208.53	1,134.25	Unknown
A-UNK002	1,840,103.71	309,716.39	1,170.82	Unknown
A-UNK003	1,839,716.19	308,308.22	1,128.56	Unknown
A-UNK004	1,840,628.51	307,264.90	1,120.66	Unknown
A-UNK005	1,840,529.25	307,275.98	1,118.96	Unknown
A-UNK006	1,839,197.34	308,553.02	1,124.98	1,115.58
A-UNK007	1,840,257.84	307,282.37	1,109.95	Unknown
A-UNK008	1,840,222.74	307,273.16	1,108.34	Unknown
B-1	1,840,927.37	307,594.94	1,126.66	Unknown
B-2	1,841,257.35	307,592.94	1,127.12	Unknown
B-3	1,841,587.34	307,584.21	1,131.28	Unknown
B-4	1,841,928.11	307,576.12	1,130.58	Unknown
B-6	1,840,556.21	307,935.05	1,127.84	Unknown
B-7	1,840,936.63	307,925.39	1,130.77	Unknown
B-8	1,841,327.67	307,915.42	1,131.13	Unknown
B-9	1,841,617.76	307,910.57	1,300.00	Unknown
B-10	1,841,936.35	307,900.06	1,138.53	Unknown
B-11	1,842,136.58	307,894.74	1,144.56	Unknown
B-12	1,842,495.32	307,885.37	1,162.88	Unknown
B-13	1,840,526.72	308,273.66	1,131.18	Unknown
B-14	1,840,945.31	308,255.51	1,134.15	Unknown
B-15	1,841,340.05	308,245.85	1,138.01	Unknown
B-16	1,841,593.52	308,247.45	1,300.00	Unknown
B-17	1,841,944.80	308,232.19	1,155.94	Unknown
B-18	1,842,364.13	308,219.71	1,172.14	Unknown
B-19	1,842,480.56	308,217.10	1,176.53	Unknown
B-20	1,842,552.45	308,215.73	1,300.00	Unknown
B-21	1,842,484.26	308,367.17	1,175.99	Unknown
B-22	1,842,683.24	308,372.04	1,300.00	Unknown
B-23	1,840,527.48	308,602.08	1,134.20	Unknown
B-24	1,840,954.09	308,591.47	1,140.07	Unknown
B-25	1,840,973.19	308,591.71	1,139.65	Unknown
B-26	1,841,264.80	308,583.76	1,145.41	Unknown
B-27	1,841,564.42	308,576.27	1,153.41	Unknown
B-28	1,841,952.58	308,566.68	1,169.75	Unknown
B-29	1,842,367.24	308,557.29	1,171.81	Unknown
B-30	1,842,367.53	308,549.60	1,171.94	Unknown
B-32	1,840,978.04	308,773.77	1,142.75	Unknown
B-32-1	1,840,980.04	308,920.74	1,144.93	Unknown
B-33	1,841,442.32	308,760.43	1,158.36	Unknown
B-33-1	1,841,447.28	308,913.49	1,164.79	Unknown
B-34	1,841,778.71	308,751.48	1,167.24	Unknown
B-35	1,841,957.40	308,744.78	1,170.54	Unknown
B-36	1,842,376.81	308,733.00	1,178.98	Unknown
B-37	1,841,958.37	308,784.53	1,171.56	Unknown
B-38	1,841,984.83	308,952.10	1,180.43	Unknown
B-39	1,842,165.68	309,153.39	1,205.60	Unknown
B-40	1,842,294.37	309,124.86	1,207.32	Unknown
B-41	1,842,389.57	309,249.15	1,222.02	Unknown
B-42	1,842,476.08	309,367.69	1,241.35	Unknown
B-43	1,842,019.64	309,190.38	1,300.00	Unknown
B-44	1,841,961.31	309,211.38	1,300.00	Unknown
B-45	1,841,954.57	309,436.78	1,226.49	Unknown
B-47	1,841,455.00	309,086.37	1,171.73	Unknown
B-48	1,840,990.09	309,218.09	1,152.08	Unknown

City of Chelan Sewer Collection Hydraulic Model (2020 GSP)
Basic Entity Data

Manholes				
B-49	1,841,202.73	309,210.98	1,161.26	Unknown
B-50	1,841,449.59	309,202.81	1,176.45	Unknown
B-51	1,841,755.14	309,201.84	1,194.90	Unknown
B-53	1,840,426.74	308,602.79	1,300.00	Unknown
B-54	1,840,424.31	308,778.24	1,133.87	Unknown
B-55	1,842,170.25	309,172.64	1,300.00	Unknown
B-56	1,842,123.95	309,187.14	1,300.00	Unknown
B-57	1,840,347.48	308,814.00	1,300.00	Unknown
B-UNK001	1,842,232.49	309,129.52	1,205.75	Unknown
B-UNK002	1,842,224.08	309,119.93	1,203.93	Unknown
C-1	1,840,919.80	307,271.93	1,124.03	Unknown
C-2	1,841,306.43	307,262.10	1,125.20	Unknown
C-3	1,841,692.11	307,252.59	1,127.19	Unknown
C-4	1,842,070.93	307,243.06	1,127.74	Unknown
C-5	1,842,338.94	307,236.14	1,134.14	Unknown
C-6	1,842,419.42	307,234.44	1,136.82	Unknown
C-7	1,842,738.96	307,226.38	1,146.86	Unknown
C-8	1,843,284.88	307,217.31	1,300.00	Unknown
C-9	1,842,426.99	307,557.24	1,145.76	Unknown
C-10	1,842,724.56	307,550.79	1,157.30	Unknown
C-11	1,842,847.27	307,548.00	1,159.37	Unknown
C-12	1,843,097.71	307,542.07	1,172.02	Unknown
C-13	1,843,293.58	307,537.23	1,176.93	Unknown
C-14	1,843,437.17	307,536.87	1,300.00	Unknown
C-15	1,843,697.14	307,527.23	1,185.73	Unknown
C-16	1,844,047.74	307,518.59	1,195.56	Unknown
C-17	1,844,318.93	307,508.42	1,300.00	Unknown
C-18	1,843,293.59	307,696.50	1,178.62	Unknown
C-19-1	1,843,518.69	307,692.71	1,181.57	Unknown
C-19-2	1,843,664.52	307,690.01	1,184.88	Unknown
C-19-3	1,843,709.46	307,690.51	1,185.15	Unknown
C-20	1,844,058.03	307,684.02	1,198.05	Unknown
C-21	1,844,235.37	307,683.81	1,300.00	Unknown
C-22	1,843,515.05	307,849.10	1,300.00	Unknown
C-23	1,844,057.28	307,830.57	1,203.26	Unknown
C-24	1,840,915.07	307,100.23	1,122.43	Unknown
C-25	1,840,923.34	307,081.81	1,122.23	1,115.00
C-26	1,841,402.08	307,068.20	1,124.90	1,114.18
C-27	1,841,883.29	307,057.02	1,125.78	1,113.38
C-28	1,841,880.67	306,912.57	1,126.59	1,113.05
C-29	1,842,386.91	306,898.48	1,130.73	Unknown
C-30	1,842,930.88	306,885.31	1,142.43	Unknown
C-31	1,842,934.89	307,034.10	1,146.61	Unknown
C-32	1,843,235.37	307,045.26	1,156.05	Unknown
C-33	1,843,416.70	307,210.06	1,160.21	Unknown
C-34	1,843,565.93	307,203.90	1,156.49	Unknown
C-35	1,844,071.60	307,187.04	1,194.21	Unknown
C-36	1,844,108.78	307,184.18	1,194.79	Unknown
C-37	1,844,164.60	307,182.77	1,195.53	Unknown
C-38	1,844,397.36	307,176.81	1,199.03	Unknown
C-39	1,844,697.02	307,176.57	1,200.95	Unknown
C-40	1,844,929.32	307,171.18	1,200.68	Unknown
C-41	1,845,215.01	307,163.23	1,201.90	Unknown
C-42	1,844,109.06	307,018.79	1,203.84	Unknown
C-43	1,844,473.37	307,011.66	1,231.01	Unknown
C-44	1,844,113.01	306,682.29	1,212.93	Unknown
C-45	1,844,479.14	306,661.71	1,258.97	Unknown
C-46	1,844,117.69	306,392.39	1,221.93	Unknown
C-47	1,844,498.32	306,396.77	1,262.33	Unknown
C-48	1,844,126.26	307,326.15	1,194.85	Unknown
C-49	1,844,356.37	307,320.49	1,194.18	Unknown
C-50	1,844,360.28	307,365.13	1,300.00	Unknown
C-52	1,844,491.31	307,379.14	1,193.69	Unknown
C-53	1,844,506.71	307,632.23	1,202.73	Unknown
C-54	1,840,636.81	306,939.75	1,300.00	Unknown

City of Chelan Sewer Collection Hydraulic Model (2020 GSP)

Basic Entity Data

Manholes				
C-55	1,840,910.78	306,936.18	1,121.30	Unknown
C-56	1,841,411.22	306,923.64	1,124.85	Unknown
C-57	1,841,831.75	306,912.93	1,125.71	Unknown
C-59	1,841,401.21	306,592.72	1,124.34	Unknown
C-60	1,841,681.18	306,586.09	1,129.42	Unknown
C-61	1,841,872.49	306,581.13	1,129.99	1,112.55
C-62	1,841,996.15	306,579.21	1,128.61	Unknown
C-63	1,842,416.29	306,569.53	1,128.95	Unknown
C-64	1,842,694.74	306,563.07	1,132.58	Unknown
C-65	1,842,949.83	306,556.44	1,152.86	Unknown
C-66	1,841,396.08	306,430.23	1,123.48	Unknown
C-67	1,841,898.32	306,419.11	1,131.23	Unknown
C-68	1,842,396.15	306,408.57	1,127.94	Unknown
C-69	1,841,081.74	306,408.18	1,300.00	Unknown
C-70	1,841,384.35	306,405.46	1,123.25	Unknown
C-71	1,841,380.76	306,279.34	1,123.95	Unknown
C-72	1,841,816.04	306,266.04	1,125.48	Unknown
C-73	1,841,867.89	306,282.97	1,124.00	1,112.00
C-74	1,841,892.97	306,240.95	1,127.69	1,111.93
C-75	1,842,388.08	306,228.16	1,126.80	1,103.67
C-76	1,842,798.73	306,030.27	1,122.77	1,103.13
C-77	1,841,992.39	306,254.53	1,300.00	Unknown
C-78	1,842,392.35	306,246.21	1,126.91	Unknown
C-79	1,842,825.29	306,233.32	1,300.00	Unknown
C-81	1,843,693.21	307,020.13	1,183.41	Unknown
C-82	1,843,652.35	307,934.81	1,210.22	Unknown
C-83	1,843,682.91	307,984.41	1,216.79	Unknown
C-84	1,844,560.81	308,362.44	1,330.17	Unknown
C-85	1,844,596.81	308,421.30	1,336.81	Unknown
C-86	1,844,594.23	308,463.50	1,340.20	Unknown
C-87	1,844,850.65	308,473.57	1,350.61	Unknown
C-88	1,844,590.92	308,619.35	1,349.54	Unknown
C-89	1,844,588.97	308,708.28	1,349.26	Unknown
C-90	1,844,583.69	308,864.65	1,345.13	Unknown
C-91	1,844,580.00	308,993.23	1,348.56	Unknown
C-92	1,844,856.80	308,869.75	1,336.40	Unknown
C-93	1,844,863.42	308,586.37	1,347.47	Unknown
C-94	1,845,115.94	308,874.42	1,325.48	Unknown
C-95	1,845,124.19	308,532.64	1,346.44	Unknown
C-96	1,845,110.06	308,467.60	1,350.20	Unknown
C-97	1,845,378.81	308,880.67	1,313.37	Unknown
C-98	1,845,383.12	308,655.26	1,316.34	Unknown
C-99	1,845,391.37	308,307.31	1,343.61	Unknown
C-100	1,845,581.21	308,883.77	1,310.67	Unknown
C-101	1,845,638.41	308,830.11	1,310.06	Unknown
C-102	1,845,646.19	308,561.55	1,309.13	Unknown
C-103	1,845,661.41	308,215.71	1,330.74	Unknown
C-104	1,845,693.83	308,221.45	1,300.00	Unknown
C-105	1,845,664.68	308,096.07	1,337.19	Unknown
C-106	1,845,109.13	308,198.66	1,351.86	Unknown
C-107	1,845,048.22	308,248.44	1,352.23	Unknown
C-108	1,845,049.84	308,361.60	1,352.51	Unknown
C-109	1,845,776.64	308,566.84	1,307.15	Unknown
C-110	1,845,781.13	308,390.72	1,309.76	Unknown
C-111	1,843,695.85	307,201.51	1,300.00	Unknown
C-112	1,842,466.05	307,555.25	1,147.19	Unknown
C-113	1,842,476.33	307,757.22	1,155.62	Unknown
C-114	1,842,878.78	307,726.29	1,168.68	Unknown
C-115	1,840,933.66	307,080.61	1,122.05	1,114.97
C-UNK001	1,842,860.23	306,010.50	1,108.24	1,103.05
C-UNK002	1,841,374.55	307,069.07	1,124.14	1,114.23
C-UNK003	1,840,932.31	307,103.01	1,122.71	1,115.00
C-UNK004	1,842,838.47	307,223.81	1,154.88	Unknown
C-UNK005	1,844,420.11	306,388.07	1,250.30	Unknown
C-UNK006	1,844,474.00	306,392.20	1,259.75	Unknown

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C-UNK007	1,844,470.01	307,677.36	1,205.92	Unknown
C-UNK008	1,843,948.69	308,091.71	1,250.45	Unknown
C-UNK009	1,844,223.46	308,213.37	1,286.46	Unknown
C-UNK010	1,844,460.55	308,313.93	1,317.29	Unknown
C-UNK011	1,844,859.58	308,778.73	1,337.90	Unknown
C-UNK012	1,844,874.81	308,473.53	1,350.82	Unknown
C-UNK013	1,845,393.88	308,206.60	1,346.60	Unknown
CC LS NO. 4 \	1,836,382.48	305,876.99	1,108.91	Unknown
CC LS NO. 4 \	1,836,376.83	305,870.06	1,109.53	Unknown
D-2	1,840,073.88	306,831.18	1,110.04	Unknown
D-3	1,839,613.69	306,770.80	1,134.21	Unknown
D-4	1,839,944.36	306,762.75	1,126.33	Unknown
D-4A	1,839,944.78	306,661.22	1,127.84	Unknown
D-5	1,840,073.45	306,759.86	1,124.69	Unknown
D-6	1,840,272.32	306,732.33	1,104.36	Unknown
D-8	1,839,613.32	306,419.25	1,137.44	Unknown
D-9	1,839,946.62	306,259.93	1,136.45	Unknown
D-10	1,840,269.98	306,448.17	1,132.44	Unknown
D-11	1,840,266.64	306,193.28	1,133.02	Unknown
D-12	1,839,553.03	305,950.82	1,138.93	Unknown
D-13	1,839,613.29	305,947.11	1,139.69	Unknown
D-14	1,839,705.52	305,939.44	1,300.00	Unknown
D-15	1,839,948.16	305,971.51	1,141.35	Unknown
D-16	1,840,263.41	305,943.10	1,140.74	Unknown
D-17	1,840,537.84	305,920.68	1,137.59	Unknown
D-18	1,840,265.29	306,006.19	1,138.76	Unknown
D-19	1,840,893.22	305,859.96	1,119.82	Unknown
D-20	1,840,850.61	305,798.48	1,123.94	Unknown
D-21	1,840,905.89	305,683.58	1,130.94	Unknown
D-22	1,840,648.51	305,518.39	1,300.00	Unknown
D-23	1,840,907.67	305,512.53	1,140.43	Unknown
D-24	1,841,290.75	305,508.83	1,142.50	Unknown
D-25	1,841,397.06	305,394.80	1,151.57	Unknown
D-26	1,840,907.14	305,336.33	1,153.56	Unknown
D-27	1,841,330.10	305,329.81	1,154.86	Unknown
D-28	1,840,907.48	305,118.58	1,170.14	Unknown
D-28A	1,840,613.23	305,116.60	1,173.92	Unknown
D-29	1,841,404.17	305,121.41	1,170.35	Unknown
D-30	1,841,663.59	305,122.25	1,165.10	Unknown
D-31	1,840,892.15	304,956.71	1,188.15	Unknown
D-32	1,841,572.50	304,951.29	1,170.84	Unknown
D-33	1,841,663.32	304,953.11	1,166.08	Unknown
D-34	1,841,396.55	304,792.76	1,176.20	Unknown
D-35	1,841,571.99	304,792.61	1,167.31	Unknown
D-36	1,841,393.83	304,618.24	1,173.91	Unknown
D-37	1,841,573.52	304,618.44	1,169.88	Unknown
D-39	1,841,393.97	304,415.31	1,180.84	Unknown
D-40	1,841,589.99	304,416.56	1,175.80	Unknown
D-41	1,841,601.01	304,434.56	1,174.68	Unknown
D-42	1,841,912.46	304,432.67	1,175.55	Unknown
D-43	1,841,914.19	304,280.68	1,184.93	Unknown
D-45	1,841,914.80	304,118.38	1,196.80	Unknown
D-46	1,841,913.44	303,936.11	1,213.35	Unknown
D-46	1,842,152.78	304,119.48	1,199.93	Unknown
D-47	1,841,507.28	303,929.76	1,218.37	Unknown
D-48	1,841,912.15	304,441.11	1,175.61	Unknown
D-49	1,841,986.35	304,388.61	1,177.15	Unknown
D-50	1,842,046.21	304,478.12	1,174.90	Unknown
D-51	1,842,093.35	304,548.19	1,172.80	Unknown
D-52	1,841,396.33	304,282.90	1,300.00	Unknown
D-53	1,840,271.17	306,749.39	1,300.00	Unknown
D-54	1,840,568.03	306,201.84	1,300.00	Unknown
D-55	1,841,860.32	304,621.89	1,167.46	Unknown
D-56	1,839,950.41	305,543.47	1,300.00	Unknown
D-57	1,841,185.86	304,958.96	1,300.00	Unknown

