Kennedy Jenks

32001 32nd Avenue South, Suite 300
Federal Way, Washington 98001
253-835-6400
FAX: 253-952-3435

DRAFT

City of Ellensburg
General Sewer Plan

DRAFT

November 2025

Prepared for

City of Ellensburg
501 North Anderson Street
Ellensburg, Washington 98926

KJ Project No. 2297006.01

Table of Contents

List of Tables ..... *iv*

List of Figures ..... *vi*

List of Appendices ..... *vii*

Section 1: Executive Summary i

1.1 Introduction i
1.2 Planning Area Characteristics i
1.2.1 Regulatory Requirements v
1.3 Historical and Projected Flows and Loads vi
1.3.1 Historical Flow and Loads vi
1.3.2 Projected Flow and Loads ix
1.4 Existing Wastewater Facilities ix
1.5 Business Risk and Vulnerability Assessment xii
1.5.1 BRVA Findings xii
1.6 Wastewater Collection System Analysis xiii
1.6.1 Inflow and Infiltration Analysis xv
1.6.2 Pump Station Assessment xvi
1.6.3 Collection System Considerations xvi
1.7 Wastewater Treatment Facility Analysis xvii
1.7.1 Process Model xvii
1.7.2 WWTF Considerations xviii
1.8 Capital Improvement Plan xx
1.9 Financial Analysis xx

Section 2: Introduction 2-1

2.1 City Background 2-1
2.2 Purpose and Scope 2-1
2.3 Regulatory Requirements 2-2
2.3.1 Federal Regulations 2-3
2.3.2 Washington State Regulations 2-3
2.4 Compliance Status 2-4
2.5 Previous Planning Documents 2-5
2.6 Ownership and Management 2-6
2.7 Plan Overview 2-6

Section 3: Planning Area Characteristics 3-1

3.1 Introduction 3-1
3.2 Service Area, Zoning, and Land Use 3-1
3.2.1 Service Area 3-1

DRAFT

Table of Contents (cont'd)

3.2.2 Zoning and Land Use 3-3
3.3 Surrounding Area Characteristics 3-5
3.3.1 Topography 3-5
3.3.2 Water Resources 3-6
3.3.3 Water Supply System 3-6
3.4 Growth Management Act 3-6
3.5 Population 3-6
3.5.1 Existing Population 3-6
3.5.1.1 Residential 3-6
3.5.1.2 Commercial/Industrial 3-7
3.5.1.3 Central Washington University 3-7
3.5.2 Future Population 3-7
3.5.3 Near Term Development 3-8

Section 4: Historical and Projected Flows and Loads 4-1

4.1 Introduction 4-1
4.2 Historical WWTF Flows and Loads 4-1
4.3 Projected Wastewater Flows and Loads 4-9
4.4 Design Criteria 4-15

Section 5: Existing Wastewater Facilities 5-1

5.1 Introduction 5-1
5.2 Description of Existing Collection System 5-1
5.2.1 Pump Stations 5-1
5.2.2 Collection System Piping 5-1
5.3 Description of Existing Wastewater Treatment Facility 5-7
5.3.1 Flow Path 5-7
5.3.2 WWTF Unit Process Descriptions 5-9
5.3.2.1 Influent Pump Station 5-9
5.3.2.2 Grit Chamber and Removal 5-9
5.3.2.3 Headworks Screens/Automated Fine Screens 5-9
5.3.2.4 Aeration Basins 5-10
5.3.2.5 Secondary Clarifiers 5-10
5.3.2.6 Return Activate Sludge 5-11
5.3.2.7 Effluent Flow Meter 5-11
5.3.2.8 Ultraviolet Disinfection 5-11
5.3.2.9 Effluent Outfall 5-12
5.3.2.10 Solids Treatment Facilities (Solids Stream Process) 5-12
5.3.2.11 Waste Activated Sludge 5-12
5.3.2.12 Anaerobic digesters 5-13
5.3.2.13 Sludge Storage Lagoons/ Sludge Drying Beds 5-13

DRAFT

Table of Contents (cont'd)

Section 6: Business Risk and Vulnerability Assessment 6-1

6.1 BRVA Workshop Series 6-1
6.2 Adjusted Risk Scoring 6-16

Section 7: Wastewater Collection System Analysis 7-1

7.1 Overview 7-1
7.2 Hydraulic Model Development 7-1
7.2.1 Model Approach, Assumptions and Update 7-1
7.2.2 Sewer Inflow Allocation 7-4
7.2.2.1 Existing Sewer Average Daily Flows Calculation from Water Billing Data 7-4
7.2.2.2 Existing Sewer Inflow Allocation 7-6
7.2.3 Model Calibration Methodology 7-7
7.2.3.1 Existing Average Dry Weather Flow Calibration 7-8
7.2.3.2 Existing Peak Wet Weather Flow Calibration 7-8
7.2.3.3 Future Average Dry Weather Flow Calibration ... 7-10
7.2.3.4 Future Peak Wet Weather Flow Calibration 7-10
7.2.4 Hydraulic Model Capacity Evaluation 7-10
7.2.4.1 Existing Flow Conditions 7-10
7.2.4.2 Future Flow Conditions 7-16
7.2.5 Inflow & Infiltration Analysis 7-22
7.2.5.1 Infiltration Analysis 7-22
7.2.5.2 Inflow Analysis 7-24
7.3 Cora Street Pump Station Analysis 7-24
7.4 Maintenance and Testing 7-25
7.4.1 Gravity Sewer Inspection, Rehabilitation & Repair 7-25
7.4.2 Force Main Inspection and Testing 7-25
7.4.3 I/I Reduction Program 7-26
7.4.4 PS Inspection and Maintenance 7-26
7.5 Collection System Analysis Summary 7-26

Section 8: Wastewater Treatment Facility Analysis 8-1

8.1 Overview 8-1
8.2 Plant Hydraulic Capacity 8-1
8.3 Secondary Process Performance and Capacity 8-2
8.3.1 Process Model Setup 8-2
8.3.2 Simulation Conditions 8-3
8.3.3 Aeration Basin Capacity Assessment 8-7
8.3.4 Aeration Capacity Assessment 8-8
8.3.5 Secondary Clarifier Capacity Assessment 8-8
8.4 Other Process Capacity Assessment 8-9

DRAFT

Table of Contents (cont'd)

8.4.1 Influent Pump Station 8-9
8.4.2 Grit Removal 8-10
8.4.3 Screening 8-11
8.4.4 UV Disinfection 8-12
8.4.5 Return Activated Sludge (RAS) Pumps 8-12
8.4.6 Waste Activated Sludge (WAS) Pumps 8-13
8.4.7 Thickening Process 8-13
8.4.8 Digesters 8-14
8.4.9 Digested Sludge Storage Process 8-15
8.5 Aeration Basin Alternative Analysis 8-16
8.6 WWTF Analysis Summary 8-17

Section 9: Operations and Maintenance 9-1

9.1 Introduction 9-1
9.2 Organizational Structures & Responsibilities 9-1
9.3 WWTF Section Responsibilities 9-2
9.4 Water/Wastewater System Responsibilities 9-2
9.5 System Operation & Control 9-3
9.6 Staffing Assessment 9-3
9.7 O&M Assessment Summary 9-3

Section 10: Capital Improvement Plan 10-1

10.1 Introduction 10-1
10.2 Project Prioritization 10-1
10.3 20-Year CIP 10-4

Section 11: Financial Analysis 11-1

List of Tables

Table ES1-1: NPDES Permit Requirements vi
Table ES1-2: Historical WWTF Influent Flow Summary vii
Table ES1-3: Summary of Influent Flows and Loads Design Criteria ix
Table ES1-4: Summary of Infiltration Analysis during Dry Weather Periods (2016-2024) xv
Table ES1-5: City of Ellensburg 20-Year CIP xx
Table 2-1: GSP Requirements per WAC 173-240-050 2-2
Table 2-2: NPDES Permit Requirements 2-5
Table 3-1: Ellensburg WWTF Service Area Population Projections 2022-2044 3-8

DRAFT

Table of Contents (cont'd)

Table 4-1: Historical WWTF Influent Flow Summary 4-3
Table 4-2: Ellensburg WWTF Influent Flow Peaking Factors 2016-2021 4-4
Table 4-3: Ellensburg WWTF Influent Load Summary 2016-2021 4-7
Table 4-4: Ellensburg WWTF Wastewater Load Peaking Factors 2016-2021 4-7
Table 4-5: TCF Discharge Limits (Permit No. ST0005507) 4-8
Table 4-6: IHB Discharge Limits (Permit No. ST00501278) 4-8
Table 4-7: IHB Discharge Data 2017 - 2021 4-9
Table 4-8: Ellensburg Population and WWTF AADWF Flow Projection 2022-2044 4-10
Table 4-9: Ellensburg WWTF Projected Influent Wastewater Flows 2022-2044 4-11
Table 4-10: Ellensburg WWTF Projected Influent Wastewater BOD_5 and TSS 4-11
Table 4-11: Ellensburg WWTF Projected Influent TKN Loads 2022-2044 4-12
Table 4-12: Ellensburg WWTF Existing NPDES Permit Influent Limitations 4-12
Table 4-13: Summary of Design Criteria 4-15
Table 5-1: Pump Station Information 5-1
Table 5-2: Collection System Pipe Inventory 5-6
Table 6-1: BRVA Workshop Agenda 6-1
Table 6-2: RVA Approach to Asset Evaluation 6-6
Table 6-3: Condition Rating and Scoring Criteria 6-8
Table 6-4: Consequence of Failure Scoring 6-10
Table 7-1: Collection System Hydraulic Model Inventory 7-2
Table 7-2: Sewer Base Flow per Land Use 7-6
Table 7-3: Summary of Infiltration Analysis during Dry Weather Periods (2016-2024) 7-24
Table 8-1: Secondary Effluent Quality Goal 8-3
Table 8-2: Operation Criteria for Secondary Process Capacity Assessment 8-5
Table 8-3: Operating Scenarios for Modeling and Desktop Calculations 8-6
Table 8-4: Summary of Aeration Tank Capacity Assessment 8-7
Table 8-5: Summary of Aeration Demand Assessment 8-8
Table 8-6: Summary of Secondary Clarifier Capacity Assessment 8-9
Table 8-7: IPS Capacity Assessment Results 8-10
Table 8-8: Grit Removal Capacity Assessment Results 8-10
Table 8-9: Screening Capacity Assessment Results 8-12
Table 8-10: UV Disinfection Capacity Assessment Results 8-12
Table 8-11: RAS Pump Capacity Assessment Results 8-13
Table 8-12: WAS Pump Capacity Assessment Results 8-13
Table 8-13: Thickening Process Capacity Assessment Results 8-14
Table 8-14: Digesters Capacity Assessment Results 8-15
Table 8-15: Digested Sludge Storage Assessment Results 8-16