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Manholes				
D-58	1,841,396.82	304,951.10	1,177.31	Unknown
D-59	1,841,079.06	304,959.80	1,300.00	Unknown
D-60	1,840,893.05	304,777.59	1,218.19	Unknown
D-61	1,840,569.71	304,774.79	1,218.24	Unknown
D-62	1,841,396.24	304,105.55	1,300.00	Unknown
D-63	1,840,615.37	305,914.02	1,136.59	Unknown
D-64	1,840,885.92	305,833.79	1,300.00	Unknown
D-UNK001	1,841,808.96	303,777.16	1,227.44	Unknown
D-UNK002	1,841,912.48	303,848.44	1,222.15	Unknown
D-UNK003	1,842,061.63	303,850.28	1,223.09	Unknown
D-UNK004	1,842,194.11	303,816.04	1,224.06	Unknown
D-UNK005	1,842,216.21	304,235.59	1,189.01	Unknown
D-UNK006	1,841,912.40	304,622.17	1,166.56	Unknown
D-UNK007	1,841,911.65	304,656.49	1,164.61	Unknown
D-UNK008	1,839,805.24	306,908.57	1,300.00	Unknown
D-UNK009	1,840,766.31	304,774.53	1,215.96	Unknown
D-UNK010	1,840,182.27	306,793.42	1,300.00	Unknown
D-UNK011	1,839,534.01	305,937.25	1,138.69	Unknown
D-UNK012	1,839,535.53	305,828.23	1,141.09	Unknown
D-UNK013	1,839,536.39	305,563.42	1,154.49	Unknown
E-3	1,839,602.75	307,045.54	1,109.67	1,097.28
E-4	1,839,433.69	306,863.11	1,108.41	1,098.45
E-5	1,839,165.81	306,431.23	1,106.97	1,099.20
E-7	1,839,227.82	306,390.99	1,108.34	Unknown
E-8	1,839,011.65	306,226.22	1,109.05	1,099.65
E-9	1,837,457.93	306,230.42	1,104.04	Unknown
E-10	1,837,821.61	306,313.06	1,103.95	Unknown
E-11	1,838,375.23	306,339.46	1,108.98	Unknown
E-12	1,838,371.84	306,396.36	1,300.00	Unknown
E-13	1,838,401.79	306,329.65	1,108.48	Unknown
E-14	1,838,407.17	306,329.80	1,108.46	Unknown
E-15	1,838,644.59	306,334.17	1,300.00	Unknown
E-16	1,838,711.46	306,255.17	1,105.79	Unknown
E-17	1,838,409.32	306,147.46	1,116.29	Unknown
E-18	1,837,949.98	306,077.94	1,127.49	Unknown
E-19	1,838,412.68	306,046.60	1,121.08	Unknown
E-20	1,838,857.64	306,040.90	1,116.92	1,105.22
E-22	1,839,153.04	306,031.86	1,300.00	Unknown
E-23	1,837,955.95	306,061.06	1,126.85	1,120.15
E-24	1,838,244.42	306,031.27	1,124.59	1,117.19
E-25	1,838,645.29	306,002.75	1,117.16	1,111.31
E-26	1,838,661.15	305,991.50	1,118.60	1,111.00
E-27	1,838,795.21	305,989.35	1,116.17	1,108.87
E-28	1,839,007.94	306,031.01	1,121.55	Unknown
E-29	1,839,234.53	305,992.47	1,130.54	Unknown
E-30	1,838,188.46	305,848.37	1,156.40	Unknown
E-31	1,838,570.34	305,803.49	1,148.45	Unknown
E-32	1,838,719.55	305,838.74	1,146.51	Unknown
E-33	1,839,008.89	305,831.59	1,141.34	Unknown
E-34	1,838,028.59	305,698.23	1,300.00	Unknown
E-35	1,838,518.05	305,647.21	1,190.29	Unknown
E-36	1,838,766.69	305,694.42	1,182.78	Unknown
E-37	1,838,990.42	305,671.82	1,163.48	Unknown
E-38	1,839,365.94	305,683.45	1,150.03	Unknown
E-39	1,839,364.74	305,982.56	1,134.79	Unknown
E-40	1,838,634.59	306,260.93	1,106.63	Unknown
E-UNK001	1,838,349.35	306,459.93	1,104.89	Unknown
E-UNK002	1,839,545.45	306,994.73	1,108.53	1,098.20
E-UNK003	1,838,046.98	305,891.39	1,159.73	Unknown
E-UNK004	1,839,131.13	306,366.65	1,107.17	1,099.40
F-1	1,836,378.53	305,890.46	1,108.44	1,100.54
F-3	1,836,386.07	305,944.50	1,107.48	Unknown
F-6	1,836,090.26	305,922.19	1,107.37	1,101.85
F-9	1,835,803.04	305,789.72	1,108.45	Unknown
F-10	1,835,804.92	305,779.94	1,108.33	1,103.19

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Manholes				
F-11	1,835,549.67	305,389.15	1,300.00	Unknown
F-12	1,835,688.77	305,299.39	1,126.59	Unknown
F-14	1,835,691.60	305,295.19	1,127.78	1,123.56
F-15	1,835,900.40	305,270.37	1,300.00	Unknown
F-16	1,836,055.02	305,259.67	1,154.47	Unknown
F-17	1,836,248.24	305,430.49	1,155.74	Unknown
F-19	1,833,336.80	305,656.80	1,300.00	Unknown
F-22	1,833,037.90	305,703.13	1,128.29	1,121.50
F-23	1,833,020.05	305,534.41	1,136.53	Unknown
F-24	1,832,838.71	305,570.03	1,300.00	Unknown
F-25	1,832,723.69	305,751.86	1,139.24	1,132.84
F-25A	1,832,699.58	305,588.02	1,147.12	1,141.52
F-26	1,832,325.43	305,816.58	1,149.68	Unknown
F-27	1,832,561.46	305,611.83	1,300.00	Unknown
F-29	1,832,675.24	305,415.77	1,154.59	Unknown
F-30	1,832,406.16	305,450.36	1,168.21	Unknown
F-31	1,832,180.90	305,483.53	1,178.18	Unknown
F-32	1,831,962.28	305,524.67	1,300.00	Unknown
F-33	1,832,155.98	305,331.25	1,191.22	Unknown
F-34	1,832,017.65	305,358.30	1,300.00	Unknown
F-35	1,832,127.98	305,180.41	1,300.00	Unknown
F-36	1,832,394.14	305,297.21	1,300.00	Unknown
F-37	1,832,634.61	305,264.01	1,300.00	Unknown
F-38	1,833,354.45	305,822.47	1,104.38	Unknown
F-39	1,833,008.95	305,879.72	1,124.26	Unknown
F-40	1,832,614.98	305,940.66	1,133.51	Unknown
F-41	1,832,262.70	305,996.19	1,300.00	Unknown
F-42	1,832,229.88	305,999.19	1,142.15	Unknown
F-43	1,833,359.38	305,972.43	1,300.00	Unknown
F-44	1,833,280.61	305,986.89	1,300.00	Unknown
F-45	1,833,378.60	305,976.01	1,105.55	Unknown
F-46	1,832,793.03	306,068.55	1,122.15	Unknown
F-47	1,832,284.50	306,149.04	1,130.97	Unknown
F-48	1,832,699.51	306,224.80	1,300.00	Unknown
F-49	1,832,308.70	306,363.71	1,103.89	Unknown
F-50	1,831,930.31	306,358.90	1,114.43	Unknown
F-51	1,831,670.45	306,380.06	1,112.01	Unknown
F-52	1,831,650.52	306,311.41	1,115.11	Unknown
F-52A	1,831,884.39	306,274.70	1,120.93	Unknown
F-53	1,832,141.36	306,231.00	1,124.79	Unknown
F-54	1,831,618.99	306,114.93	1,120.24	Unknown
F-55	1,831,609.93	306,046.62	1,300.00	Unknown
F-56	1,831,359.12	305,959.35	1,122.07	Unknown
F-57	1,831,757.64	305,908.78	1,145.06	Unknown
F-58	1,832,137.98	305,847.71	1,151.68	Unknown
F-59	1,831,158.50	305,926.96	1,115.28	Unknown
F-60	1,831,152.96	305,778.00	1,132.72	Unknown
F-61	1,831,352.06	305,793.14	1,139.55	Unknown
F-62	1,831,723.35	305,745.03	1,300.00	Unknown
F-63	1,832,114.09	305,678.52	1,165.76	Unknown
F-64	1,832,182.40	305,668.46	1,163.96	Unknown
F-65	1,832,203.94	305,814.83	1,151.61	Unknown
F-66	1,831,167.07	305,631.35	1,150.72	Unknown
F-67	1,831,342.98	305,625.07	1,150.25	Unknown
F-68	1,831,741.08	305,551.58	1,176.72	Unknown
F-69	1,831,795.73	305,542.04	1,176.73	Unknown
F-70	1,831,700.93	305,231.21	1,202.68	Unknown
F-71	1,835,822.93	305,813.54	1,108.45	Unknown
F-73	1,835,988.12	305,926.15	1,300.00	Unknown
F-74	1,836,174.60	305,931.62	1,300.00	Unknown
F-75	1,833,359.38	305,845.77	1,300.00	Unknown
F-76	1,833,335.25	305,665.54	1,114.54	1,109.50
F-77	1,833,559.78	305,628.85	1,108.29	1,102.46
F-78	1,833,755.48	305,580.35	1,106.85	1,100.96
F-79	1,833,931.61	305,530.74	1,107.18	1,099.24

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Manholes				
F-81	1,833,513.78	305,630.26	1,300.00	Unknown
F-82	1,833,757.42	305,570.47	1,300.00	Unknown
F-83	1,833,926.96	305,525.59	1,300.00	Unknown
F-84	1,837,029.49	306,059.63	1,300.00	Unknown
F-85	1,836,387.64	305,948.61	1,106.95	Unknown
F-UNK001	1,831,661.04	306,368.75	1,111.63	Unknown
F-UNK002	1,832,319.14	306,357.20	1,104.04	Unknown
F-UNK003	1,832,308.62	306,379.57	1,103.35	Unknown
F-UNK004	1,835,776.73	305,849.98	1,107.99	Unknown
F-UNK005	1,835,749.36	305,540.62	1,112.57	1,105.49
H-1	1,838,047.41	310,182.74	1,160.94	1,151.00
H-2	1,837,821.87	310,202.18	1,165.43	Unknown
H-3	1,837,442.87	310,301.02	1,178.42	Unknown
H-4	1,837,164.42	310,355.58	1,189.66	Unknown
H-5	1,837,163.56	309,918.88	1,104.80	Unknown
H-6	1,837,167.18	309,837.97	1,105.38	Unknown
H-7	1,836,870.17	309,960.86	1,104.01	Unknown
H-8	1,836,526.88	309,883.55	1,300.00	Unknown
H-9	1,835,796.71	309,647.13	1,300.00	Unknown
H-10	1,837,497.11	309,649.07	1,300.00	Unknown
H-11	1,837,696.26	309,373.64	1,104.13	Unknown
H-12	1,837,877.99	309,375.42	1,120.17	Unknown
H-13	1,838,045.76	310,231.27	1,300.00	Unknown
H-14	1,838,044.96	310,422.82	1,226.16	Unknown
H-15	1,837,923.04	310,430.56	1,228.03	Unknown
H-16	1,837,929.39	310,664.00	1,294.67	Unknown
H-17	1,837,614.35	310,489.40	1,242.58	Unknown
H-18	1,837,472.96	310,550.46	1,257.73	Unknown
H-19	1,837,459.27	310,648.01	1,282.46	Unknown
H-20	1,837,452.99	310,716.73	1,302.15	Unknown
H-21	1,837,550.35	310,743.64	1,313.50	Unknown
H-22	1,837,764.32	310,791.28	1,334.59	Unknown
H-23	1,838,015.05	310,836.94	1,361.87	Unknown
H-24	1,837,561.00	310,876.02	1,300.00	Unknown
H-25	1,837,684.41	310,878.64	1,374.70	Unknown
H-26	1,837,687.38	311,031.15	1,410.38	Unknown
H-28	1,837,556.39	311,026.34	1,300.00	Unknown
H-29	1,837,162.01	311,016.90	1,407.46	Unknown
H-31	1,837,343.49	310,817.58	1,368.31	Unknown
H-32	1,837,051.99	310,789.62	1,370.60	Unknown
H-33	1,836,822.46	310,960.80	1,372.16	Unknown
H-34	1,836,981.48	311,200.59	1,374.85	Unknown
H-35	1,836,829.99	311,256.03	1,300.00	Unknown
H-36	1,836,744.49	311,531.00	1,407.18	Unknown
H-36A	1,836,941.48	311,561.58	1,410.07	Unknown
H-36B	1,837,137.16	311,909.72	1,414.62	Unknown
H-36C	1,837,051.68	312,299.09	1,419.96	Unknown
H-36D	1,837,034.21	312,568.29	1,420.80	Unknown
H-37	1,836,891.26	312,580.43	1,413.80	Unknown
H-38	1,836,854.63	312,641.09	1,300.00	Unknown
H-39	1,836,842.02	312,800.69	1,300.00	Unknown
H-40	1,836,545.99	312,986.32	1,437.06	Unknown
H-41	1,836,138.18	313,097.07	1,300.00	Unknown
H-42	1,835,934.83	313,293.88	1,468.76	Unknown
H-43	1,835,837.42	313,476.57	1,300.00	Unknown
H-44	1,835,708.50	313,142.08	1,440.30	Unknown
H-45	1,835,446.38	313,195.63	1,300.00	Unknown
H-46	1,835,469.79	313,345.06	1,300.00	Unknown
H-47	1,835,291.67	313,296.45	1,457.47	Unknown
H-47A	1,835,325.84	313,434.88	1,466.92	Unknown
H-48	1,835,421.80	313,519.84	1,300.00	Unknown
H-49	1,836,594.53	311,928.97	1,338.61	Unknown
H-50	1,836,406.30	311,625.26	1,300.36	Unknown
H-51	1,836,292.62	311,361.29	1,279.22	Unknown
H-54	1,835,946.26	313,571.37	1,502.08	Unknown

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Manholes				
H-55	1,836,050.11	313,706.18	1,300.00	Unknown
H-56	1,836,145.39	313,704.59	1,300.00	Unknown
H-57	1,836,363.97	313,691.57	1,300.00	Unknown
H-58	1,836,682.16	313,562.47	1,584.59	Unknown
H-59	1,835,971.47	313,758.28	1,529.41	Unknown
H-60	1,835,710.91	313,789.30	1,556.26	Unknown
H-61	1,835,657.42	313,849.90	1,567.38	Unknown
H-62	1,835,637.58	313,908.44	1,574.01	Unknown
H-63	1,835,754.47	313,931.29	1,585.25	Unknown
H-64	1,835,976.69	314,038.94	1,606.96	Unknown
H-65	1,836,191.84	314,055.08	1,615.88	Unknown
H-66	1,836,838.72	312,622.72	1,415.58	Unknown
H-67	1,838,079.08	310,843.40	1,368.77	Unknown
H-68	1,838,217.25	310,863.27	1,379.72	Unknown
H-69	1,838,503.60	310,939.94	1,411.53	Unknown
H-70	1,838,571.60	310,963.40	1,416.61	Unknown
H-71	1,838,640.89	311,038.53	1,418.50	Unknown
H-72	1,838,667.32	311,135.18	1,419.68	Unknown
H-73	1,838,664.77	311,321.89	1,421.68	Unknown
H-74	1,838,615.92	311,401.04	1,421.15	Unknown
H-75	1,838,370.20	311,572.54	1,421.54	Unknown
H-76	1,838,308.37	311,683.98	1,421.54	Unknown
H-77	1,838,293.25	311,790.96	1,428.67	Unknown
H-78	1,838,457.20	311,943.10	1,449.72	Unknown
H-79	1,838,588.30	312,299.91	1,448.44	Unknown
H-80	1,838,514.72	312,363.79	1,450.99	Unknown
H-81	1,838,527.19	312,535.28	1,512.65	Unknown
H-82	1,838,267.47	312,839.73	1,523.80	Unknown
H-83	1,838,006.04	313,036.32	1,300.00	Unknown
H-84	1,837,782.39	313,236.27	1,300.00	Unknown
H-85	1,837,679.61	313,298.83	1,300.00	Unknown
H-86	1,837,699.16	313,362.62	1,568.43	Unknown
H-87	1,837,602.42	313,441.75	1,300.00	Unknown
H-88	1,837,575.15	313,477.76	1,300.00	Unknown
H-89	1,837,655.88	313,660.24	1,621.77	Unknown
H-90	1,837,301.19	313,583.88	1,621.98	Unknown
H-91	1,837,157.48	313,592.50	1,628.26	Unknown
H-92	1,837,138.27	313,648.97	1,635.23	Unknown
H-93	1,837,080.64	313,672.00	1,642.41	Unknown
H-94	1,836,932.82	313,690.67	1,660.65	Unknown
H-95	1,836,898.44	313,716.68	1,666.46	Unknown
H-96	1,836,900.59	313,763.88	1,672.96	Unknown
H-97	1,836,852.08	313,796.46	1,674.45	Unknown
H-98	1,836,758.59	313,839.27	1,686.49	Unknown
H-99	1,836,704.14	313,860.02	1,693.38	Unknown
H-100	1,836,657.81	313,899.33	1,700.67	Unknown
H-101	1,836,930.20	313,787.60	1,678.16	Unknown
H-102	1,837,055.12	313,821.76	1,692.68	Unknown
H-103	1,837,175.41	313,883.20	1,704.02	Unknown
H-104	1,837,323.99	313,922.46	1,714.79	Unknown
H-105	1,837,478.91	314,010.90	1,725.62	Unknown
H-106	1,837,588.91	314,036.17	1,729.49	Unknown
H-107	1,837,824.82	314,139.03	1,737.08	Unknown
H-108	1,837,868.34	314,142.80	1,737.90	Unknown
H-109	1,837,907.31	314,121.56	1,738.45	Unknown
H-110	1,837,929.05	314,069.91	1,738.31	Unknown
H-111	1,837,972.48	313,913.14	1,735.72	Unknown
H-112	1,838,028.49	313,813.18	1,732.53	Unknown
H-113	1,838,102.46	313,730.38	1,729.19	Unknown
H-114	1,838,332.28	313,588.17	1,732.93	Unknown
H-115	1,838,407.84	313,490.74	1,733.73	Unknown
H-116	1,838,454.89	313,336.49	1,730.40	Unknown
H-117	1,838,512.05	313,277.72	1,730.90	Unknown
H-118	1,838,891.52	313,149.62	1,726.52	Unknown
H-119	1,838,875.76	313,086.64	1,723.61	Unknown