DRAFT

Table of Contents (cont'd)

List of Figures

Figure ES1-1: City of Ellensburg Sewer Service Area Map ii
Figure ES1-2: City of Ellensburg Zoning and Land Use Map (*2021 Comprehensive Plan*) iv
Figure ES1-3: WWTF Process Flow Diagram xi
Figure ES1-4: System Level Total Risk Score xiii
Figure ES1-5:Flow Metering Plan xiv
Figure 3-1: City of Ellensburg Sewer Service Area Map 3-2
Figure 3-2: City of Ellensburg Zoning and Land Use Map 3-4
Figure 3-3: City of Ellensburg Topographic Map 3-5
Figure 3-4: City Growth Plan 3-9
Figure 4-1: Ellensburg WWTF Influent Flow 2016 - 2022 4-2
Figure 4-2: Ellensburg WWTF Influent BOD_5 Load 2016 - 2022 4-5
Figure 4-3: Ellensburg WWTF Influent TSS Load 2016 – 2022 4-6
Figure 4-4: Projected Influent AAF and MMF 4-13
Figure 4-5: Projected Influent MDF and PIF 4-13
Figure 4-6: Projected Influent BOD_5 Load 4-14
Figure 4-7: Projected Influent TSS Load 4-14
Figure 5-1: Overall Existing Sewer System 5-2
Figure 5-2: Pipe Diameters 5-2
Figure 5-3: Pipe Material 5-3
Figure 5-4: WWTF Process Flow Diagram 5-8
Figure 6-1: City Risk Matrix and Scoring 6-3
Figure 6-2: Example of Relative Risk Score and Profile 6-4
Figure 6-3: Asset Criticality Heat Map 6-12
Figure 6-4: Risk Criticality Score Adjustment Comparison 6-19
Figure 6-5: Asset Criticality Heat Map - Adjustment 6-20
Figure 7-1: Hydraulic Model Overview 7-3
Figure 7-2: 2023-2024 Water System Demands 7-5
Figure 7-3: Existing Sewer Inflow Allocation 7-7
Figure 7-4: Flow Metering Plan 7-9
Figure 7-5: Dry Weather d/D and Pump Station Flow Rates 7-11
Figure 7-6: Wet Weather d/D and Pump Station Flow Rates 7-13
Figure 7-7: Existing Pipe Velocity Analysis 7-15
Figure 7-8: Future d/D Dry Weather Flow 7-17
Figure 7-9: Future d/D Wet Weather Flow 7-19
Figure 7-10: Future Pipe Velocity Analysis 7-21
Figure 7-11: Influent Flow and 30-day Running Average (2016-2024) 7-23
Figure 8-1: BioWin Simulator Layout for Ellensburg WWTF 8-3
Figure 9-1: City of Ellensburg Organizational Structure 9-2
Figure 10-1: City of Ellensburg System Risk Evaluation & Associated CIPs 10-3
Figure 10-2: 20-Year CIP (2025-2034) (Unescalated $) 10-7
Figure 10-3: 20-Year CIP (2035-2044) (Unescalated $) 10-8

DRAFT

Table of Contents (cont'd)

List of Appendices

Appendix A SEPA Checklist
Appendix B NPDES Permit
Appendix C City of Ellensburg WWTF Aeration Basin Study
Appendix D WWTF Flows and Loads Report, 2023
Appendix E WWTF Modeling Results
Appendix F Ellensburg Secondary Process Capacity Assessment and Hydraulic Analysis Results Presentation, March 2023
Appendix G Aeration Basin Alternatives Analysis
Appendix H CIP Project Site Layouts

DRAFT

Section 1: Executive Summary

1.1 Introduction

This General Sewer Plan (GSP) for the City of Ellensburg, Washington (City) identifies improvements required for both the City's wastewater collection system and wastewater treatment facility (WWTF) to increase its reliability, efficiency, and capacity. The GSP considers projections for a 20-year period prioritizing improvement projects based upon growth projections, regulatory requirements, project costs, and risk reduction.

1.2 Planning Area Characteristics

The City is responsible for the infrastructure and operations and maintenance of wastewater collection and treatment within the City's boundaries and the adjacent Urban Growth Areas (UGA). The service area information is based upon the City's 2021 Comprehensive Plan as well as data from the Washington State Office of Financial Management. The City encompasses approximately 7.6 square miles within its limits and an additional 7.1 square miles within its UGA. Sewer service is confined to within both areas. Figure ES1-1 shows the City limits and UGA.

DRAFT

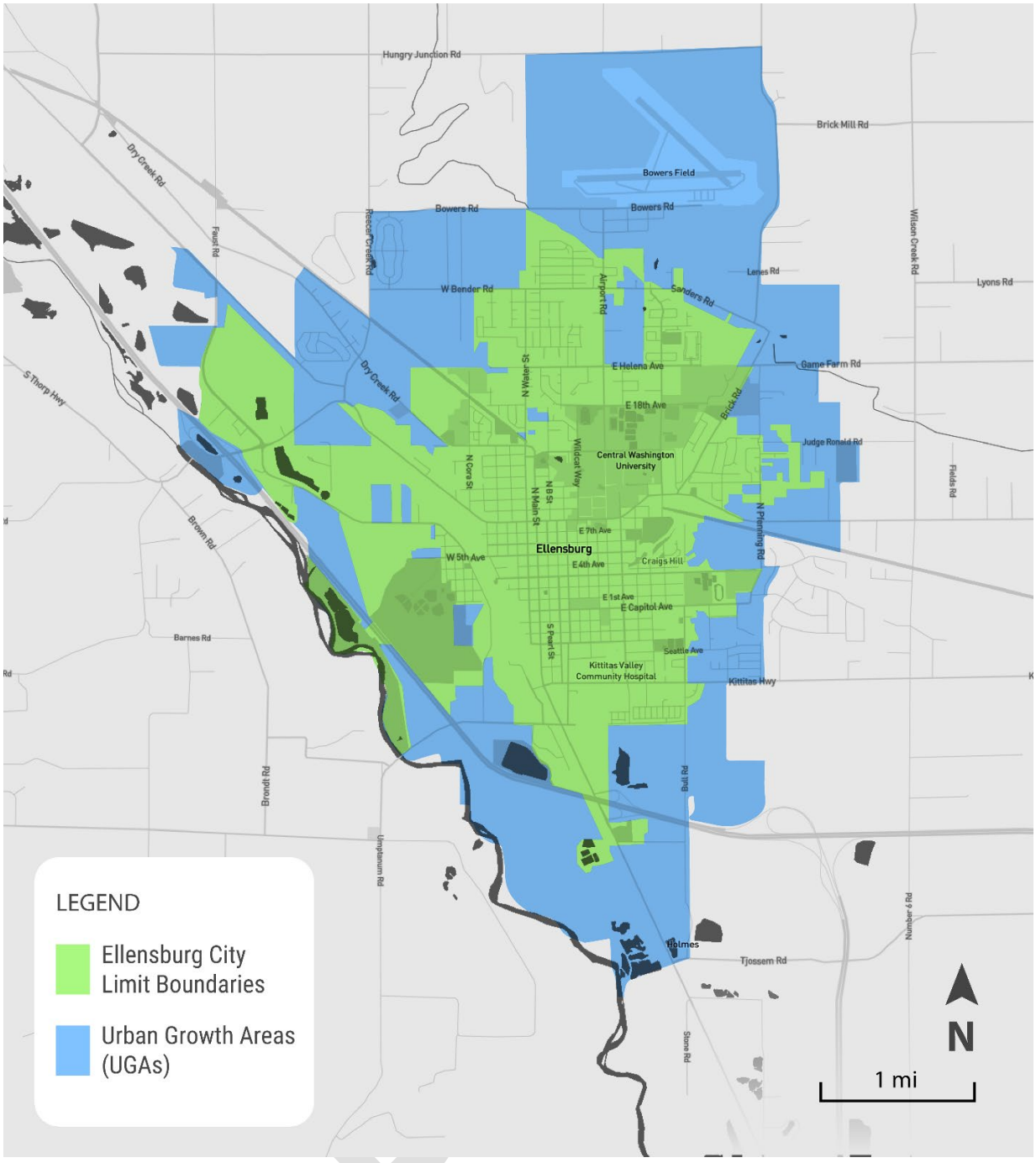


Figure ES1-1: City of Ellensburg Sewer Service Area Map

As per City officials, the total combined extents of the existing City limits and the UGA are not anticipated to increase during the planning period (2022-2044). Changes to the City limits are anticipated to be limited to incorporation of existing UGA.