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Manholes				
H-120	1,838,815.78	313,046.71	1,718.69	Unknown
H-121	1,838,661.83	313,030.36	1,712.71	Unknown
H-122	1,838,618.34	313,047.68	1,709.04	Unknown
H-123	1,838,356.34	313,201.66	1,688.11	Unknown
H-124	1,838,175.09	313,355.94	1,653.52	Unknown
H-125	1,838,117.79	313,384.72	1,643.30	Unknown
H-126	1,837,860.62	313,506.46	1,626.99	Unknown
H-127	1,837,712.29	313,644.75	1,622.94	Unknown
H-128	1,837,155.53	311,140.02	1,300.00	Unknown
H-128	1,836,388.18	311,185.11	1,266.02	Unknown
H-129	1,836,460.26	311,069.08	1,252.10	Unknown
H-130	1,836,526.18	310,897.45	1,243.89	Unknown
H-131	1,836,559.87	310,759.25	1,235.85	Unknown
H-132	1,836,636.73	310,641.56	1,231.40	Unknown
H-133	1,836,593.32	310,595.07	1,225.30	Unknown
H-134	1,836,685.79	310,513.95	1,216.75	Unknown
H-135	1,836,679.97	310,504.61	1,216.92	Unknown
H-136	1,836,915.57	310,401.58	1,200.93	Unknown
H-137	1,836,830.25	310,566.36	1,300.00	Unknown
H-138	1,837,204.12	310,626.83	1,300.00	Unknown
H-139	1,835,274.33	314,193.58	1,613.72	Unknown
H-140	1,835,558.45	314,173.52	1,600.79	Unknown
H-UNK001	1,838,649.64	311,077.77	1,419.44	Unknown
H-UNK002	1,838,102.36	311,043.50	1,415.30	Unknown
H-UNK003	1,838,292.95	311,076.27	1,417.54	Unknown
H-UNK004	1,837,640.94	313,629.34	1,618.03	Unknown
H-UNK005	1,835,604.49	314,036.04	1,589.31	Unknown
H-UNK006	1,835,622.27	314,124.86	1,598.30	Unknown
I-1	1,829,933.94	312,416.92	1,112.91	Unknown
I-2	1,829,825.04	312,511.07	1,111.41	Unknown
I-3	1,829,708.58	312,791.26	1,300.00	Unknown
I-4	1,829,614.19	312,979.12	1,114.41	Unknown
I-5	1,829,985.78	312,819.48	1,132.03	Unknown
I-6	1,830,092.41	312,806.71	1,140.89	Unknown
I-7	1,830,108.27	312,972.17	1,149.17	Unknown
I-8	1,830,406.29	312,798.17	1,300.00	Unknown
I-9	1,830,658.62	312,828.98	1,156.48	Unknown
I-10	1,831,350.95	312,274.51	1,300.00	Unknown
I-11	1,831,203.03	312,398.41	1,118.73	Unknown
I-12	1,831,448.39	312,398.57	1,132.25	Unknown
I-13	1,830,917.69	312,395.94	1,300.00	Unknown
I-14	1,830,815.19	312,544.84	1,134.75	Unknown
I-15	1,830,806.65	312,658.09	1,139.10	Unknown
I-16	1,831,197.65	312,662.41	1,137.56	Unknown
I-17	1,831,496.06	312,663.91	1,156.85	Unknown
I-18	1,828,353.07	314,408.77	1,300.00	Unknown
I-19	1,828,733.51	314,320.78	1,108.24	Unknown
I-20	1,828,937.55	314,168.54	1,109.20	Unknown
I-21	1,829,076.99	314,159.12	1,135.65	Unknown
I-22	1,829,155.32	314,066.02	1,135.55	Unknown
I-23	1,828,379.46	314,573.81	1,127.54	Unknown
I-24	1,828,408.46	314,694.93	1,135.26	Unknown
I-25	1,828,420.34	314,747.79	1,147.15	Unknown
I-26	1,828,571.86	314,547.72	1,129.51	Unknown
I-27	1,828,660.04	314,587.65	1,141.61	Unknown
I-28	1,828,840.97	314,487.17	1,147.02	Unknown
I-29	1,828,678.62	314,730.27	1,161.58	Unknown
I-30	1,828,641.39	314,791.52	1,170.15	Unknown
I-31	1,828,554.05	314,848.81	1,179.83	Unknown
I-32	1,828,737.44	314,982.15	1,218.47	Unknown
I-33	1,828,859.24	315,001.57	1,239.73	Unknown
I-34	1,828,994.93	314,975.30	1,258.34	Unknown
I-35	1,828,140.00	314,621.73	1,132.59	Unknown
I-36	1,827,876.60	314,670.80	1,123.37	Unknown
I-37	1,827,613.35	314,708.29	1,137.89	Unknown

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Manholes				
I-38	1,827,586.81	314,746.08	1,144.54	Unknown
I-39	1,827,579.99	314,792.35	1,153.42	Unknown
I-40	1,827,617.99	314,870.74	1,166.79	Unknown
I-41	1,827,675.97	314,885.88	1,170.64	Unknown
I-42	1,827,920.44	314,897.41	1,168.82	Unknown
I-43	1,828,222.32	315,044.20	1,184.54	Unknown
I-44	1,828,317.93	315,043.14	1,183.78	Unknown
I-45	1,828,373.36	315,018.91	1,182.80	Unknown
I-46	1,827,340.44	314,484.34	1,300.00	Unknown
I-47	1,827,325.15	314,559.31	1,300.00	Unknown
I-48	1,827,261.54	314,625.85	1,300.00	Unknown
I-49	1,827,116.55	314,659.50	1,300.00	Unknown
I-50	1,827,135.06	314,710.51	1,300.00	Unknown
I-51	1,826,999.53	314,695.32	1,300.00	Unknown
I-52	1,826,917.26	314,752.52	1,300.00	Unknown
I-53	1,826,831.11	314,802.51	1,300.00	Unknown
I-54	1,826,635.44	314,822.50	1,300.00	Unknown
I-55	1,826,892.25	314,881.37	1,300.00	Unknown
I-56	1,826,958.45	314,917.44	1,300.00	Unknown
I-57	1,826,913.90	315,018.84	1,300.00	Unknown
I-58	1,826,770.33	315,083.14	1,300.00	Unknown
I-59	1,826,535.18	315,093.03	1,300.00	Unknown
I-60	1,827,146.57	314,981.74	1,300.00	Unknown
I-61	1,827,238.16	315,053.46	1,300.00	Unknown
I-62	1,827,240.63	315,142.50	1,300.00	Unknown
I-63	1,827,154.00	315,231.53	1,300.00	Unknown
I-64	1,826,852.02	315,407.12	1,300.00	Unknown
I-65	1,826,624.29	315,399.70	1,300.00	Unknown
I-66	1,826,654.00	315,478.84	1,300.00	Unknown
I-67	1,826,488.16	315,365.08	1,300.00	Unknown
I-68	1,826,406.47	315,431.85	1,300.00	Unknown
I-69	1,826,413.90	315,518.41	1,300.00	Unknown
I-70	1,834,230.72	311,559.27	1,164.37	Unknown
I-71	1,833,894.08	311,557.20	1,160.68	Unknown
I-72	1,833,578.43	311,475.44	1,155.40	Unknown
I-73	1,833,398.41	311,465.67	1,154.34	Unknown
I-74	1,833,356.64	311,439.81	1,154.42	Unknown
I-75	1,832,972.69	311,421.30	1,153.76	Unknown
I-76	1,832,625.06	311,389.94	1,300.00	Unknown
I-77	1,832,578.76	311,387.35	1,152.13	Unknown
I-78	1,832,575.07	311,692.37	1,151.93	Unknown
I-79	1,832,572.17	311,976.27	1,154.24	Unknown
I-80	1,832,592.44	312,851.24	1,221.01	Unknown
I-81	1,827,847.92	314,517.41	1,111.51	Unknown
I-82	1,827,997.73	314,488.02	1,112.96	Unknown
I-85	1,834,231.74	311,492.34	1,300.00	Unknown
I-86	1,834,227.99	311,925.29	1,167.86	Unknown
I-87	1,834,456.37	311,928.74	1,300.00	Unknown
I-88	1,835,114.22	310,337.49	1,345.28	Unknown
I-89	1,835,099.85	310,160.10	1,341.46	Unknown
I-90	1,835,055.99	310,096.98	1,338.82	Unknown
I-91	1,834,750.75	310,093.37	1,324.20	Unknown
I-92	1,834,688.21	310,154.00	1,321.69	Unknown
I-93	1,834,679.25	310,824.09	1,303.57	Unknown
I-94	1,834,911.68	311,047.41	1,300.96	Unknown
I-95	1,834,981.94	311,076.64	1,300.66	Unknown
I-96	1,835,112.82	310,494.50	1,343.28	Unknown
I-97	1,835,109.33	310,620.51	1,330.08	Unknown
I-98	1,834,973.70	310,619.37	1,334.03	Unknown
I-99	1,835,102.86	311,080.21	1,299.01	Unknown
I-100	1,835,154.75	311,110.94	1,292.69	Unknown
I-101	1,835,222.63	311,196.03	1,284.63	Unknown
I-102	1,835,125.62	311,269.46	1,273.76	Unknown
I-103	1,834,717.43	311,357.34	1,216.18	Unknown
I-104	1,834,647.07	311,421.46	1,205.21	Unknown

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Manholes				
I-105	1,834,548.95	311,677.88	1,188.01	Unknown
I-106	1,834,558.94	311,807.03	1,181.33	Unknown
I-107	1,834,587.26	311,857.23	1,179.34	Unknown
I-108	1,834,645.30	311,964.71	1,179.88	Unknown
I-109	1,834,667.45	312,061.60	1,181.35	Unknown
I-110	1,834,664.23	312,218.18	1,185.00	Unknown
I-111	1,834,656.41	312,586.94	1,204.32	Unknown
I-112	1,834,878.24	312,560.58	1,207.95	Unknown
I-113	1,835,006.98	312,520.48	1,208.20	Unknown
I-115	1,830,770.05	313,213.74	1,300.00	Unknown
I-116	1,835,028.91	312,554.10	1,300.00	Unknown
I-116	1,828,290.96	314,365.88	1,110.90	Unknown
I-117	1,835,512.94	312,067.03	1,300.00	Unknown
I-118	1,830,803.17	313,197.14	1,180.00	Unknown
I-119	1,827,341.21	314,455.43	1,300.00	Unknown
I-120	1,834,639.25	312,636.92	1,300.00	Unknown
I-121	1,826,418.57	314,808.55	1,300.00	Unknown
I-122	1,826,223.76	314,865.69	1,300.00	Unknown
I-123	1,826,113.84	314,871.85	1,300.00	Unknown
I-124	1,826,004.09	314,906.39	1,300.00	Unknown
I-125	1,825,897.01	315,008.70	1,300.00	Unknown
I-126	1,825,845.13	315,083.77	1,300.00	Unknown
I-127	1,826,141.69	315,054.61	1,300.00	Unknown
I-128	1,826,183.67	315,067.39	1,300.00	Unknown
I-129	1,826,261.50	315,125.87	1,300.00	Unknown
I-130	1,826,175.28	315,291.63	1,300.00	Unknown
I-131	1,825,759.30	315,094.93	1,300.00	Unknown
I-132	1,825,632.34	315,203.14	1,300.00	Unknown
I-133	1,825,495.57	315,333.44	1,300.00	Unknown
I-134	1,825,501.62	315,386.70	1,300.00	Unknown
I-135	1,825,532.83	315,425.98	1,300.00	Unknown
I-136	1,825,563.89	315,445.00	1,300.00	Unknown
I-137	1,825,397.67	315,445.15	1,300.00	Unknown
I-138	1,834,812.34	312,201.35	1,183.57	Unknown
I-139	1,834,959.83	312,088.90	1,300.00	Unknown
I-140	1,835,055.30	311,985.28	1,300.00	Unknown
I-141	1,835,114.34	311,810.15	1,300.00	Unknown
I-142	1,835,217.54	311,693.30	1,195.94	Unknown
I-143	1,835,321.14	311,549.32	1,300.00	Unknown
I-144	1,835,615.49	311,437.67	1,231.27	Unknown
I-145	1,835,678.89	311,263.78	1,250.09	Unknown
I-146	1,835,688.36	311,174.05	1,256.61	Unknown
I-147	1,835,678.15	311,091.87	1,300.00	Unknown
I-148	1,835,683.60	311,000.21	1,261.61	Unknown
I-149	1,835,660.84	310,889.16	1,262.06	Unknown
I-150	1,835,603.88	310,757.63	1,300.00	Unknown
I-151	1,835,608.79	310,603.66	1,288.91	Unknown
I-152	1,835,535.18	311,011.37	1,300.00	Unknown
I-153	1,835,405.55	311,082.97	1,279.80	Unknown
I-154	1,835,347.72	311,108.48	1,283.37	Unknown
I-155	1,835,600.90	311,260.83	1,252.01	Unknown
I-156	1,835,459.08	311,301.57	1,265.37	Unknown
I-157	1,835,372.02	311,279.36	1,274.73	Unknown
I-164	1,835,566.14	310,189.54	1,300.00	Unknown
I-166	1,835,466.97	310,078.65	1,312.31	Unknown
I-168	1,835,333.47	310,081.51	1,325.80	Unknown
I-169	1,835,467.72	310,643.09	1,298.34	Unknown
I-170	1,835,337.26	310,630.34	1,313.90	Unknown
I-171	1,835,268.07	310,990.23	1,296.03	Unknown
I-172	1,835,218.08	310,954.88	1,300.51	Unknown
I-173	1,835,230.15	310,105.25	1,335.86	Unknown
I-178	1,835,329.80	310,401.72	1,300.00	Unknown
I-188	1,835,471.95	310,240.80	1,314.66	Unknown
I-189	1,832,790.03	310,580.88	1,218.59	Unknown
I-190	1,832,762.79	310,784.43	1,203.19	Unknown

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Manholes				
I-191	1,832,593.85	310,817.39	1,182.64	Unknown
I-UNK001	1,835,681.74	310,876.42	1,262.03	Unknown
I-UNK002	1,835,768.80	310,854.01	1,254.59	Unknown
I-UNK003	1,834,682.38	310,483.22	1,317.53	Unknown
I-UNK004	1,834,680.63	310,569.75	1,314.20	Unknown
I-UNK005	1,835,311.76	311,137.19	1,284.74	Unknown
I-UNK006	1,832,588.32	310,929.41	1,167.27	Unknown
I-UNK007	1,835,089.28	312,469.51	1,210.78	Unknown
I-UNK008	1,834,664.06	312,199.53	1,184.19	Unknown
I-UNK009	1,835,669.64	311,350.56	1,241.41	Unknown
I-UNK010	1,832,524.37	310,865.70	1,177.99	Unknown
I-UNK011	1,832,698.09	310,814.54	1,195.13	Unknown
I-UNK012	1,832,787.82	310,720.42	1,211.01	Unknown
I-UNK013	1,832,590.25	312,804.20	1,220.57	Unknown
I-UNK014	1,830,090.48	312,376.02	1,111.29	Unknown
I-UNK015	1,828,389.91	315,011.58	1,182.99	Unknown
K-1	1,845,853.93	308,262.37	1,300.00	Unknown
K-2	1,846,153.44	308,247.47	1,310.22	Unknown
K-3	1,846,431.47	308,270.99	1,299.62	Unknown
K-4	1,846,561.60	308,034.23	1,300.00	Unknown
K-5	1,846,596.18	307,587.79	1,295.39	Unknown
K-6	1,846,879.98	307,582.25	1,298.88	Unknown
K-7	1,846,941.70	307,303.31	1,295.93	Unknown
K-8	1,847,069.48	307,327.87	1,300.00	Unknown
K-9	1,847,404.82	307,526.97	1,289.62	Unknown
K-10	1,847,604.22	307,723.79	1,290.27	Unknown
K-11	1,847,320.96	307,929.59	1,303.34	Unknown
K-12	1,847,454.63	308,159.49	1,309.46	Unknown
K-13	1,847,684.30	308,291.02	1,309.95	Unknown
K-14	1,847,838.74	308,332.12	1,313.95	Unknown
K-16	1,847,832.41	308,670.50	1,315.42	Unknown
K-18	1,847,960.38	307,312.18	1,286.04	Unknown
K-20	1,848,078.00	307,175.24	1,284.58	Unknown
K-21	1,848,147.41	307,010.34	1,282.74	Unknown
K-22	1,848,157.48	306,826.40	1,280.78	Unknown
K-24	1,848,128.76	306,706.93	1,279.60	Unknown
K-25	1,848,039.72	306,551.92	1,277.65	Unknown
K-26	1,847,924.64	306,448.41	1,273.10	Unknown
K-27	1,847,809.10	306,390.41	1,265.70	Unknown
K-28	1,847,639.36	306,369.59	1,251.57	Unknown
K-29	1,847,358.28	306,364.45	1,234.11	Unknown
K-30	1,847,149.52	306,360.02	1,229.60	Unknown
K-31	1,847,028.77	306,323.92	1,227.30	Unknown
K-32	1,846,963.12	306,273.26	1,225.49	Unknown
K-33	1,846,856.76	306,077.11	1,221.79	Unknown
K-34	1,847,133.32	305,815.71	1,223.85	Unknown
K-35	1,847,185.97	305,567.89	1,300.00	Unknown
K-36	1,847,180.75	305,421.18	1,218.44	Unknown
K-37	1,847,528.79	305,429.12	1,223.56	Unknown
K-38	1,847,828.10	305,435.18	1,232.97	Unknown
K-39	1,848,011.19	305,432.05	1,300.00	Unknown
K-40	1,847,179.37	305,286.81	1,216.92	Unknown
K-48	1,847,153.22	305,288.83	1,217.00	1,207.75
K-50	1,847,153.38	305,246.43	1,217.00	1,206.66
K-52	1,847,327.00	304,924.64	1,193.00	1,188.43
K-54	1,847,599.82	304,782.90	1,186.05	1,178.35
K-54	1,847,833.58	307,466.63	1,284.51	Unknown
K-55	1,847,712.67	307,606.02	1,284.20	Unknown
K-56	1,847,613.93	304,787.80	1,188.04	1,177.74
K-58	1,847,754.39	304,715.50	1,187.00	1,177.04
K-59	1,847,981.26	304,512.95	1,182.37	1,175.36
K-61	1,848,149.86	304,338.41	1,183.00	1,174.15
K-63	1,848,336.88	304,088.33	1,179.53	1,172.73
K-65	1,848,666.71	303,636.13	1,175.00	1,168.28
K-66	1,848,813.96	303,445.04	1,175.00	1,166.85

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Manholes				
K-69	1,848,976.22	303,270.88	1,171.01	1,165.41
K-70	1,848,969.45	303,268.20	1,170.56	Unknown
K-71	1,847,907.42	307,357.06	1,300.00	Unknown
K-72	1,848,138.50	307,455.02	1,288.07	Unknown
K-75	1,848,227.79	307,640.99	1,292.37	Unknown
K-76	1,848,314.60	307,705.57	1,292.20	Unknown
K-77	1,848,974.56	303,262.71	1,170.31	1,165.28
K-78	1,849,379.67	302,990.18	1,166.87	1,160.40
K-84	1,847,457.55	307,844.19	1,297.09	Unknown
K-UNK001	1,848,711.98	303,499.53	1,174.25	Unknown
K-UNK002	1,848,557.63	303,795.22	1,176.98	1,170.36
K-UNK003	1,847,870.11	304,612.37	1,181.51	1,176.26
K-UNK004	1,847,889.89	304,636.55	1,182.43	Unknown
K-UNK005	1,847,180.46	305,313.00	1,217.16	Unknown
K-UNK006	1,847,142.21	305,668.03	1,225.59	1,217.53
K-UNK007	1,848,401.71	307,726.00	1,291.09	Unknown
K-UNK008	1,847,256.51	307,417.44	1,290.46	Unknown
K-UNK009	1,846,592.00	307,819.19	1,300.67	Unknown
L-1	1,828,451.43	316,879.12	1,300.00	Unknown
L-2	1,828,392.40	316,806.42	1,300.00	Unknown
L-3	1,828,385.05	316,767.91	1,300.00	Unknown
L-4	1,828,328.37	316,716.48	1,300.00	Unknown
L-5	1,828,211.64	316,704.14	1,300.00	Unknown
L-6	1,828,157.76	316,666.29	1,300.00	Unknown
L-7	1,828,055.79	316,661.20	1,300.00	Unknown
L-8	1,827,808.60	316,675.52	1,300.00	Unknown
L-9	1,827,586.25	316,713.12	1,300.00	Unknown
L-10	1,827,468.09	316,700.10	1,300.00	Unknown
L-11	1,827,279.62	316,598.06	1,300.00	Unknown
L-12	1,827,355.94	316,532.91	1,300.00	Unknown
L-13	1,827,577.53	316,434.39	1,300.00	Unknown
L-14	1,827,801.68	316,356.35	1,300.00	Unknown
L-15	1,827,931.34	316,344.79	1,300.00	Unknown
L-16	1,827,733.92	316,217.00	1,300.00	Unknown
L-17	1,827,724.49	316,086.48	1,300.00	Unknown
L-18	1,827,585.59	316,125.77	1,300.00	Unknown
L-19	1,827,463.31	316,199.32	1,300.00	Unknown
L-20	1,827,721.99	315,897.29	1,300.00	Unknown
L-21	1,827,822.64	315,810.48	1,300.00	Unknown
L-22	1,827,870.09	315,763.49	1,300.00	Unknown
L-23	1,827,989.02	315,800.43	1,300.00	Unknown
L-24	1,828,362.14	315,915.45	1,300.00	Unknown
L-25	1,828,439.34	315,963.92	1,300.00	Unknown
L-26	1,828,485.15	316,034.03	1,300.00	Unknown
L-27	1,828,500.75	316,096.35	1,300.00	Unknown
L-28	1,828,512.46	316,209.57	1,300.00	Unknown
L-29	1,827,814.17	315,879.17	1,300.00	Unknown
L-29	1,827,438.97	316,704.49	1,300.00	Unknown
L-30	1,827,338.47	316,704.09	1,300.00	Unknown
L-31	1,827,226.49	316,706.26	1,300.00	Unknown
L-32	1,827,155.74	316,707.99	1,300.00	Unknown

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Forcemains				
Label	Start Node	Stop Node	Length (Scaled) (ft)	Diameter (in)
CC 10 FM	CC LS NO. 10 (CHELAN SHORES)	J-4	1191.8	4
CC 10 FM	CC LS NO. 10 (CHELAN SHORES)	CC LS NO. 10 (CHELAN SHORES)	12.9	4
CC 14 FM	CC LS NO. 14 (KEY BAY)	CC LS NO. 14 (KEY BAY)	17.8	4
CC 14 FM	CC LS NO. 14 (KEY BAY)	J-6	911.4	4
CC 9 FM	CC LS NO. 9	H-42	532	4
CC 9 FM	CC LS NO. 9	CC LS NO. 9	8.4	4
LOW PRESSURE FM	J-56	J-11	262.1	2
LOW PRESSURE FM	H-66	J-57	884.2	2
CC 8 FM	CC LS NO. 8	CC LS NO. 8	19.1	4
CC 8 FM	H-4	CC LS NO. 8	403.7	4
CC 1 FM	CC LS NO. 1	CC LS NO. 1	23.2	15
CC 1 FM	CC LS NO. 1	C-25	732.3	15
TRANSFER FM	TRANSFER LS	TRANSFER LS	22.4	12
TRANSFER FM	TRANSFER LS	K-UNK006	6350.2	16
CC 6 FM	CC LS NO. 6	CC LS NO. 6	10.4	4
CC 6 FM	CC LS NO. 6	F-76	118.8	4
CC 7 FM	CC LS NO. 7	CC LS NO. 7	16.6	4
CC 7 FM	CC LS NO. 7	F-47	209.3	4
LCSD 1 FM	LCSD LS NO. 1	LCSD LS NO. 1	11.4	6
LCSD 1 FM	LCSD LS NO. 1	F-25A	1881.6	6
CC 4 FM	PP-4_J-3	E-23	24.4	8
CC 4 FM	E-23	PP-4_J-2	26.6	8
LOW PRESSURE FM	J-59	J-1	216.8	2.5
LOW PRESSURE FM	J-58	J-1	387.4	2.5
LOW PRESSURE FM	J-1	I-117	331.9	2.5
CC 4 FM	CC LS NO. 4	CC LS NO. 4	5.9	8
CC 4 FM	CC LS NO. 4	PP-4_J-1	7.1	8
CC 4 FM	PP-4_J-1	PP-4_J-3	1592.9	8
CC 11 FM	CC LS NO. 11 (LCRD LS NO. 4)	CC LS NO. 11 (LCRD LS NO. 4)	11.2	8
CC 10 FM	J-4	J-31	88.2	4
CC 14 FM	J-6	J-34	45.1	4
LOW PRESSURE FM	J-55	J-11	1323.8	2.5
LOW PRESSURE FM	J-11	H-47A	388.5	3
CC 15 FM	CC LS NO. 15 (LORD ACRES)	CC LS NO. 15 (LORD ACRES)	11.4	6
CC 15 FM	CC LS NO. 15 (LORD ACRES)	J-15_1	1464.7	6
CC 15 FM (to 10" NSI)	J-35 (NSI 10 CC LS NO. 15 Connection)"	J-15_1	43.5	6
CC 15 FM (to 14" NSI)	J-15_1	J-36 (NSI 14 CC LS NO. 15 Connection)"	44.1	6
CC 2 FM	CC LS NO. 2	CC LS NO. 2	8.4	16
CC 2 FM	CC LS NO. 2	J-10	26.9	16
CC 2 FM	J-10	J-11	102.8	16
CC 2 FM	J-11	J-12	210.1	16
CC 2 FM	J-12	J-13	230.1	16
CC 2 FM	J-13	J-14	112.4	16
CC 2 FM	J-14	J-15	29.1	16
CC 2 FM	J-15	J-16	61.7	16
CC 2 FM	J-16	J-17	143	16
CC 2 FM	J-17	J-18	368.1	16
CC 2 FM	J-18	J-19	133.8	16
CC 2 FM	J-19	J-20	307.1	16
CC 2 FM	J-20	C-UNK003	14.3	16
LCRD 2 FM	LCRD LS NO. 2 (LCRD)	LCRD LS NO. 2	9.1	8
LCRD 2 FM	LCRD LS NO. 2	J-27	27.1	8
10" NSI FM (CC 15 to HP)	J-35 (NSI 10 CC LS NO. 15 Connection)"	AV 10 NSI HP"	4287.8	10
14" NSI FM (CC 15 to HP)	J-36 (NSI 14 CC LS NO. 15 Connection)"	AV 14 NSI HP"	4275.7	14
CC 5 FM	CC LS NO. 5	J-41	8.2	6
CC 5 FM	J-41	F-14	1784.4	4
CC 5 FM	J-41	J-42	433.2	6
CC 5 FM	J-42	J-43	921.7	6
CC 5 FM	J-43	J-44	280.8	6
CC 5 FM	J-44	J-45	126.2	6
CC 5 FM	J-45	F-14	17.5	6
14" NSI FM (HP to NSI Gravity)	AV 14 NSI HP"	J-NSI Gravity 1	2319.3	14

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Forcemains				
10" NSI FM (HP to NSI Gravity)	AV 10 NSI HP"	J-NSI Gravity 1	2316.2	10
NSI Gravity 2	J-NSI Gravity 1	J-NSI Gravity 2	14	10
NSI Gravity 3	J-NSI Gravity 2	J-NSI Gravity 3	1358.6	10
10" NSI FM (LCRD 2 to CC 11)	J-27	J-46	21418.2	10
10" NSI FM (CC 11 to CC 15)	J-46	J-35 (NSI 10 CC LS NO. 15 Connection)"	4793.3	10
14" NSI FM (CC 11 to CC 15)	J-47	J-36 (NSI 14 CC LS NO. 15 Connection)"	4792.7	14
14" NSI FM (LCRD 2 to CC 11)	J-27	J-47	21427.3	14
CC 11 FM to NSI 10"	J-48	J-46	41.1	8
CC 11 FM to NSI 14"	J-48	J-47	39.8	8
CC 11 FM	CC LS NO. 11 (LCRD LS NO. 4)	J-49	21.5	8
CC 11 FM	J-49	J-48	32.1	8
CC 10 & 14 FM (to CC 15)	J-34	I-80	1056.2	8
LOW PRESSURE FM	J-21	J-26	206	2
LOW PRESSURE FM	J-27	J-26	374.8	2
LOW PRESSURE FM	J-26	J-28	562.4	2
LOW PRESSURE FM	J-28	C-47	299.5	2
LOW PRESSURE FM	J-29	J-28	447.5	2
LOW PRESSURE FM	J-30	H-139	1962.4	6
CC 10 & 14 FM (to CC 15)	J-31	J-32	214.1	8
LOW PRESSURE FM	J-31	J-33	332	6
LOW PRESSURE FM	J-33	J-32	59.3	6
LOW PRESSURE FM	J-34	J-33	110.9	6
LOW PRESSURE FM	J-35	J-31	395.5	6
LOW PRESSURE FM	J-36	J-43	555.5	2
LOW PRESSURE FM	J-37	F-3	116.7	6
CC 16 FM	CC LS NO. 16	CC LS NO. 16	11	6
CC 16 FM	CC LS NO. 16	D-63	326.5	6
CC 3 FM	CC LS NO. 3	E-15	253.6	6
CC 3 FM	CC LS NO. 3	CC LS NO. 3	7.5	6
CC 10 & 14 FM (to CC 11)	J-31	I-118	8.2	8
NSI Gravity 4	J-NSI Gravity 3	J-NSI Gravity 4	361.2	10
NSI Gravity 5	J-NSI Gravity 4	J-NSI Gravity 5	975.9	10
NSI Gravity 6	J-NSI Gravity 5	J-NSI Gravity 6	431.9	10
NSI Gravity 7	J-NSI Gravity 6	AV NSI Gravity Nixon/Sanders	1354.6	10
NSI Gravity 8	AV NSI Gravity Nixon/Sanders	J-NSI Gravity 7	1011.9	10
NSI Gravity 9	J-NSI Gravity 7	AV NSI Gravity Johnson/Navarre	1017.7	10
NSI Gravity 10	AV NSI Gravity Johnson/Navarre	J-NSI Gravity 9	1484.2	10
NSI Gravity 11	J-NSI Gravity 9	J-NSI Gravity 10	465.6	10
NSI Gravity 12	J-NSI Gravity 10	TRANSFER LS	142	10
CC 5 FM	CC LS NO. 5	CC LS NO. 5	12	6
CC 10 & 14 FM (to CC 15)(1)	J-32	MH LID	205.9	8
CC 10 & 14 FM (to CC 15)(2)	MH LID	J-34	345.6	8
CC 4 FM(1)	PP-4_J-1	J-58	12.7	8
CC 4 FM(2)	J-58	PP-4_J-2	1589.8	8
Temp LS5 FM Extension	J-45	J-59	502.9	12
Temp LS5 FM Extension	J-59	J-60	332	12
Temp LS5 FM Extension	J-60	J-58	303.4	12

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Transitions			Pressure Junctions		
Label	X (ft)	Y (ft)	Label	X (ft)	Y (ft)
CO-F-2	1,831,842.73	305,988.02	J-1	1,835,497.34	312,339.39
CO-B-2	1,842,169.31	309,229.53	J-4	1,830,777.18	313,114.01
CO-B-3	1,842,190.01	309,320.97	J-6	1,831,542.73	312,986.63
CO-B-4	1,842,237.11	309,482.87	J-10	1,839,624.31	307,052.42
CO-D-2	1,842,052.47	304,656.87	J-11	1,834,990.00	313,518.23
CO-C-2	1,843,933.10	307,021.88	J-11	1,839,698.04	307,124.07
CO-C-1	1,843,039.75	307,719.67	J-12	1,839,876.68	307,234.74
CO-A-1	1,840,969.93	309,703.73	J-13	1,840,076.36	307,349.08
CO-H-1	1,835,675.39	313,513.81	J-14	1,840,176.48	307,400.19
CO-H-2	1,835,652.84	313,334.35	J-15	1,840,202.68	307,412.75
CAP-I-01	1,835,803.70	311,796.76	J-15_1	1,832,595.61	312,807.54
CO-B-1	1,842,543.39	308,544.77	J-16	1,840,264.40	307,412.42
CO-B-5	1,842,180.50	308,890.06	J-17	1,840,262.37	307,269.42
CO-B-6	1,841,977.96	308,893.03	J-18	1,840,629.98	307,251.18
CO-F-1	1,833,315.07	305,501.31	J-19	1,840,624.88	307,117.47
CO-B-7	1,841,276.27	308,912.16	J-20	1,840,931.94	307,117.33
CO-A-2	1,841,412.62	309,546.23	J-21	1,845,095.42	306,272.88
CO-B-8	1,842,132.84	309,473.74	J-26	1,845,104.11	306,067.09
CO-D-3	1,841,502.75	304,105.55	J-27	1,810,481.60	322,097.50
CO-A-3	1,840,332.42	309,105.04	J-27	1,845,394.86	306,235.31
CO-A-4	1,840,256.05	308,846.23	J-28	1,844,545.11	306,107.32
CO-B-9	1,840,348.35	308,939.21	J-29	1,844,887.72	305,823.07
CO-C-3	1,843,125.86	306,888.74	J-30	1,833,504.62	314,071.22
CAP-C-01	1,841,844.09	306,586.40	J-31	1,830,811.22	313,195.36
T-K10	1,849,834.70	296,363.90	J-31	1,830,887.64	313,424.15
T-K11	1,849,800.42	296,353.39	J-32	1,831,023.21	313,165.51
TempTrans_1	1,832,172.00	305,669.35	J-33	1,831,027.43	313,224.51
CAP-E-01	1,838,851.64	306,042.09	J-34	1,831,555.71	313,029.79
TempTrans_5	1,841,547.69	304,792.56	J-34	1,831,029.00	313,335.36
TempTrans_4	1,841,400.27	304,649.34	J-35	1,830,658.14	313,542.70
TempTrans_6	1,840,278.05	306,746.41	J-35 (NSI 10	1,832,597.06	312,850.99
TempTrans_7	1,840,305.52	307,615.58	J-36	1,835,796.09	305,090.74
TempTrans_9	1,837,966.64	313,922.74	J-36 (NSI 14	1,832,602.57	312,847.32
T-K01	1,848,014.36	307,356.71	J-37	1,836,317.22	306,026.71
CO-K-3	1,848,028.76	307,338.16	J-41	1,833,946.67	305,504.12
CO-K-4	1,848,114.29	306,827.12	J-42	1,834,365.65	305,394.07
CO-K-5	1,847,942.95	307,296.65	J-43	1,835,275.87	305,249.28
CO-K-1	1,850,197.40	302,929.01	J-44	1,835,549.53	305,312.33
T-K02	1,850,378.66	301,978.79	J-45	1,835,674.21	305,292.97
T-K03	1,850,188.56	301,025.13	J-46	1,828,245.15	314,421.65
T-K04	1,850,133.11	300,024.69	J-47	1,828,251.67	314,416.73
T-K05	1,849,942.10	299,068.90	J-48	1,828,229.23	314,383.81
T-K06	1,849,492.72	298,214.28	J-49	1,828,227.67	314,351.72
TempTrans1	1,847,745.95	304,692.99	J-55	1,834,009.56	313,605.77
TempTrans2	1,848,019.48	304,456.52	J-56	1,834,986.46	313,257.51
TempTrans3	1,848,334.85	304,064.17	J-57	1,836,082.71	312,811.57
TempTrans4	1,848,649.26	303,631.51	J-58	1,835,203.20	312,584.59
TempTrans5	1,848,804.30	303,433.04	J-58	1,836,391.29	305,892.20
T-K07	1,848,753.05	303,524.01	J-59	1,835,620.28	312,515.37
CO-K-3	1,847,987.69	308,331.62	J-59	1,835,794.83	305,781.16
CO-K-2	1,847,991.33	308,671.43	J-60	1,836,090.52	305,932.12
T-K08	1,849,088.45	303,140.93	J-NSI Gravit	1,838,079.98	310,173.84
T-K09	1,849,220.69	303,041.75	J-NSI Gravit	1,838,087.51	310,185.60
T-K12	1,849,621.28	296,795.60	J-NSI Gravit	1,839,151.09	309,543.33
T-K13	1,849,805.09	296,744.60	J-NSI Gravit	1,839,158.76	309,182.71
T-K14	1,849,846.16	296,733.01	J-NSI Gravit	1,840,130.69	309,182.37
T-K15	1,849,755.81	296,361.40	J-NSI Gravit	1,840,125.12	308,751.01
T-K16	1,849,381.41	297,365.25	J-NSI Gravit	1,841,461.56	307,709.40
T-K17	1,849,422.88	297,428.61	J-NSI Gravit	1,842,411.94	306,256.49
			J-NSI Gravit	1,842,834.18	306,060.36
			MH LID	1,831,224.74	313,129.17
			PP-4_J-1	1,836,388.51	305,879.77

City of Chelan Sewer Collection Hydraulic Model (2020 GSP)
Basic Entity Data

Transitions	Pressure Junctions		
	PP-4_J-2	1,837,931.45	306,071.41
	PP-4_J-3	1,837,931.56	306,062.30

APPENDIX E

MINOR COLLECTION SYSTEM PROJECT DEFINITIONS

APPENDIX E – MINOR COLLECTION SYSTEM PROJECTS

Introduction

A brief scope for each minor collection system project is outlined in this appendix for use in budgeting the CIP item *CS00 - Annual Pipe Replacement Fund*. The deficiency and improvement areas are generally outlined on an aerial for each item. A planning-level estimate of piping necessary to rectify each deficiency is provided; exact routing of piping will be determined during final design.

MH A-67 and B-54 Vicinity

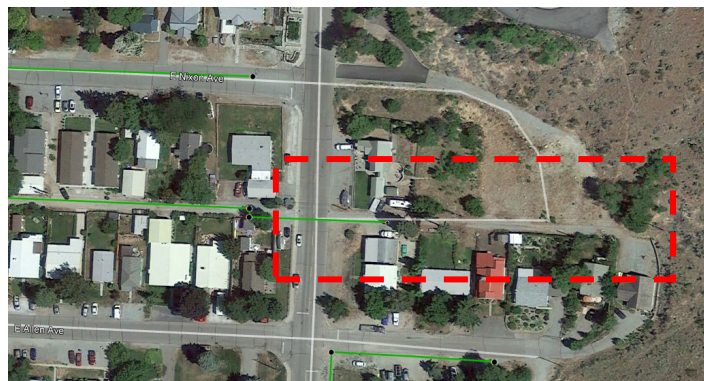
Deficiency: The existing pipe routing is poor and through private property and under structures.

Improvement: Install approximately 600 lineal feet of 8-inch pipe within existing roadways to replace and reroute existing.



MH B-31 to end of alley

Improvement: Replace and extend pipe to end of alley.



MH B-38 to MH B-39

Deficiency: The existing pipe routing is poor and through private property and under structures.

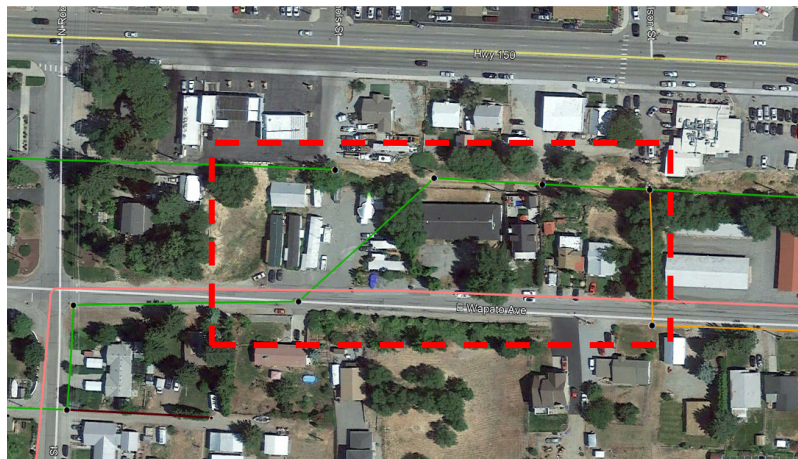
Improvement: Install approximately 400 lineal feet of 8-inch pipe within existing roadways to replace and reroute existing.