The City's 2021 Comprehensive Plan and the City's 2021 Housing Action Plan provide information on the existing and proposed land use within the sewer service area boundaries and corresponding planning area as shown on Figure ES1-2. The City's zoning code includes five residential districts, a manufactured home district, and three commercial districts that allow for multifamily development. The City has indicated that there were 11 developments in or starting construction as of 2022. The current annual housing production rate is 107 units/year and the City needs an average annual projection of 281 units to meet 2037 populations targets.

DRAFT

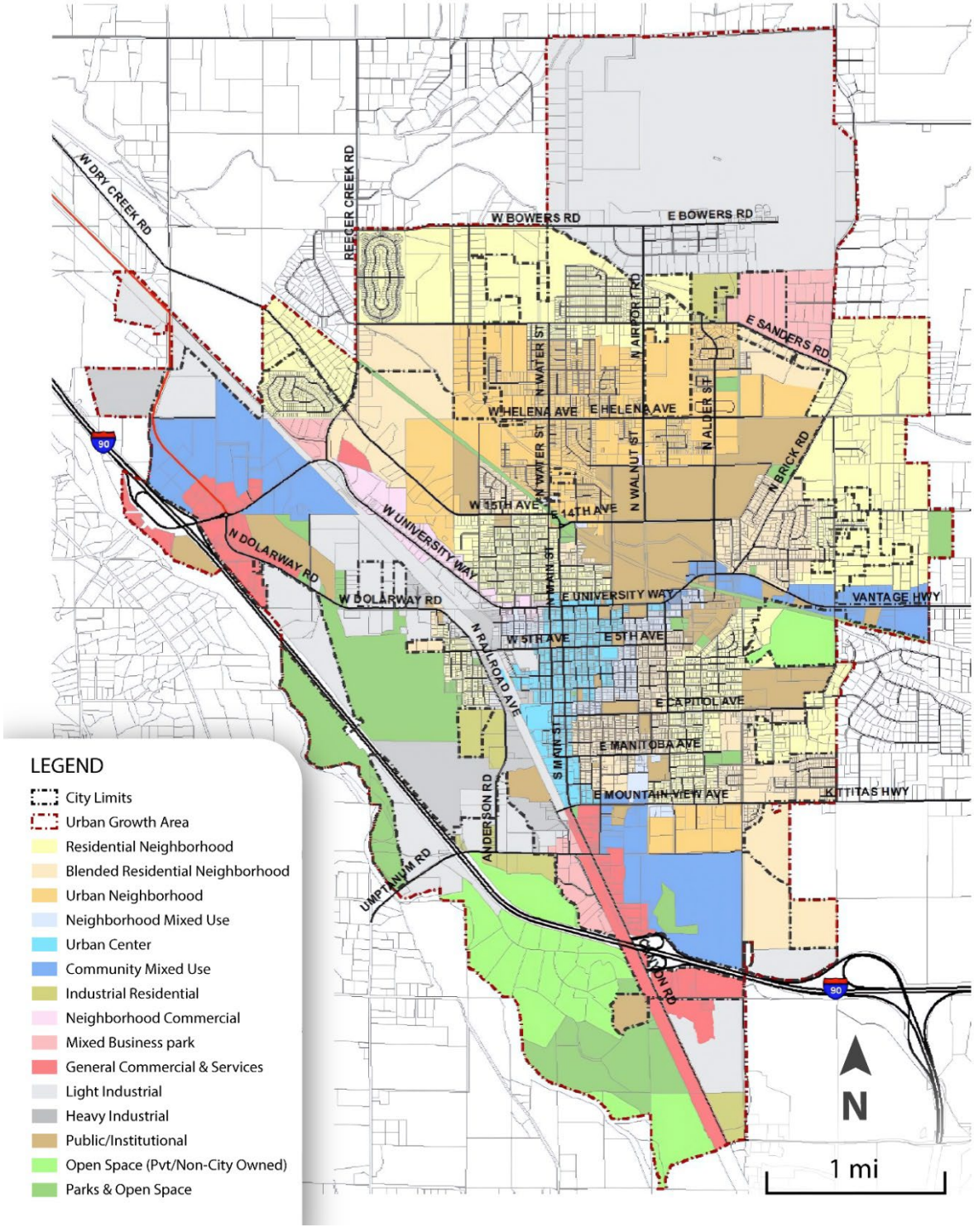


Figure ES1-2: City of Ellensburg Zoning and Land Use Map (*2021 Comprehensive Plan*)

According to the City's 2021 Housing Needs Assessment, the estimated population within the UGAs was 22,879 people, which grew approximately 14% from the 20,786 population in 2015. This represents an average growth rate of 1.9%. The City additionally has about 500 non-residential wastewater customer connections, including two industrial connections. Central Washington University (CWU) is a major economic, social, and cultural influence for the City. According to the 2021 Housing Needs Assessment, 50% of the population falls between the ages of 15 and 30, which reflects the large student population at CWU. The WWTF serves CWU's nearly 10,000 students. As per CWU's 2019-2029 Capital Master Plan, CWU anticipates increasing the campus student population to 12,000 in the next few years. As of the fall of 2022, CWU had a student body population of 10,327 of which 2,800 live on campus with the remainder living predominantly in the City or UGA. While the students themselves are not considered City residents, their off-campus residences are connected sewer customers. Likewise, the on-campus students and the rest of the CWU campus is considered a commercial connection to the WWTF. There is no single point of connection between CWU and the City and therefore their flows are not metered but rather calculated based upon potable water consumption.