MH C-32 to C-33 and MH C-81 to MH C-111

Deficiency: The existing pipe routing is poor and through private property and under structures.

Improvement: Install approximately 700 lineal feet of 8-inch pipe within and outside of existing roadways to replace and reroute existing.



MH C-59 Extension

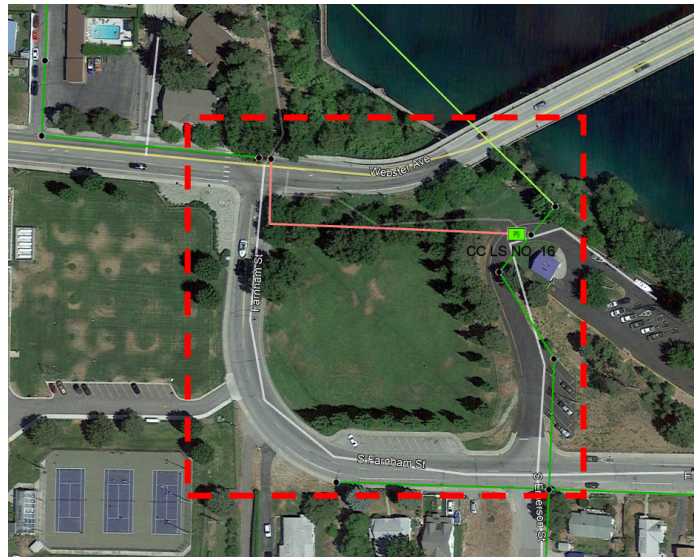
Deficiency: The existing pipe extension is very flat and undersized at 4-inch along the alley.

Improvement: Install approximately 400 lineal feet of 8-inch pipe within the existing alley.



MH D-22 to MH D-17

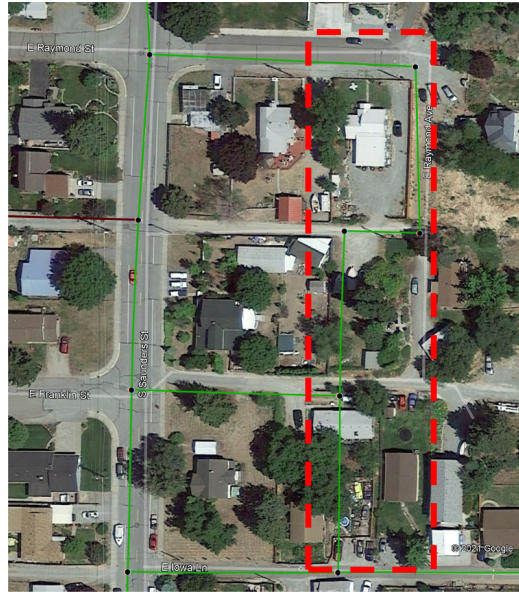
Improvement: Extend approximately 700 lineal feet of 8-inch pipe to existing collection system piping in SR 97A.



MH D-37 to MH D-32

Deficiency: The existing pipe routing is poor and through private property and under structures.

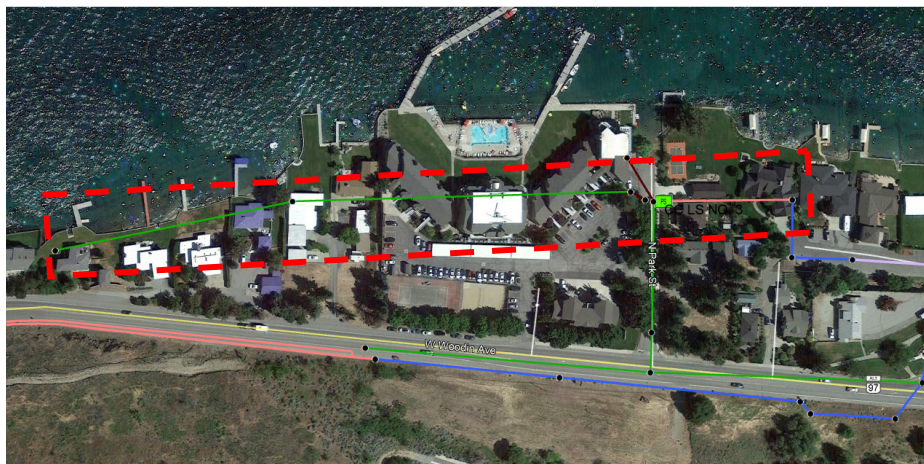
Improvement: Install approximately 500 lineal feet of 8-inch pipe within and outside of existing roadways.



MH E-9 to MH E-13

Deficiency: The existing pipe routing is poor and through private property and under structures near the lake shore.

Improvement: Install approximately 1,000 lineal feet of 8-inch pipe within and outside of existing roadways. It is assumed that this work will be completed pending the outcome of the CC 3 pre-design report noted in the CIP.



MH E-37 to MH E-33

Deficiency: The existing pipe routing is poor and through private property.

Improvement: Install approximately 600 lineal feet of 8-inch pipe within existing roadways.



MH F-17 to CC 4

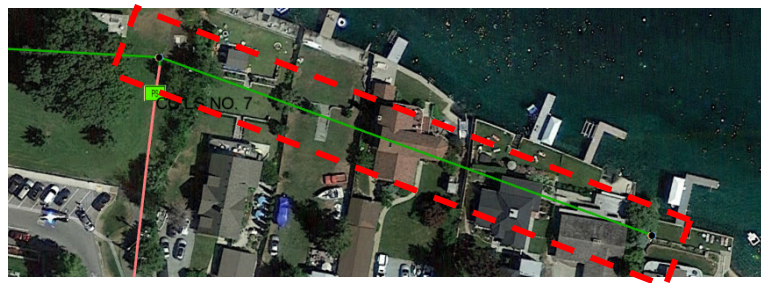
Deficiency: When Slidewaters drains tanks, surcharging of the collection system piping upstream of CC 4 has occurred.

Improvement: This should be mitigated by operational changes by Slidewaters. If needed, a flow control device could be installed. No infrastructure improvements are currently planned.

MH F-48 to MH F-49

Deficiency: The pipe routing in this area is poor and through private property along lakeshore. This area of collection system has been problematic for the City.

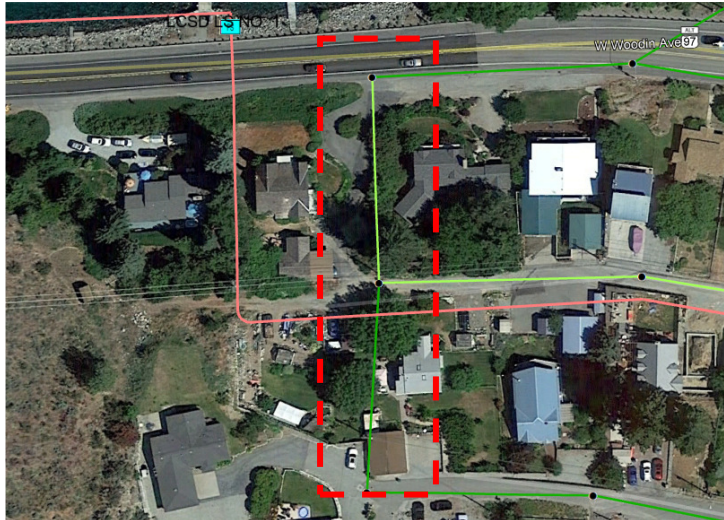
Improvement: Install approximately 600 lineal feet of 8-inch pipe in this area to replace the existing system. Alternatively, individual grinder pumps at residences and a small forcemain could be considered too.



MH F-66 to F-59

Deficiency: The existing pipe routing is poor and through private property and under structures.

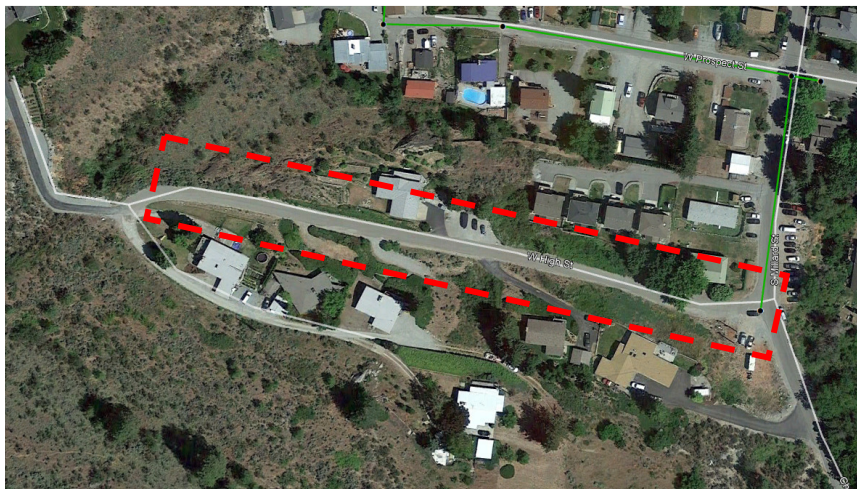
Improvement: Install approximately 500 lineal feet of 8-inch pipe within and outside of existing roadways.



MH F-70 Extension

Deficiency: The existing pipe extension is undersized 4-inch pipe to multiple houses.

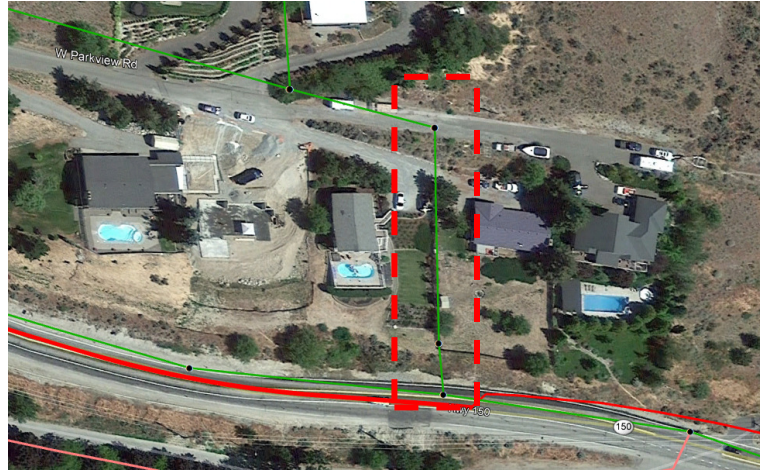
Improvement: Install approximately 800 lineal feet of 8-inch pipe within the driveway.



MH H-14 to H-01

Deficiency: The existing pipe routing is poor and through private property and under structures.

Improvement: Install approximately 500 lineal feet of 8-inch pipe within and outside of existing roadways.



MH H-36A Vicinity

Deficiency: The existing pipe routing is poor and through private property between steep hillside and houses.

Improvement: This will likely be difficult to reroute, but at the planning level, assume new routing of approximately 100 lineal feet of 8-inch pipe within and outside of existing roadways.



MH I-118 and Riviera Drive

Deficiency: Existing private residences on septic systems could be collected and routed to CC 11 (through old Northshore Interceptor) with a collection system extension up Riviera Drive.

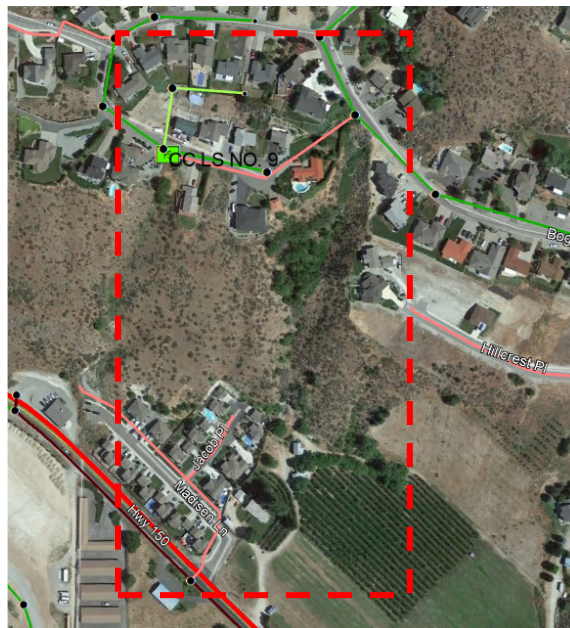
Improvement: Extend 8-inch pipe up Riviera Drive.



CC 9 Lift Station Removal

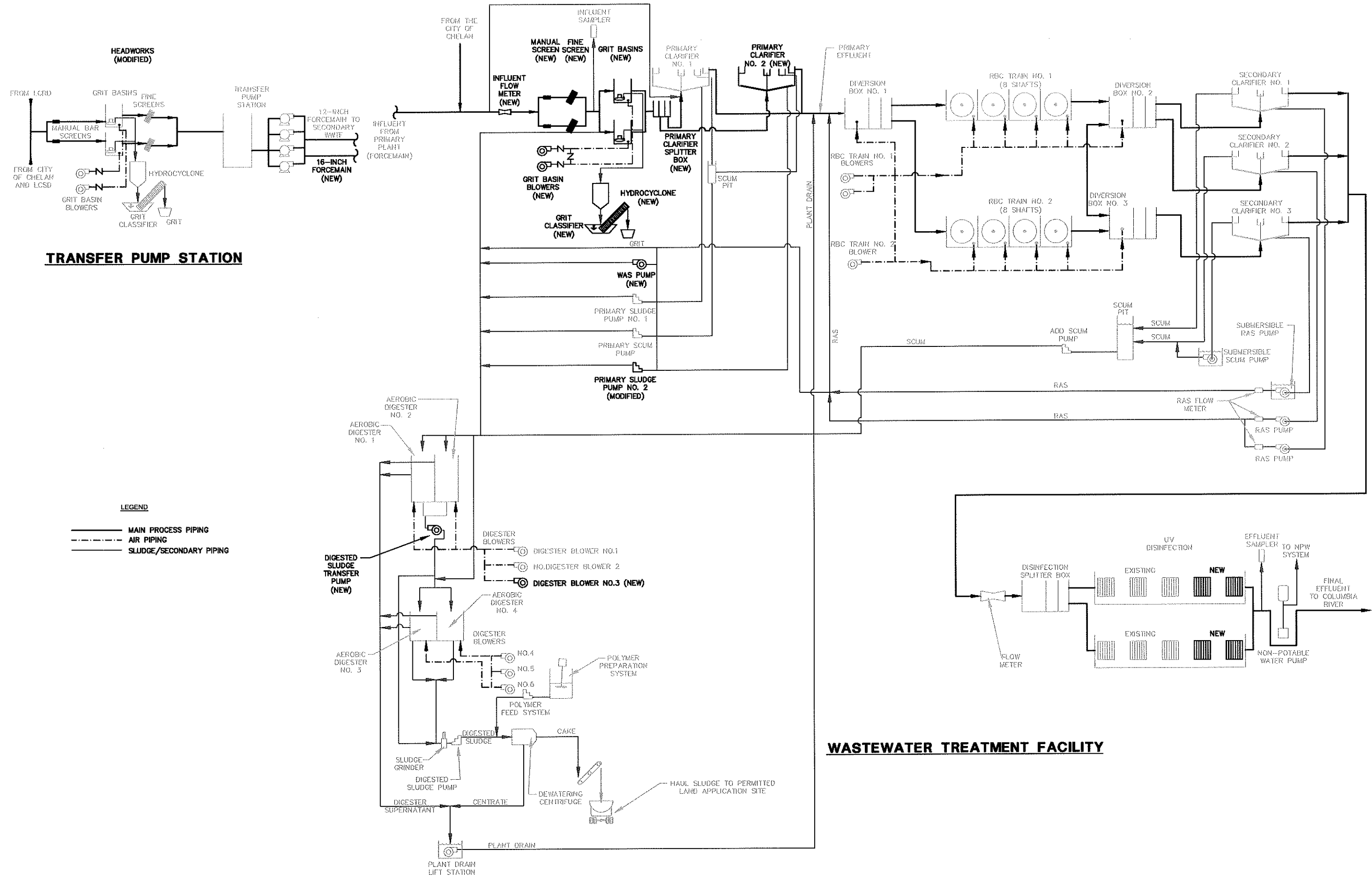
Deficiency: Lift station CC 9 serves a minimal collection system area and would ideally be removed and replaced with gravity flow to lift station CC 15.

Improvement: Due to the steep terrain in this area, gravity collection system pipe routing could be very difficult. For the purposes of planning, approximately 1200 lineal feet of 8-inch pipe is assumed to drain into the area of proposed development north of SR 150 and west of Golf Course Road.



APPENDIX F

WWTP DESIGN CRITERIA, PROCESS SCHEMATIC, HYDRAULIC
PROFILE AND SITE PLAN



TRANSFER PUMP STATION

WASTEWATER TREATMENT FACILITY

PROCESS FLOW DIAGRAM
NTS

0 1" 2"
TWO INCHES AT FULL SCALE
IF NOT, SCALE ACCORDINGLY

Gray & Osborne, Inc.
CONSULTING ENGINEERS
107 SOUTH THIRD STREET
YAKIMA, WASHINGTON 98901 (509) 453-4833

DATE:	OCT 2011
SCALE:	NOTED
DRAWN:	FHP
CHECKED:	NJM
APPROVED:	JFW

RECORD DRAWING
Based upon best available information
obtained during construction.
Date: April 2014
By: JFW
Checked by: NJM

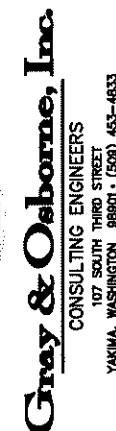
Professional Engineer
J. MORTON
WASHINGTON
NO. 12345
EXPIRATION DATE: 12/31/2015

Professional Engineer
J. WILSON
WASHINGTON
NO. 67890
EXPIRATION DATE: 12/31/2015

CITY OF CHELAN
CHELAN COUNTY WASHINGTON
PHASE II WASTEWATER TREATMENT FACILITY UPGRADE
PROCESS FLOW DIAGRAM

SHEET: **G-4**
OF: **27**
JOB NO.: 08046.02
DWG: PROC-FLOW

Wastewater Treatment Facility Design Criteria							
Influent Flow Meter (new)		Odor Control Fan (new)		Recirculation Pump Clarifier No. 3 (existing)		Digester Cell No. 1 and 2 Blowers (existing)	
Type	Parshall Flume	Quantity	1	Quantity	1	Quantity	3
Throat	12 in	Capacity	1300 scfm	Type	Submersible Centrifugal	Type	Positive Displacement
Flow Range	0.211 – 10.564 MGD	Motor	3 hp	Capacity	600 gpm @ 20 ft TDH	Capacity	400 scfm @ 6 psig
				Motor	7.5 hp	Motor	20 hp
Manual Bar Screen (new)		Primary Clarifiers (1 new, 1 existing)		Speed Control		Digester Cell No. 3 and 4 Blowers (1 new 2 existing)	
Quantity	2	Quantity	2			Quantity	3
Size	2 in	Type	Circular, Center Feed; Peripheral	Scum Pump (existing)		Type	Positive Displacement
		Diameter	53 ft	Quantity	1	Capacity	400 scfm @ 10 psig
Influent Fine Screen (new)		Side Water Depth	10 ft	Type	Screw Centrifugal	Blower Motor No. 1 & 2	30 hp
Quantity	2	Surface Area (each)	2,205 ft ²	Capacity	150 gpm @ 17 ft TDH	Blower No. 3 (new)	40 hp
Type	Rotary Fine Screen	Surface Loading at MMF	588 gpd/ft ²	Motor	3 hp	Speed Control No. 3	VFD
Minimum Hydraulic Capacity	4.32 MGD	Surface Loading at PHF	972 gpd/ft ²	Effluent Flow Meter (existing)			
Screen Size	0.25 in	Motor	1 hp	Type	Parshall Flume	Digester Cell No. 1 and 2 Mixers (existing)	
Motor	2 hp	Rotating Biological Contactors (existing)		Throat	12 –inch	Type	Submerged Turbine
		Quantity of Basins	4	Flow Range	0.211 – 10.564 MGD	Motor	15 hp
Degritting Basins (new)		Quantity of Standard Density Shafts	8	UV Disinfection (existing/modified)		Digested Sludge Transfer Pump (new)	
Quantity	2	Quantity of High Density Shafts	8	Type	Low Pressure – Low Intensity	Quantity	1
Dimensions	8' x 26'–4" x 10'–9" SWD	Total Quantity of Shafts	16	Configuration	Vertical Open Channel	Type	Screw Centrifugal
Volume (each)	17,000 gal	Standard Density Media Area	110,000 ft ²	Quantity of Channels	2	Capacity	300 gpm @ 28 feet TDH
Hydraulic Detention Time (one basin)	8 min @ 4.32 MGD	High Density Media Area	140,000 ft ²	Quantity of Modules per Channel	5 (3 existing, 2 new)	Motor	5 hp
		Total First Stage Area	880,000 ft ²	Quantity of Lamps per Module	40	Digested Sludge Pump (existing)	
Aeration Blowers (new)		Total Second and Third Stage Area	1,120,000 ft ²	Total Quantity of Lamps (both channels)	400	Quantity	1
Quantity	2	Total Area (All Stages)	2,000,000 ft ²	Design Peak Hour Flow	4.4 MGD	Type	Double Disc
Type	Positive Displacement	RBC Blowers (existing)		Design Transmittance	55%	Capacity	100 gpm @ 30 psi
Capacity	80 scfm @ 7 psig	Quantity	3	Minimum Disinfection Dose @ MMF	80,220 uW–sec/cm ²	Motor	7.5 hp
Motor	5 hp	Type	Centrifugal	Effluent Limitation (Average Monthly)	<200 cfu/100 mL	Speed Control	VFD
Speed Control	VFD	Capacity	No. 1: 2,200 scfm @ 4.4 psi	Nonpotable Water Pump (existing)			
			No. 2: 1,450 scfm @ 4.4 psi	Type	Vertical Turbine	Sludge Grinder (existing)	
Grit Collectors (new)			No. 3: 2,200 scfm @ 4.4 psi	Capacity	100 gpm @ 60 psi	Quantity	1
Quantity	2	Motor	No. 1: 75 hp	Motor	7.5 hp	Motor	3 hp
Type	Screw		No. 2: 50 hp	Primary Clarifier Sludge Pump No. 1 and No. 2 (existing/modified)		Centrifuge (existing)	
Screw Diameter	12 inches		No. 3: 60 hp	Quantity	2	Quantity	1
Motor	1.5 hp	Secondary Clarifiers No. 1 and 2 (existing)		Type	Air Operated Diaphragm	Design Hydraulic Capacity (min)	50 gpm
		Quantity	2	Capacity	152 gpm	Main Drive Motor	50 hp
Grit Pumps (new)		Type	Circular, Center Feed; Peripheral	Primary Clarifier Scum Pump (existing)		Back Drive Motor	10 hp
Quantity	2	Diameter	35 ft	Quantity	1	Bowl Diameter	14 in
Type	Submersible Centrifugal	Side Water Depth	10 ft	Type	Air Operated Diaphragm	Speed Control	VFD
Capacity	220 gpm @ 32 ft TDH	Surface Area, each	962 ft ²	Capacity	152 gpm	Maximum Bowl Speed	4,000 rpm
Motor	5 hp	Surface Loading at 50% MMF	686 gpd/ft ²	Primary Drain Pump (new)		Polymer Feed System (existing)	
Speed Control	VFD	Surface Loading at 50% PHF	1,122 gpd/ft ²	Quantity	1	Type	Dry and Liquid
		Motor	0.5 hp	Type	Screw Centrifugal	Mix Tank Volume	180 gal
Hydrocyclones (new)		Secondary Clarifiers No. 3 (existing)		Capacity	200 gpm @ 25 ft TDH	Feed Tank Volume	200 gal
Quantity	1	Quantity	1	Motor	5 hp	Capacity (0.5% active concentration and 30 min batch time)	12 lbs/hr
Hydraulic Capacity	250 gpm @ 7psi	Type	Circular, Center Feed; Peripheral	Speed Control	VFD	Feed Pump Type	Progressing Cavity
		Diameter	50 ft	WAS Flow Meter		Feed Pump Capacity	0–360 gph
Grit Flow Meter (new)		Side Water Depth	10 ft	Quantity	1	Dilution Water Capacity	0–1200 gph
Type	Magnetic Flow Meter	Surface Area, each	1963 ft ²	Type	Magnetic Flow	Sludge Conveyor (existing)	
Size	4 inch	Surface Loading at 50% MMF	686 gpd/ft ²	Size	4 inch	Quantity	1



DATE: OCT 2011	SCALE: NOTED	DRAWN: FHP	CHECKED: NUM	APPROVED: FWP
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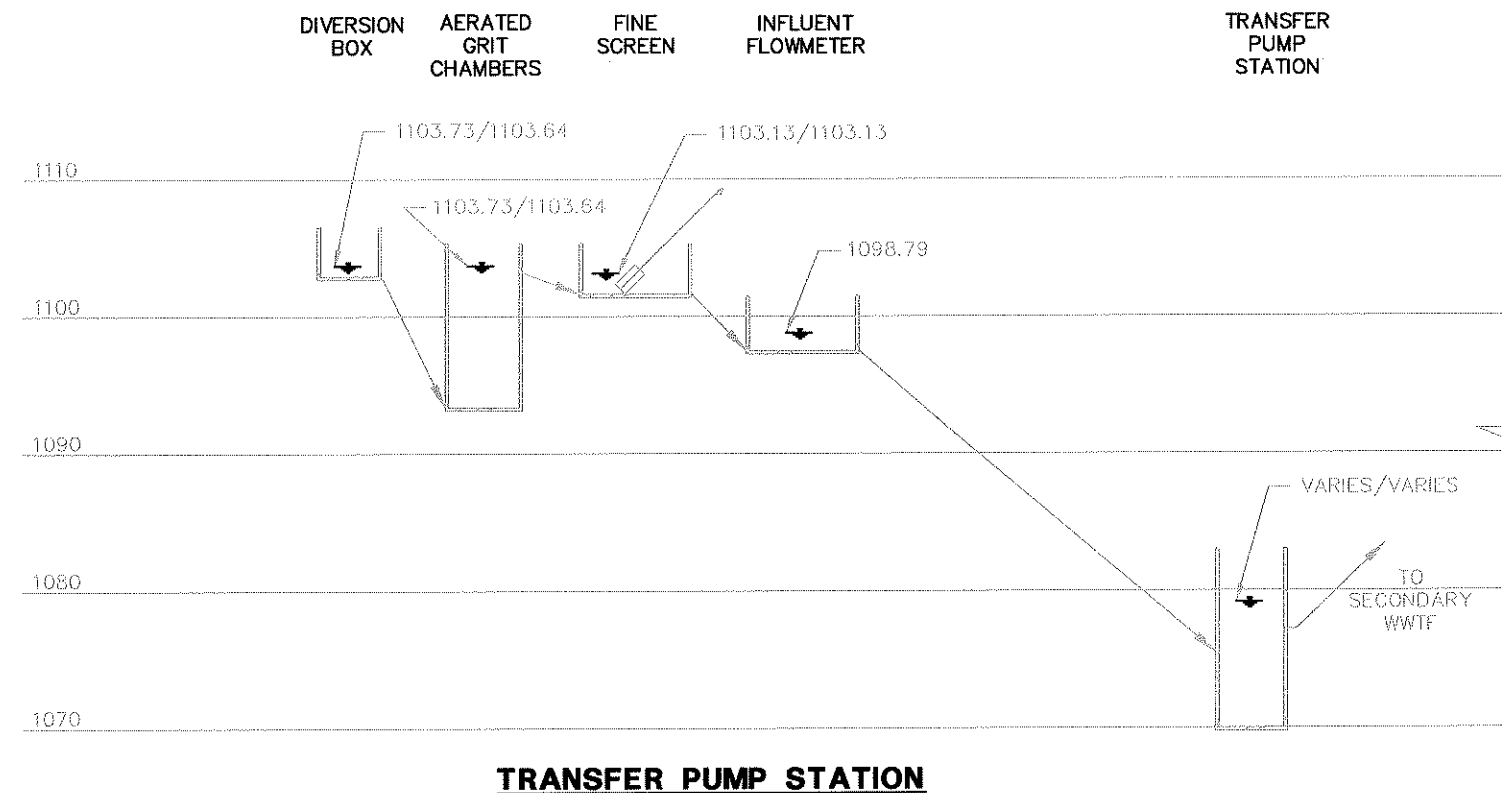
RECORD DRAWING



CITY OF CHELAN
CHELAN COUNTY WASHINGTON
**PHASE II WASTEWATER TREATMENT
FACILITY UPGRADE**
WASTEWATER TREATMENT FACILITY DESIGN

SHEET: **G-6**
OF: **27**

JOB NO.: 08046.02
DWG: DESIGN—CRIT



LEGEND

WS EL (FT) PHF (PEAK HOUR FLOW)/WS EL (FT) MMF (MAXIMUM MONTHLY FLOW)

TOS (TOP OF SLAB)

TOW (TOP OF WALL)

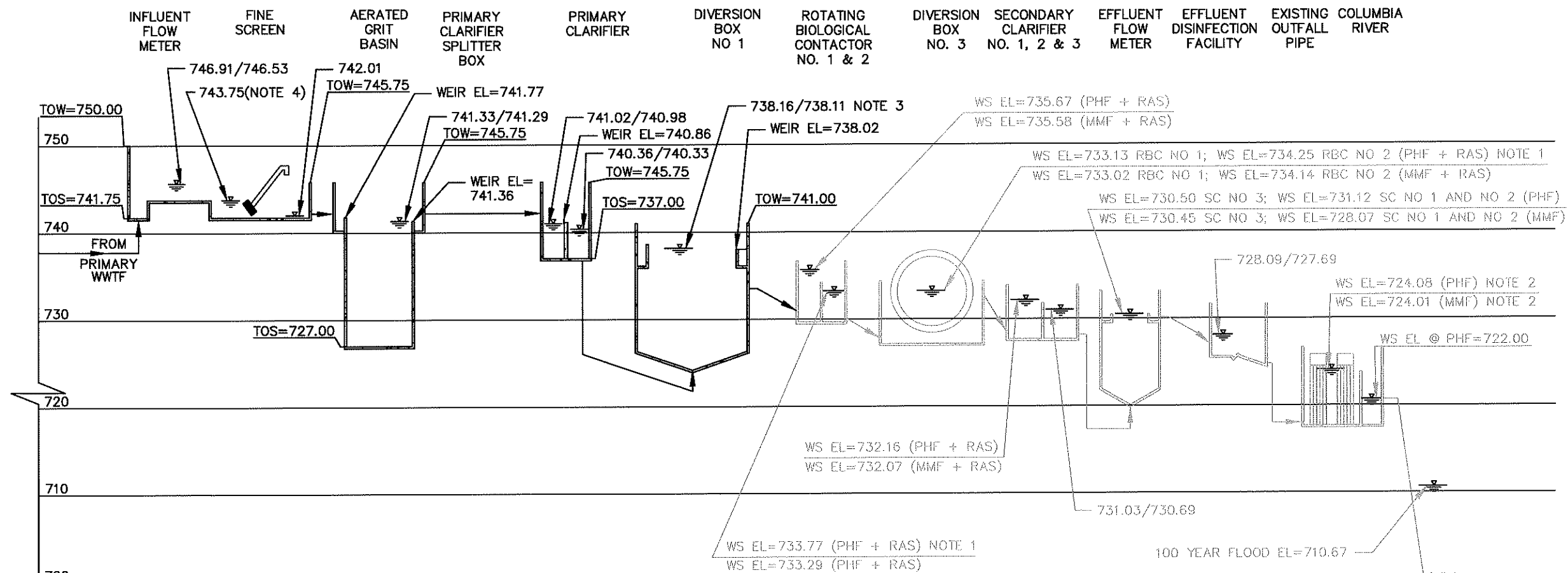
WS EL (WATER SURFACE ELEVATION)

PEAK HOUR FLOW = 4.32 MGD

MAXIMUM MONTH FLOW = 2.66 MGD

RAS = 2.00 MGD

- NOTES:**
1. ELEVATIONS GIVEN WITH HALF OF ONE RBC TRAIN (4 SHAFTS) OUT OF SERVICE.
 2. ELEVATIONS GIVEN WITH BOTH UV CHANNELS IN SERVICE.
 3. ELEVATIONS GIVEN WITH ONLY ONE PRIMARY CLARIFIER IN SERVICE.
 4. MAX WS EL ALLOWED BY SCREEN MANUFACTURER.



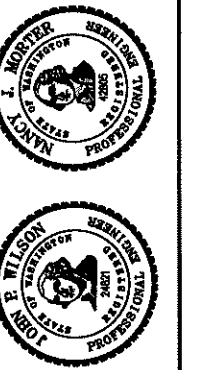
0 1" 2"

TWO INCHES AT FULL SCALE
IF NOT, SCALE ACCORDINGLY

Gray & Osborne, Inc.
CONSULTING ENGINEERS
107 SOUTH THIRD STREET
YAKIMA, WASHINGTON 98901 • (509) 453-4833

DATE: OCT 2011
SCALE: NOTED
DRAWN: FHP
CHECKED: N.M.
APPROVED: J.P.W.

RECORD DRAWING
Based on best available information
obtained during construction.
Date: Sept. 2014
By: FHP
Checked By: N.M.



CITY OF CHELAN
CHELAN COUNTY WASHINGTON
**PHASE II WASTEWATER TREATMENT
FACILITY UPGRADE**
HYDRAULIC PROFILE

SHEET: **G-7**
OF: **27**
JOB NO.: 08046.02
DWG: HYD-PROF



1" = 20'

LEGEND

- EXISTING PROCESS AND NPW PIPE TO REMAIN INSERVICE
- NEW PROCESS PIPE
- - - ELECTRICAL DUCT BANK



Gray & Osborne, Inc.
CONSULTING ENGINEERS
107 SOUTH THIRD STREET
YAKIMA, WASHINGTON 98901 • (509) 453-4833

DATE: OCT 2011	NOTED	FWP	NAM	JPW
SCALE:	NOTED	FWP	NAM	JPW
DRAWN:	FWP	FWP	NAM	JPW
CHECKED:	FWP	FWP	NAM	JPW
APPROVED:	FWP	FWP	NAM	JPW

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


Based on field and available information
and subject to engineering verification.

Date: Sept 2014
By: FWP
Checked By: NAM



CITY OF CHELAN
CHELAN COUNTY WASHINGTON
PHASE II WASTEWATER TREATMENT FACILITY UPGRADE
WASTEWATER TREATMENT FACILITY SITE PROCESS PIPING

SHEET: **G-25**
OF: **27**
JOB NO.: 08046.02
DWG: SEC-P-SITE

- NOTES:**
- (X) INDICATES PIPE COORDINATE AND IDENTIFICATION. COORDINATES SHOWN LOCATE CENTER OF FITTINGS OR CHANGES IN GRADE.
 - SEE G-27 FOR COORDINATE TABLE.
 - PIPING BETWEEN POINT OF INDICATED ELEVATIONS TO BE SET AT A SINGLE UNIFORM GRADE. CONTRACTOR TO FIELD VERIFY ELEVATIONS OF EXISTING PIPES.
 - ALL PIPING SHALL HAVE RESTRAINED JOINTS.
 - CONTOURS NOT SHOWN FOR CLARITY.
 - WHERE PIPES CROSS WITH LESS THEN ONE FOOT OF CLEARANCE CRUSHED SURFACING TOP COURSE SHALL BE USED BETWEEN THE PIPES. THE CRUSHED ROCK SHALL BE HAND TAMPED AND COMPACTED BETWEEN PIPES.
 - FOR PIPE TRENCH DETAILS SEE DETAIL  GD-3
 - FOR INVERT ELEVATIONS AT OR NEAR STRUCTURES SEE MECHANICAL.
 - FOR VALVE BOX DETAIL SEE  GD-1
 - FOR CLEANOUT DETAIL SEE  GD-1
 - WHEN CONNECTING NEW PIPING TO EXISTING PIPING CONTRACTOR SHALL PROVIDE ALL COUPLINGS AND FITTINGS NECESSARY TO PROVIDE A CONNECTION THAT MEETS OR EXCEEDS THE PRESSURE RATING OF THE NEW PIPE.
 - ELECTRICAL PULLHOLES AND LUMINAIRES ARE SHOWN ON THE PIPING PLANS FOR REFERENCE ONLY. REFER TO E SHEETS FOR EXACT LOCATIONS AND DETAILS ON THE ELECTRICAL SITE PLAN.
 - REFER TO ORDER OF WORK SPECIFICATION 01110 FOR INFORMATION ON TRANSFER PUMP STATION SHUTDOWN.
 - EXISTING PLANT DRAIN MANHOLE
RIM EL. 727.17
N INVERT=713.50 (EXISTING)
W INVERT=713.00 (EXISTING)
S INVERT=713.00 (EXISTING)
NE INVERT=720.00 (NEW)
 - COAT THE EXTERIOR OF THE EXISTING CONCRETE ROOF PANELS AT THE SLUDGE PUMP ROOM WITH XYPEX CONCENTRATE AND XYPEX MODIFIER. REFER TO SPEC 07180. PREPARE SURFACE PER THE MANUFACTURERS RECOMMENDATIONS. THE CONCRETE ROOF PANELS HAVE PREVIOUSLY BEEN COATED WITH CONCRETE SEALER.