1.2.1 Regulatory Requirements

General Sewer Plans are held to all federal, state, and local regulations. Key federal regulations include the Federal Water Pollution Control Act of 1972 (PL 92-500), as amended by the Clean Water Act of 1977 (PL 95-217) and the Water Quality Act of 1987 (PL-100-4), commonly referred to as the Clean Water Act (CWA), are the federal requirements over wastewater collection, treatment, and disposal. In the State of Washington, the Washington Department of Ecology (DOE, Ecology) has primacy from the EPA to administer and enforce the CWA. Federal regulations for biosolids treatment and disposal are outlined in Title 40 Part 503 of the Code of Federal Regulations (CFR). The EPA's Part 503 regulations classify biosolids as Class A or Class B based on pathogen density achieved through treatment. The City of Ellensburg classifies its biosolids as Class B. Class B biosolids are produced using a Process to Significantly Reduce Pathogens (PSRP), including aerobic/anaerobic digestion, composting, lime stabilization, and drying. Restrictions apply to food crop harvesting, animal grazing, and public access to land treated with Class B biosolids.

The governing Washington State laws for the planning and designing of wastewater facilities are the Revised Code of Washington (RCW) 90.48.110. Washington Administrative Code (WAC) Section 173-240 implements the "plans and specifications" from RCW 90.48.110 and includes the requirements for engineering reports, plans and specifications, and general sewer plans. WAC Section 173-240 includes the following:

Planning requirements and review procedures

- Plan contents
- Requirements for engineering reports for specific projects, ownership, and operation and maintenance
- Public notification procedures for construction of wastewater facilities.

DRAFT

The WWTF additionally operates under the National Pollutant Discharge Elimination System (NPDES) permit WA0024341. The wastewater discharge permit was issued on November 9, 2018, and was due for renewal December 31, 2023. Under the current permit, the WWTF is allowed a maximum month design flow (MMDF) of 8 million gallons per day (MGD) for flows or waste loads. Table ES1-1 provides a summary of the requirements under the current NPDES permit. The Washington Department of Ecology (Ecology) is the state regulatory authority for the NPDES permit program and thus regulates the City's permit. Copies of the NPDES permit and fact sheet are included in Appendix B.

Table ES1-1: NPDES Permit Requirements

Design Criteria	Units*	Design Quantity	
Maximum Month Flow	mgd	8	
Maximum Month Influent BOD_5 Loading	lbs/day	10,000	
Maximum Month Influent TSS Loading	lbs/day	8,000	
Parameter		**Effluent Limitations**	
		Average Monthly	**Average Weekly**
BOD_5	lbs/day	1,500	2,250
	mg/L	30	45
TSS	lbs/day	1,200	1,800
	mg/L	30	45
Fecal Coliform	# colonies /100 mL	100	400
Total Ammonia (as NH3-N)	mg/L	NA	8.2
pH		Between 6.0 and 9.0	

Notes:
mgd – million gallons per day
lbs/day – pounds per day
mg/L – milligrams per liter
mL – milliliter

1.3 Historical and Projected Flows and Loads

1.3.1 Historical Flow and Loads

Discharge Monitoring Reports (DMRs) from January 2016 to June 2022 were collected for this GSP. Flows, loads and associated peaking factors are summarized in the table below:

DRAFT

Table ES1-2: Historical WWTF Influent Flow Summary

Parameter	2016	2017	2018	2019	2020	2021	Average /Design
Flows							
Annual Average Dry Weather Flow[(1)] (AADWF), MGD	2.31	2.07	1.96	2.29	2.02	2.03	2.11
Annual Average Flow (AAF), MGD	3.84	3.54	3.01	2.84	2.87	2.77	3.14
Maximum Month Flow[(2)] (MMF), MGD	6.45	6.28	5.30	4.09	4.89	5.46	5.41
Maximum Day Flow (MDF), MGD	8.76	9.06	7.34	4.66	5.58	6.89	7.05
Peak Hour Flow[(3)] (PIF), MGD	12.9[(3)]	12.9[(3)]	NA	NA	NA	NA	NA
Annual Rainfall[(4)], inches	12.23	11.83	6.85	8.65	5.80	5.80	NA
Peaking Factors							
AAF/AADWF	1.66	1.71	1.54	1.24	1.42	1.37	1.49
MMF/AAF	1.68	1.78	1.76	1.44	1.71	1.97	1.97
MDF/AAF	2.28	2.56	2.44	1.64	1.95	2.48	2.23
PIF/AAF	3.36	3.65	NA	NA	NA	NA	3.50
Influent Loads							
BOD_5 Loads							
Average Annual (AA) BOD_5 Load, lbs/day	3,929	3,975	3,783	3,942	3,844	3,534	
Maximum Month BOD_5 Load, lbs/day	5,189	5,214	4,738	5,020	4,825	4,152	
MD BOD_5 Load, lbs/day	6,072	6,873	5,721	6,507	7,303	5,101	
BOD_5 Peaking Factors							
MML/AAL	1.32	1.31	1.25	1.27	1.25	1.17	1.32
MDL/AAL	1.55	1.73	1.51	1.65	1.90	1.44	1.63
AA BOD_5 Load per Capita, lbs/day/c	0.20	0.20	0.18	0.19	0.18	0.17	
TSS Loads							
AA TSS Load, lbs/day	3,367	3,281	2,983	3,259	3,153	2,883	
MM TSS Load, lbs/day	4,472	4,506	3,934	4,101	3,743	3,999	
MD TSS Load, lbs/day	7,234	8,091	5,585	6,602	6,487	7,229	
TSS Peaking Factors							
MML/AAL	1.33	1.37	1.32	1.26	1.19	1.39	1.39
MDL/AAL	2.15	2.47	1.87	2.03	2.06	2.51	2.18
AA TSS Load per Capita, lbs/day/c	0.17	0.16	0.15	0.16	0.15	0.14	

Notes:

(1) Minimum 30-day running average flow reported for the year
(2) Maximum 30-day running average flow reported for the year
(3) Highest peak hour flow rate in 2016 and 2017 reported in the *2018 WWTF Aeration Basin Study* (2018 Aeration Basin Study) by Gray & Osborne, Inc. No peak hour flow rate was recorded after 2017.
(4) Rainfall data provided for Yakima airport station in Washington from National Oceanic Atmospheric Administration's Climate Data Online

The study period included both above and below average rainfall as well as pre-COVID 19 pandemic (2016-2019) years. The reports highlighted the annual average dry weather flow (AADWF), annual average flow (AAF), and maximum month flow (MMF) for each year. Key findings revealed the AAF reached its peak in 2016-2017 and remained consistent thereafter. The City experienced above-average rainfall during 2016-2017, while the years from 2018-2021 saw below-average rainfall. The MMF also peaked in 2016-2017 and subsequently decreased. The high AAF and MMF were closely linked to the substantial rainfall observed in 2016 and

2017. Discussions with the City revealed the inflow and infiltration (I/I) significantly influenced the WWTF influent flows during wet weather and spring snowmelt.

The study also involved calculating flow peaking factors using various ratios, with the average of these factors used for the design flow. The highest peaking factor among the six flow conditions considered was selected for determining the design MMF, which represents the most critical flow for secondary treatment capacity. Additionally, two flow peaking factors were used to estimate the design Peak Instantaneous Flow (PIF), with the average of the historical peak hours flow (PIF)/AAF factors which were used to project the PIF corresponding to the 2022 AAF. An additional peaking factor based on Ecology's Criteria for Sewage Works (Orange Book) was applied to estimate the PIF for the projected increase in AAF beyond 2022.

Influent data for biochemical oxygen demand (BOD_5) loads, total suspended solids (TSS) loads, daily influent loads with a running 30-day average, annual average loads (AAL), and maximum month load (MML) were estimated for each year at the WWTF. Analyzing these trends showed that the annual average BOD_5 and TSS loads remained relatively constant over the past six years. Additionally, the average monthly BOD_5 and TSS loads tended to be low during the middle of the summer months, possibly due to reduced residential student presence.

Historical average annual BOD_5 and TSS generation rated ranged from 0.17 to 0.20 pounds per day per capita (LBS/DAY/C) for BOD_5 and 0.14 to 0.17 LBS/DAY/C for TSS. The highest generation rates were used to project the average annual BOD_5 and TSS loads. This historical maximum load peaking factor was chosen as the design peaking factor to determine the design MML, which is the critical load condition that the secondary process must treat to meet the required water quality standards.

The flow and load from two industrial dischargers, Twin City Foods (TCF) and Iron Horse Brewery (IHB) were analyzed separately and are not correlated to the City's population. TCF is a local frozen vegetable packing facility that was established in 1965 and is one of the largest businesses in the area. The facility is mainly operated from May through October and the activities for the remainder of the year are reduced. Per State Waste Discharge (SWD) Permit No. ST0005507 (see Appendix B), TCF typically discharges its wastewater to the City's collection system November through April of each year when it produces minimal wastewater. The permit lists local limits for total BOD_5, TSS, chlorine, flow and pH and TCF must pay a surcharge above the local limits. For the remainder of the year, TCF discharges to spray fields.