0 1 2'
TWO INCHES/AT FULL SCALE
IF NOT, SCALE ACCORDINGLY

APPENDIX G

EXPANDED CIP PROJECT TABLE

Estimated Total Cost by Improvement Year (Cost Multiplier starting with 3% in 2021)																		
CIP No.	Description	Project Cost			2022 (Yr. 1)	2023 (Yr. 2)	2024 (Yr. 3)	2025 (Yr. 4)	2026 (Yr. 5)	2027 - 2031	2032 - 36	2037 - 40	LCSD Portion	LCRD Portion	City Portion of Total Project Cost (2021 Dollars)			
		Indirect	Direct	Total	1.03	1.06	1.09	1.12	1.15	1.30	1.45	1.60			Indirect	Direct	Total	
Lift Station, Force Main and Interceptor Improvements																		
LS00	Annual Short-lived Assets Replacement (Project Cost Totalized)	\$0	\$1,710,000	\$1,710,000	\$97,850	\$100,700	\$103,550	\$106,400	\$109,250	\$123,500	\$137,750	\$152,000	0%	0%	\$0	\$1,710,000	\$1,710,000	
LS01	CC 5 and Force Main Improvements	-	-	-									-	-	-	-	-	
LS02	CC 1 Improvements	\$300,000	\$1,000,000	\$1,300,000		\$159,000	\$1,253,500						0%	0%	\$300,000	\$1,000,000	\$1,300,000	
LS03	CC 3 Improvements	\$34,615	\$115,385	\$150,000			\$18,865	\$148,615					0%	0%	\$34,616	\$115,385	\$150,000	
LS04	Transfer Lift Station Bypass Valve Replacement	\$9,231	\$30,769	\$40,000					\$46,000				5%	30%	\$6,000	\$20,000	\$26,000	
LS05	CC 8 Force Main Replacement	\$46,154	\$153,846	\$200,000						\$260,000			0%	0%	\$46,154	\$153,846	\$200,000	
LS06	CC 9 Removal	\$115,385	\$384,615	\$500,000						\$650,000			0%	0%	\$115,385	\$384,615	\$500,000	
Collection System Gravity Sewer Main Improvements																		
CS00	Annual Pipe Replacement Fund (Project Cost Totalized)	\$1,977,229	\$6,590,763	\$8,568,000	\$56,571	\$504,559	\$518,839	\$533,119	\$547,399	\$3,093,997	\$3,450,997	\$3,807,996	0%	5%	\$1,878,375	\$6,261,225	\$8,139,600	
CS01	Golf Course Road Sewer	-	-	-									-	-	-	-	-	
CS02	SR 150 Mainline near Chelan Fruit	\$87,115	\$290,384	\$377,500		\$46,171	\$363,997						5%	30%	\$56,625	\$188,750	\$245,375	
CS03	SR 150 Mainline Upsize	\$376,846	\$1,256,153	\$1,633,000				\$211,034	\$1,661,262				0%	0%	\$376,847	\$1,256,153	\$1,633,000	
CS04	Columbia Street Mainline Upsize	\$114,692	\$382,307	\$497,000				\$64,228	\$505,601				0%	0%	\$114,693	\$382,307	\$497,000	
CS05	Mainline CC 1/CC 2 to Transfer Lift Station	\$607,384	\$2,024,613	\$2,632,000							\$720,650		8%	0%	\$558,796	\$1,862,644	\$2,421,440	
CS06	SR 97A Mainline Draining to CC 2	\$178,673	\$595,576	\$774,250								\$1,238,800	50%	0%	\$89,337	\$297,788	\$387,125	
WWTP Projects																		
WW01	RBC Air Cup Replacement	-	-	-									-	-	-	-	-	
WW02	Secondary Treatment System Engineering Report	\$150,000	\$0	\$150,000					\$172,500				5%	30%	\$97,500	\$0	\$97,500	
WW03	Standby Generator Replacement	\$103,846	\$346,154	\$450,000	\$53,481	\$421,961							5%	30%	\$67,500	\$225,000	\$292,500	
WW04	Blower Building MCC Replacement	\$191,538	\$638,461	\$830,000	\$98,642	\$778,284							5%	30%	\$124,500	\$415,000	\$539,500	
WW05	Primary Sludge Valves Replacement	\$11,538	\$38,462	\$50,000			\$54,500						5%	30%	\$7,500	\$25,000	\$32,500	
WW06	Primary Clarifier Refurbishment	\$53,077	\$176,923	\$230,000						\$299,000			5%	30%	\$34,500	\$115,000	\$149,500	
WW07	Secondary Treatment System Replacement	\$1,846,152	\$6,153,840	\$8,000,000								\$12,800,000	5%	30%	\$1,200,004	\$3,999,996	\$5,200,000	
WW08	Secondary Sludge Thickening	\$235,384	\$784,615	\$1,020,000							\$1,479,000		5%	30%	\$153,001	\$509,999	\$663,000	
WW09	Two 35-ft Secondary Clarifier Refurbishments	\$80,769	\$269,231	\$350,000						\$455,000			5%	30%	\$52,500	\$175,000	\$227,500	
WW10	50-ft Sec. Clarifier RAS/Scum Pump Improvements	\$9,231	\$30,769	\$40,000			\$43,600						5%	30%	\$6,000	\$20,000	\$26,000	
WW11	Digester Mixing/Aeration System Refurbishment	\$129,231	\$430,769	\$560,000						\$728,000			5%	30%	\$84,000	\$280,000	\$364,000	
WW12	Dewatering System Replacement	\$223,846	\$746,153	\$970,000	\$115,281	\$909,561							5%	30%	\$145,500	\$485,000	\$630,500	
WW13	Membrane Roof Repair (3 Bldgs.)	\$256,154	\$853,845	\$1,110,000						\$1,443,000			5%	30%	\$166,501	\$554,999	\$721,500	
WW14	Enclose Sludge Bin Storage Area	\$9,231	\$30,769	\$40,000						\$52,000			5%	30%	\$6,000	\$20,000	\$26,000	
Miscellaneous Items																		
M01	General Sewer Plan (Total for 2 in 2021 dollars)	\$400,000	\$0	\$400,000						\$260,000		\$320,000	5%	30%	\$260,000	\$0	\$260,000	
M02	Public Works Building (sewer portion)	\$0	\$291,262	\$291,262	\$300,000								0%	0%	\$0	\$291,262	\$291,262	
M03	Sewer Rate Study (Total for 4 in 2021 dollars)	\$75,472	\$0	\$75,472		\$20,000				\$24,528	\$27,359	\$30,189	0%	0%	\$75,472	\$0	\$75,472	
M04	Update City Standards	\$25,000	\$0	\$25,000									0%	0%	\$25,000	\$0	\$25,000	
M05	Northshore Interceptor Analysis	\$50,000	\$20,000	\$70,000	\$45,000					\$26,000			0%	50%	\$25,000	\$10,000	\$35,000	
M06	Additional Heated Storage for Maintenance Crews	\$57,692	\$192,308	\$250,000							\$362,500		0%	0%	\$57,693	\$192,308	\$250,000	
Totals		\$7,755,484	\$25,537,970	\$33,293,484	\$766,824	\$2,940,236	\$2,356,852	\$1,063,396	\$3,042,013	\$7,415,025	\$6,178,255	\$18,348,985				\$6,164,999	\$20,951,275	\$27,116,274

- Table Reference Notes:
1. The indirect and direct costs are estimated with standard factors based on project type. These are shown only for the purposes of estimating annual budget allocation.
 2. Indirect costs are reduced for projects that consist of simple in-kind equipment replacement
 3. Where applicable, project costs are set to be consistent with other planning documents.
 4. The approximate portions of total WWTP flow volumes are: 5.5% LCSD, ~30% LCRD, ~65% City with the approximation of LCSD portion of total flow at the following areas:
LCSD: ~5% of flow at Transfer Lift Station and downstream to WWTP; ~8% of flow between C.C. 2 and Transfer Lift Station; 50% of flow between LCSD and C.C. 2
 5. Allocation of LCRD and LCSD costs for individual projects is per the City's discretion and may be lower than the portion of flow allocation to allow for conservative budgeting.

APPENDIX H

SEPA CHECKLIST AND DETERMINATION OF NON-SIGNIFICANCE

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization, or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. **You may use “not applicable” or “does not apply” only when you can explain why it does not apply and not when the answer is unknown.** You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to **all parts of your proposal**, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for lead agencies

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B, plus the [Supplemental Sheet for Nonproject Actions \(Part D\)](#). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in “Part B: Environmental Elements” that do not contribute meaningfully to the analysis of the proposal.

A. Background [Find help answering background questions](#)

1. Name of proposed project, if applicable:

City of Chelan General Sewer Plan (GSP)

2. Name of applicant:

City of Chelan (City)

3. Address and phone number of applicant and contact person:

Travis Denham

City of Chelan

50 Chelan Falls Highway

Chelan, WA 98816

4. Date checklist prepared:

June 14, 2023

5. Agency requesting checklist:

City of Chelan

6. Proposed timing or schedule (including phasing, if applicable):

Projects associated with the City's Capital Improvement Plan (CIP) presented in the GSP could occur between 2022 and 2040 or in later years. No specific projects are proposed at this time.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

Future sewer improvements will be based on the capital improvement projects described in the GSP. These are detailed in Chapter 7 of the GSP.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Environmental checklists and required related studies will be prepared as needed for individual construction projects listed in the GSP.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

None at this time.

10. List any government approvals or permits that will be needed for your proposal, if known.

No additional approvals or permits are required as part of the GSP update. Approvals from various agencies may be necessary for individual projects. Such approvals will be obtained at the time of each individual project.

- 11. Give a brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)**

The City's GSP proposes various improvements that are necessary to resolve existing system deficiencies and plan for the projected growth of the sewer system. The GSP details the service area, existing facilities, and construction, operation, and maintenance requirements for the sewer system in accordance with WAC 173-240-050.

- 12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.**

The City is located in Chelan County, on the southeast end of Lake Chelan. The City's urban growth area includes the current City limits and some areas of unincorporated Chelan County. The City's existing sewer collection system covers a portion, but not all of the City limits nor UGA. Refer to Figure A-2 of the GSP.

B. Environmental Elements

1. Earth [Find help answering earth questions](#)

a. General description of the site:

Refer to Chapter 2 of the GSP for a general description of the sewer service area.

Circle or highlight one: Flat, rolling, hilly, steep slopes, mountainous, other:

b. What is the steepest slope on the site (approximate percent slope)?

Slopes vary throughout the City. SEPA checklists for individual projects will address this on a site specific basis as needed.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them, and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Based on a review of National Resources Conservation Service web soil survey for the City's sewer service area, the primary soil types (i.e. soil types accounting for more than approximately 1 percent of the service area) include Chelan gravelly sandy loam, Chelan cobbly sandy loam, Chelan bouldery sandy loam, Chelan gravelly sandy loam, pumiceous, Entiat-Rock outcrop complex, riverwash, Supplee very fine sandy loam and terrace escarpments.

The majority of commercially significant agricultural lands within the City have already been removed from production. It is anticipated that some additional agricultural lands will come out of production as

the City population grows and housing is constructed within these existing agricultural lands. Due to the lack of water availability within the Chelan basin, future developments must be accompanied with existing water rights prior to platting, and this requirement prioritizes the development of agricultural lands. Checklists for individual projects will address this on a site specific basis as needed.

- d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.**

Yes, areas of erodible soils are mapped on Chelan County's GIS website. Within the City's sewer service area, erodible soils are primarily mapped at slopes, streams, and shorelines of Lake Chelan and the Chelan River. SEPA checklists for individual projects will address this on a site specific basis as needed.

- e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.**

Earthwork quantities will vary by project identified in the GSP capital improvement plan. SEPA checklists for individual projects will address this on a site specific basis as needed.

- f. Could erosion occur because of clearing, construction, or use? If so, generally describe.**

Erosion potential will vary by project identified in the GSP capital improvement plan. SEPA checklists for individual projects will address this on a site specific basis as needed.

- g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?**

Impervious surfacing will vary by project identified in the GSP capital improvement plan. SEPA checklists for individual projects will address this on a site specific basis as needed.

- h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any.**

Temporary exhaust and dust emissions from construction equipment and vehicles are anticipated during construction of the proposed projects. Checklists for individual projects will address this on a site specific basis.

2. Air [Find help answering air questions](#)

- a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.**

Temporary exhaust and dust emissions from construction equipment and vehicles are anticipated during construction of the proposed projects. Checklists for individual projects will address this on a site specific basis as needed.

- b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.**

None known. Checklists for individual projects will address this on a site specific basis as needed.

- c. Proposed measures to reduce or control emissions or other impacts to air, if any.**

Construction equipment and vehicles used for the proposed projects shall conform with Washington State standards for air quality, including using properly functioning equipment and vehicles that have

passed emissions testing. Checklists for individual projects will address this on a site specific basis as needed.

3. Water [Find help answering water questions](#)

a. Surface Water: [Find help answering surface water questions](#)

- 1. Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.**

Lake Chelan and the Chelan River, which flows from Lake Chelan to the Columbia River, are adjacent to the City Limits. The Columbia River is immediately adjacent to the WWTP.

- 2. Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

The aforementioned water bodies will be in the immediate vicinity of some of the projects proposed by the CIP. Checklists for individual projects will address this on a site specific basis as needed.

- 3. Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

No filling or dredging in surface water or wetlands is known to be a part of any of the projects proposed in the GSP.

- 4. Will the proposal require surface water withdrawals or diversions? Give a general description, purpose, and approximate quantities if known.**

No surface withdrawals or diversions are known to be a part of any of the projects proposed in the GSP.

- 5. Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

Specific parts of individual projects may lie with the 100-year floodplain. Checklists for individual projects will address this on a site specific basis as needed.

- 6. Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

Checklists for individual projects will address this on a site specific basis as needed.

b. Ground Water: [Find help answering ground water questions](#)

- 1. Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give a general description, purpose, and approximate quantities if known.**

No

- 2. Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be**

served (if applicable), or the number of animals or humans the system(s) are expected to serve.

The GSP estimates 453 properties within the Urban Growth Area that are served by individual septic systems with drainfields. The City will be able to accommodate connecting these properties to the sewer system as the septic systems fail or the property owners desire to connect.

No additional waste material discharges into the ground are identified at this time. Checklists for individual projects will address this on a site-specific basis as needed.

c. Water Runoff (including stormwater):

- a) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

BMPs will be utilized during construction to minimize impacts from stormwater runoff. The completed projects will restore ground surface to pre-construction elevations, and the existing runoff patterns of the project areas are not anticipated to change. Checklists for individual projects will address this on a site-specific basis as needed.

- b) Could waste materials enter ground or surface waters? If so, generally describe.**

Runoff from individual projects will vary by project. Checklists for individual projects will address this on a site-specific basis as needed.

- c) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.**

None of the projects identified are specifically intended to significantly alter drainage patterns. Checklists for individual projects will address this on a site-specific basis as needed.

- d) Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any.**

Measures to reduce runoff and maintain drainage patterns in individual projects will vary by project. Checklists for individual projects will address this on a site-specific basis as needed.

4. Plants [Find help answering plants questions](#)

- a. Check the types of vegetation found on the site:**

☒ deciduous tree: alder, maple, aspen, other

☒ evergreen tree: fir, cedar, pine, other

☒ shrubs

☒ grass

☐ pasture

☐ crop or grain

☒ orchards, vineyards, or other permanent crops.

☐ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other

☐ water plants: water lily, eelgrass, milfoil, other

☒ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

Vegetation varies by project. Checklists for individual projects will address this on a site-specific basis as needed.

c. List threatened and endangered species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis as needed.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any.

Checklists for individual projects will address this on a site-specific basis as needed.

e. List all noxious weeds and invasive species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis as needed.

5. Animals [Find help answering animal questions](#)

a. List any birds and other animals that have been observed on or near the site or are known to be on or near the site.

Examples include:

- Birds: hawk, heron, eagle, songbirds, other:
- Mammals: deer, bear, elk, beaver, other:
- Fish: bass, salmon, trout, herring, shellfish, other:

b. List any threatened and endangered species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis as needed.

c. Is the site part of a migration route? If so, explain.

The City is within the Pacific Flyway migration route and Lake Chelan provides habitat for migratory bird species, as well as, supporting various anadromous salmonids.

d. Proposed measures to preserve or enhance wildlife, if any.

Checklists for individual projects will address this on a site-specific basis as needed.

e. List any invasive animal species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis as needed.

6. Energy and Natural Resources [Find help answering energy and natural resource questions](#)

1. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Gasoline, oil, and electricity may be used to power project equipment and/or facilities. Checklists for individual projects will address this on a site-specific basis as needed.

- 2. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.**

No

- 3. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any.**

The prioritization of energy-effective pumping and treatment equipment will be part of the applicable projects, as will meeting the energy code requirements for building envelopes, HVAC and lighting. Checklists for individual projects will address this on a site-specific basis as needed.

7. Environmental Health [Find help with answering environmental health questions](#)

- a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur because of this proposal? If so, describe.**

The health hazards typical of any construction project, such as oil and diesel spills from construction vehicles and risk of fire, are the only significant known health hazards associated with the proposed projects. Checklists for individual projects will address this on a site-specific basis as needed.

- 1. Describe any known or possible contamination at the site from present or past uses.**

This is unlikely, but checklists for individual projects will address this on a site-specific basis as needed.

- 2. Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.**

Checklists for individual projects will address this on a site-specific basis as needed.

- 3. Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.**

Checklists for individual projects will address this on a site-specific basis as needed.

- 4. Describe special emergency services that might be required.**

None are anticipated.

- 5. Proposed measures to reduce or control environmental health hazards, if any.**

Typical construction safety measures will be required to be employed for all projects. Checklists for individual projects will address this on a site-specific basis as needed.

b. Noise

- 1. What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**

Traffic is present in the City's sewer service area, but is not expected to have an effect.

- 2. What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site)?**

Temporary construction noise will occur with the projects, including noise generated by construction vehicles, excavation, and sawcutting associated with open cutting roads. The contractor will need to follow regulations set forth in the municipal code, including controlling the level and timing of noise generated during construction. Checklists for individual projects will address this on a site-specific basis as needed.

- 3. Proposed measures to reduce or control noise impacts, if any.**

Construction activities and proposed site improvements shall comply with the noise requirements in the municipal code.

8. Land and Shoreline Use [Find help answering land and shoreline use questions](#)

- a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.**

Refer to Figure A-6 in the GSP for land uses. Infrastructure is, and will be, located within existing rights-of-way and easements and will generally not affect current land uses. Checklists for individual projects will address this on a site-specific basis as needed.

- b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses because of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?**

No agricultural or forest land of long-term commercial significance are expected to be converted to other uses as part of any of the projects identified in the GSP.

- 1. Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how?**

Not applicable. Checklists for individual projects will address this on a site-specific basis as needed.

- c. Describe any structures on the site.**

Checklists for individual projects will address this on a site-specific basis as needed.

- d. Will any structures be demolished? If so, what?**

Checklists for individual projects will address this on a site-specific basis as needed.

- e. What is the current zoning classification of the site?**

Zoning varies throughout the UGA. Refer to Figure A-6 in the GSP.

- f. What is the current comprehensive plan designation of the site?**

Land designations vary throughout the UGA and are described in Chapter 3 of the GSP.

- g. If applicable, what is the current shoreline master program designation of the site?**

The 2021 City of Chelan Shoreline Master Program designates shorelines of Lake Chelan and the Chelan River. Shoreline areas of these water bodies adjacent to the City's sewer service area are designated as a mix of Shoreline Park/Public, Shoreline Residential – Single Family, Shoreline Residential – Multifamily, and High Intensity.

Additionally, the 2021 Chelan County Shoreline Master Program designates shorelines of Lake Chelan, the Chelan River, and the Columbia River. Shoreline areas of Lake Chelan adjacent to the City's sewer service area are designated as Urban. Shoreline areas of the Chelan River adjacent to the City's sewer service area are designated as a mix of Conservancy and Natural. Shoreline areas of the Columbia River adjacent to the Wastewater Treatment plant are designated as Urban.

Checklists for individual projects will address this on a site-specific basis as needed.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

Some projects identified in the GSP may be in critical areas. Refer to Chapter 2 in the GSP regarding critical areas. Checklists for individual projects will address this on a site-specific basis as needed.

i. Approximately how many people would reside or work in the completed project?

Not applicable.

j. Approximately how many people would the completed project displace?

Not applicable.

k. Proposed measures to avoid or reduce displacement impacts, if any.

Not applicable.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any.

Checklists for individual projects will address this on a site-specific basis as needed.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any.

Not applicable.

9. Housing [Find help answering housing questions](#)

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

Not applicable.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

Not applicable.

c. Proposed measures to reduce or control housing impacts, if any.

Not applicable.

10. Aesthetics [Find help answering aesthetics questions](#)

- a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?**

Checklists for individual projects will address this on a site-specific basis as needed.

- b. What views in the immediate vicinity would be altered or obstructed?**

Checklists for individual projects will address this on a site-specific basis as needed.

- c. Proposed measures to reduce or control aesthetic impacts, if any.**

Checklists for individual projects will address this on a site-specific basis as needed.

11. Light and Glare [Find help answering light and glare questions](#)

- a. What type of light or glare will the proposal produce? What time of day would it mainly occur?**

The projects proposed in the GSP are not expected to produce significant light or glare. Checklists for individual projects will address this on a site-specific basis as needed.

- b. Could light or glare from the finished project be a safety hazard or interfere with views?**

The projects proposed in the GSP are not expected to produce significant light or glare. Checklists for individual projects will address this on a site-specific basis as needed.

- c. What existing off-site sources of light or glare may affect your proposal?**

Not applicable.

- d. Proposed measures to reduce or control light and glare impacts, if any.**

Checklists for individual projects will address this on a site-specific basis as needed.

12. Recreation [Find help answering recreation questions](#)

- a. What designated and informal recreational opportunities are in the immediate vicinity?**

The City offers numerous designated and informal recreational opportunities. Checklists for individual projects will address this on a site-specific basis as needed.

- b. Would the proposed project displace any existing recreational uses? If so, describe.**

None of the proposed projects are anticipated to displace recreational uses. Checklists for individual projects will address this on a site-specific basis as needed.

- c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any.**

Checklists for individual projects will address this on a site-specific basis as needed.

13. Historic and Cultural Preservation [Find help answering historic and cultural preservation questions](#)

- a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers? If so, specifically describe.**

The City's sewer service area contains 4 historic buildings, structures, or sites in the National Register and Washington Heritage Register, including St Andrews Episcopal Church, Ruby Theater, Richard Hinton Lord House, and the Lake Chelan Hydroelectric Power Plant, as shown on Washington State Department of Archaeology and Historic Preservation WISAARD mapping data. WISAARD shows additional properties within the sewer service area that have been determined eligible for listing. Checklists for individual projects will address this on a site-specific basis as needed.

- b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.**

[Checklists for individual projects will address this on a site-specific basis as needed.](#)

- c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.**

[At a minimum, review of the Washington Information System for Architectural and Archaeology Records Data \(WISAARD\) will be conducted for the vicinity of proposed improvements. If deemed necessary, archeological surveys may be conducted for specific projects. Checklists for individual projects will address this on a site-specific basis as needed.](#)

- d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.**

[The City shall utilize standard Inadvertent Discovery Plan language to guide the contractor if any artifacts or remains are inadvertently uncovered. Checklists for individual projects will address this on a site-specific basis as needed.](#)

14. Transportation [Find help with answering transportation questions](#)

- a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.**

[Refer to Figures B-1 through B-11 of the GSP. The City's transportation system consists of major transportation corridors, arterials, City streets, and local access roads. The City's sewer system is planned and constructed, for the most part, to utilize public street rights-of-way. Checklists for individual projects will address this on a site-specific basis as needed.](#)

- b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?**

Yes. Transit service is available throughout the service area.

- c. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle, or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

Much of the existing sewer infrastructure is within existing streets. Repair, replacement and installation of new sewer infrastructure on individual projects will necessitate restoration of existing transportation infrastructure. Checklists for individual projects will address this on a site-specific basis as needed.

- d. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No

- e. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

The proposed projects will not permanently change vehicular patterns.

- f. Will the proposal interfere with, affect, or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

No.

- g. Proposed measures to reduce or control transportation impacts, if any.

Typical construction measures, such as temporary traffic control and detours, will be employed to mitigate temporary traffic impacts. The projects are not anticipated to create permanent transportation impacts. Checklists for individual projects will address this on a site-specific basis as needed.

15. Public Services [Find help answering public service questions](#)

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

The projects are not anticipated to create an increased need for public services in any way.

- b. Proposed measures to reduce or control direct impacts on public services, if any.

Not applicable.

16. Utilities [Find help answering utilities questions](#)

- a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other:

All typical municipal utilities are available near the proposed projects. Checklists for individual projects will address this on a site-specific basis as needed.

- b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

The projects generally consist of maintenance or expansion of the municipal sewer infrastructure, served by the City of Chelan.

C. Signature [Find help about who should sign](#)

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

X  _____

Type name of signee: Travis Denham

Position and agency/organization: City Engineer / City of Chelan

Date submitted: 6/28/2023

D. Supplemental sheet for nonproject actions [Find help for the nonproject actions worksheet](#)

IT IS NOT REQUIRED to use this section for project actions.

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; pro-

duction, storage, or release of toxic or hazardous substances; or production of noise?

In general, the projects proposed by the GSP will have both temporary environmental impacts from construction measures as well as permanent direct or indirect environmental impacts.

Discharge to Water

During the construction of the proposed sewer main and facility CIP projects, discharge of turbid water could occur.

Emissions to Air

Temporary construction emissions expected include exhaust from machinery and vehicles, and dust.

Production, Storage, and Release of Toxic or Hazardous Substances

The projects will not increase production, storage, or release of toxic or hazardous substances.

Production of Noise

Temporary construction noise would be limited to daytime, work-day hours.

Potential concerns will be addressed in SEPA review for specific projects contained in the GSP.

Proposed measures to avoid or reduce such increases are:

Discharges to Water

The discharge of water supply as wastewater effluent flows to the Columbia River are addressed in the City's National Pollutant Discharge Elimination System operating permit. The Washington State Department of Ecology (Ecology) monitors compliance with permit conditions intended to avoid or mitigate impacts from these discharges.

Reducing Discharges to Water

- TESC plans for each construction project will minimize and protect water bodies from turbid water discharge and runoff.
- Construction work will comply with near-water work windows to avoid disturbing sensitive and protected fish and wildlife.

Reducing Emissions to Air

- Construction machinery and vehicle emissions shall be kept to a minimum by turning off equipment instead of idling during periods when equipment is not in use.
- Appropriate dust control measures (sweeping, watering) will be implemented as part of each project's TESC plan to keep construction generated dust to a minimum.
- Green technologies and equipment should be utilized within construction of the proposed projects when plausible.

Reducing the Projection of Noise

- Limit construction work to daytime, work-day hours, Monday through Friday.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Once completed, the sewer main projects will be fully buried within roadway rights-of-way. Staging of excavation and fill materials and equipment on land would affect any plants in the immediate area.

The facility projects could have minor localized effects on plants, animals, and fish. These projects could require clearing of minor existing vegetation, which could in turn affect wildlife that utilizes that vegetation for food or shelter. Clearing, grading and excavation may result in minor discharge of turbid water to streams though this is expected to be largely mitigated by TESC measures.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

- TESC plans for each construction project will create means to protect water bodies from turbid water discharge and runoff.
- Working during the summer month work-window presents less of a risk for turbid discharge since rain events are less frequent.
- Staging materials and equipment should be located on impervious surfaces or in previously cleared or impacted areas if possible.
- There should be no further clearing of vegetation beyond what is needed for the construction of the projects.

3. How would the proposal be likely to deplete energy or natural resources?

Petroleum resources will be used for the construction of the proposed projects (fuel for construction machinery and vehicles). Electrical power in the area is provided from renewable sources (hydroelectric). No other natural resources will be significantly depleted by the proposed projects.

Proposed measures to protect or conserve energy and natural resources are:

Energy and natural resource depletion by the projects is expected to be minor and not necessitate significant conservation measures. Where applicable, specific measures will be identified and included in SEPA review for specific projects contained in the GSP.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection, such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

The projects should have no direct effect on parks, wilderness, wild and scenic rivers, floodplains, or prime farmlands. The projects could directly affect sensitive areas such as federally-listed threatened species habitat, cultural sites, and wetlands. As discussed previously, construction of these projects could potentially discharge turbid water to water bodies (including riparian wetland areas).

The projects could have indirect effects (via expanded clearing, grading, and building in the service area) on federally-listed threatened species habitat, cultural sites, wetlands, and floodplains. Discharge of turbid water to adjacent water bodies could affect rearing and

migrating bull trout and salmonids, critical habitat, and riparian wetlands associated with these water bodies. Excavation of structure foundations could uncover cultural sites. Impervious surfaces (buildings, parking lots, roads) result in increased stormwater runoff, which could contribute to flooding issues.

Proposed measures to protect such resources or to avoid or reduce impacts are:

- TESC plans for each construction project will create means to protect water bodies from turbid water discharge and runoff.
- Working during the summer month work-window presents less of a risk for turbid discharge since rain events are less frequent and severe.
- Construction work will comply with near-water and migratory bird work windows to avoid disturbing federally-listed salmonids and wildlife.
- Staging materials and equipment should be located on impervious surfaces or in previously cleared or impacted areas if possible.
- There should be no further clearing of vegetation beyond what is needed for the construction of the projects.
- If cultural artifacts or historic resources are uncovered during construction, project work should be suspended immediately. Appropriate authorities at City, County and state levels should be notified and appropriate measures taken to protect these resources.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

The proposed projects in the GSP would allow for an expansion of residential and commercial uses within the Urban Growth Area. The Urban Growth Area was defined specifically to accommodate population growth in the City.

Proposed measures to avoid or reduce shoreline and land use impacts are:

Minimize clearing and grading of vegetation to that directly needed to accomplish the proposed project. Ensure projects are consistent with City planning objectives and ordinances.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

The direct transportation effects of the proposed projects associated with the GSP could be temporary loss of sidewalks, on-street parking, lane closures, or detours near sewer main installation within road right-of-way. Bus stops may be temporarily affected by work in the right-of-way. Sewer service and other utility services should not be affected during construction.

Indirect effects of the proposed projects on transportation would be increased road usage and the need to build new roads for new developments and potentially expand and make more frequent repairs to existing roads. Higher population may result in increased ridership of community transit and expanded service route frequency and stops. The expansion and improvement of the sewer system will result in the ability to support new residential and commercial developments.

Proposed measures to reduce or respond to such demand(s) are:

- Construction would take place in a timely manner to minimize obstructions and alterations of local traffic flow.
- City-approved traffic control will be provided during construction if needed.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

All projects proposed will be required to obtain applicable local, state, and federal permits, which are intended to encourage avoidance, minimization, and mitigation for adverse environmental impacts. A preliminary list of potential permits needed for proposed sewer main and facility projects are listed as follows.

City and County Permits

- Building, Right-of-Way, and Site Development Permits.
- Floodplain Development Permit.
- Critical Areas Compliance.
- Shoreline Conditional Use or Variance Permit

State

- Ecology General Order of Approval for Diesel or Gas Emergency Electrical Generators (for backup generators during power outages).
- Section 401 Water Quality Certification through Ecology (needed if Section 404 is required).

Federal

- Federal permits for work within wetlands or waters of the state (i.e. Section 404 or Section 10 approval through the US Army Corps of Engineers), including associated Endangered Species Act, Coastal Zone Management, and National Historic Preservation Act compliance.



Community Development Department

135 E Johnson Ave.
P.O. Box 1669
Chelan Washington, 98816

(509)682-8017
Fax (509)682-8050

DETERMINATION OF NONSIGNIFICANCE

CITY OF CHELAN – SEWER COMPREHENSIVE PLAN UPDATE

Date: June 28, 2023

Lead Agency: City of Chelan

Agency Contact: John Ajax, jajax@cityofchelan.us, (509) 682-8017

Lead Agency File Number: SEPA2023-06

Project Description: Update to the City of Chelan Sewer Comprehensive Plan, aka General Sewer Plan (GSP) that proposes various improvements that are necessary to resolve existing system deficiencies and plan for the projected growth of the sewer system. The GSP details the service area, existing facilities, and construction, operation, and maintenance requirements for the sewer system in accordance with WAC 173-240-050.

Project Location: This is a non-project action comprising the City of Chelan Corporate Limits, Chelan Urban Growth Area, and limited areas of unincorporated Chelan County.

Project Applicant: City of Chelan

The City of Chelan has determined that this proposal will not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030. This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

This DNS is issued under WAC 197-11-340(2) and the comment period will end on July 13, 2023.

Responsible official: John Ajax - 135 E. Johnson Avenue/PO Box 1669, Chelan, WA 98816

Position/title: Community Development Director

Phone: (509) 682-8017

Signature:

Date: June 18, 2023

The SEPA Checklist, DNS, and associated documents can be obtained online at:
<https://tinyurl.com/City-of-Chelan-SEPA-Register> under the applicable Lead Agency File Number identified above.

From: John Ajax <jajax@cityofchelan.us>
Sent: Friday, June 30, 2023 10:32 AM
To: alicia.hankins@chelanpud.org; AquaticLeasing.Rivers@dnr.wa.gov; basher@cfr7.org; casey_barney@yakama.com; chesna.kern@ziply.com; crosepa@ecy.wa.gov; darnell.sam.adm@colvilletribes.com; enviroreview@yakama.com; Evan.G.Carnes@usace.army.mil; guestservices@linktransit.com; guy.moura@colvilletribes.com; Jennifer Collins; jena.churchill@usace.army.mil; jessica_lally@yakama.com; jim@ccpd.com; John Ajax; john.sirois.adm@colvilletribes.com; lfor461@ECY.WA.GOV; milton.davis.adm@colvilletribes.com; NC-Review@WSDOT.WA.GOV; Rod Anderson; sepa@dahp.wa.gov; sepacenter@dnr.wa.gov; tolefk@wsdot.wa.gov; wdfwr2planning@dfw.wa.gov; williamst@chelanschools.org; wilsonb@chelanschools.org
Cc: kmclain@agr.wa.gov; reviewteam@commerce.wa.gov; davm461@ECY.WA.GOV; comi461@ECY.WA.GOV; sepa.reviewteam@doh.wa.gov; larry.covey@dshs.wa.gov; deanna.walter@co.chelan.wa.us; richard@linktransit.com; jim@cdrpa.org; Travis Denham; jyoungren@cityofchelan.us
Subject: City of Chelan - SEPA DNS / Comprehensive Sewer Plan Update
Attachments: SEPA 2023-06 DNS Signed.pdf

All,

Please find attached a signed DNS and a link to the supporting documents on the Washington State SEPA register for the proposed update to the City of Chelan's Sewer Comprehensive Plan. If you have any questions, please feel free to contact me or Travis Denham (City Engineer).

Link: [City of Chelan SEPA Register](#)

Best regards,

John Ajax
Community Development Director
City of Chelan
(509) 682-8017 Ext 451

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APPENDIX I

AGENCY CORRESPONDENCE AND CITY ADOPTION

Subject:

FW: City of Chelan: General Sewer Plan

From: Travis Denham**Sent:** Friday, September 10, 2021 9:16 AM**To:** randerson@LCRD.org; Mark Babcock <MBabcock@cityofchelan.us>; jim@cdrpa.org; eric.pierson@co.chelan.wa.us; marcia.porter@ecy.wa.gov**Cc:** Jake Youngren (jyoungren@cityofchelan.us) <jyoungren@cityofchelan.us>**Subject:** RE: City of Chelan: General Sewer Plan

Hello All,

I'm just providing an additional email to remind you to review the Agency Review draft of the City of Chelan 2021 General Sewer Plan (see link below in previous email). If you haven't already, please provide comments by September 25th.

Thank you,

Travis

Travis Denham, PE

City Engineer | City of Chelan

50 Chelan Falls Hwy.

Chelan, WA 98816

O: (509) 682-8055

F: (509) 682-8035

ttenham@cityofchelan.uswww.cityofchelan.us

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From: Travis Denham**Sent:** Friday, August 20, 2021 11:08 AM**To:** randerson@LCRD.org; Mark Babcock <MBabcock@cityofchelan.us>; jim@cdrpa.org; eric.pierson@co.chelan.wa.us; marcia.porter@ecy.wa.gov**Cc:** Jake Youngren (jyoungren@cityofchelan.us) <jyoungren@cityofchelan.us>**Subject:** City of Chelan: General Sewer Plan

All,

Please find the City of Chelan 2021 General Sewer Plan – Agency Review draft within the link provided below. SEPA is intended to be completed after Agency review to ensure that any changes that may arise during the review process can be incorporated prior to SEPA.

https://rh2engineeringinc-my.sharepoint.com/:f:/g/personal/esmith_rh2_com/EiGs2YDNp3hEo5B9GJ8BZhcB-M8IUdZ_rn5d3FGGeE8xxUA?e=BPFCob

Let me know if you have any questions.

Thank you,

Travis

Travis Denham, PE

City Engineer | City of Chelan

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Eric Smith

From: Travis Denham <tdenham@cityofchelan.us>
Sent: Thursday, August 26, 2021 10:14 AM
To: Eric Smith
Subject: FW: City of Chelan: General Sewer Plan

Follow Up Flag: Follow up
Flag Status: Completed

Hi Eric,
I'm just going to forward any comments from other agencies to you as they come. See Rod's comments below.
Travis

Travis Denham, PE

City Engineer | City of Chelan

50 Chelan Falls Hwy.

Chelan, WA 98816

O: (509) 682-8055

F: (509) 682-8035

tdenham@cityofchelan.us

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From: Rod Anderson <randerson@lcrd.org>
Sent: Thursday, August 26, 2021 10:05 AM
To: Travis Denham <tdenham@cityofchelan.us>
Subject: RE: City of Chelan: General Sewer Plan

CAUTION: External Email

Good morning Travis –

Thanks for the opportunity to review. Only one item I noted ...

- Figure B-8 - Crystal View is missing some gravity infrastructure

- Rod

Notice of Confidentiality:

The information transmitted is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. Any review re-transmission or other use of or taking any action in reliance upon this information by persons or entities other than the intended recipient is prohibited. If you received this in error please contact the sender immediately by return electronic transmission and then immediately delete this transmission including all attachments without copying, distributing or disclosing same.

From: Travis Denham [<mailto:tdenham@cityofchelan.us>]

Sent: Friday, August 20, 2021 11:08 AM

To: Rod Anderson <randerson@lcrd.org>; Mark Babcock <MBabcock@cityofchelan.us>; jim@cdrpa.org; eric.pierson@co.chelan.wa.us; marcia.porter@ecy.wa.gov

Cc: Jake Youngren <jyoungren@cityofchelan.us>

Subject: City of Chelan: General Sewer Plan

All,

Please find the City of Chelan 2021 General Sewer Plan – Agency Review draft within the link provided below. SEPA is intended to be completed after Agency review to ensure that any changes that may arise during the review process can be incorporated prior to SEPA.

https://rh2engineeringinc-my.sharepoint.com/:f:/g/personal/esmith_rh2_com/EiGs2YDNp3hEo5B9GJ8BZhcB-M8IUdZ_rn5d3FGGeE8xxUA?e=BPFCob

Let me know if you have any questions.

Thank you,

Travis

Travis Denham, PE

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