IHB is another local industrial user that discharges wastewater from brewing activities to the City's collection system year-round. The wastewater collected at IHB is pretreated for pH neutralization before discharging to the collection system. The discharge limits for flow, BOD_5, TSS and pH are established in the contract between the City and IHB executed on 1 November 2019 based on SWD Permit No. ST0501278.

Historical DMR data was obtained from 2017 to 2021 for these dischargers. TCF effluent contains less BOD_5 and TSS loads as compared to those in the IHB effluent although its flow was high. The combined flows and loads from the two industries were relatively constant. By separating out TCF and IHB, the population projections will only be applied to the appropriate portions of the WWTF influent. The average of the combined flows and waste loads from 5 years were added in the projection of AAFs and AALs as described later.

1.3.2 Projected Flow and Loads

The City is forecasted to grow both residentially and commercially at 2.0% annually for the 2024-2044 planning period. With consideration to anticipated flows from the City's two significant industrial users, TCF and IHB, and by incorporating peaking factors based upon daily WWTF influent flow data from 2016 to 2021 the flows and loads to the WWTF can be forecasted for 2044. As per Table ES1-3, the MMF for 2044 is greater than the current plant permitted influent flow of 8.0 MGD. Likewise, the BOD_5 and TSS, are forecasted to be just below current permitted values of 10,000 lbs/day and 8,000 lbs/day respectively.

The projected influent conditions were compared with the influent conditions allowed in the current permit and the design criteria were selected using the greater value of the two conditions. If projected influent conditions exceed the current permit, the rating of the WWTF will be impacted. The design criteria are summarized in Table ES1-3 and will be used the basis of both the GSP effort.

Table ES1-3: Summary of Influent Flows and Loads Design Criteria

Parameter	Design Criteria
Average Annual Flow, MGD	5.1
Maximum Month Flow, MGD	10.1
Maximum Day Flow, MGD	11.5
Peak Instantaneous Flow, MGD	16.1
Average Annual BOD_5 Load, LBS/DAY	7,600(1)
Maximum Month BOD_5 Load, LBS/DAY	10,000
Maximum Day BOD_5 Load, LBS/DAY	12,300(1)
Average Annual TSS Load, LBS/DAY	5,800(1)
Maximum Month TSS Load, LBS/DAY	8,000
Average Annual TKN Load, LBS/DAY	1,400(2)
Maximum Month TKN Load, LBS/DAY	1,900(2)
Maximum Day TKN Load, LBS/DAY	2,300(2)

Notes:

(1) The conditions are derived from the design peaking factors based on the maximum month loads.

(2) The TKN to BOD_5 ratio of 0.19 applied to BOD_5 Load.

1.4 Existing Wastewater Facilities

The collection system consists of approximately 77 miles of sanitary sewer pipe and one active pump station. The sanitary sewer pipe material within the City consists of vitrified clay, asbestos cement, concrete pipe, and PVC. Approximately 12 blocks of sewer service have combined sewers. The Cora Street PS is the only active pump station, consisting of a concrete wet well with two submersible pumps. The First Avenue PS is currently offline and will no longer be used by the City; it is not addressed as part of this plan. Two additional pump stations are planned for future operation: the Foster Lift Station, which is under construction and expected to be operational soon, and the Mallard Meadows Lift Station, which has not yet been constructed. There are also several privately owned and operated sewage pump stations.

The WWTF is located west of Interstate 90 adjacent to the Yakima River and Wilson Creek in the southern portion of the City limits near Canyon Road and Berry Road. From the 1930s to

1970s, the City had an established collection system and WWTF. At this time, the City provided primary treatment discharged into Wilson Creek. In 1974, the primary treatment facility was largely decommissioned, and a newly constructed secondary treatment facility was created. This is the existing WWTF which discharges into the Yakima River. Prior to 1997, the primary treatment plant continued to serve as an overflow in the event of a major storm that exceeded the secondary facility's capacity. In 2001, the City isolated the primary treatment facility from the sanitary sewer system, and it is no longer used for overflows; there are no sanitary sewer discharges into the Wilson Creek outfall.

Most of the collection system installed in the 1930 comprised of vitrified clay pipe. From 1960 to 1980, the City transitioned to asbestos cement pipe and since the 1980s, PVC pipe has been used. Over the years the City has worked to separate the sanitary sewer from the storm water collection system but there are still several areas of combined sewer.

At the WWTF (Figure ES1-3), wastewater undergoes primary clarification through grit removal and fines screening followed by aeration and then secondary clarification where liquids are sent through the UV system and then to the Yakima River for discharge. Remaining sludge is then sent through RAS and WAS, GBT and DAFT sludge thickening, and through primary and secondary digester before heading to the sludge lagoon and finally the sludge drying building.

DRAFT

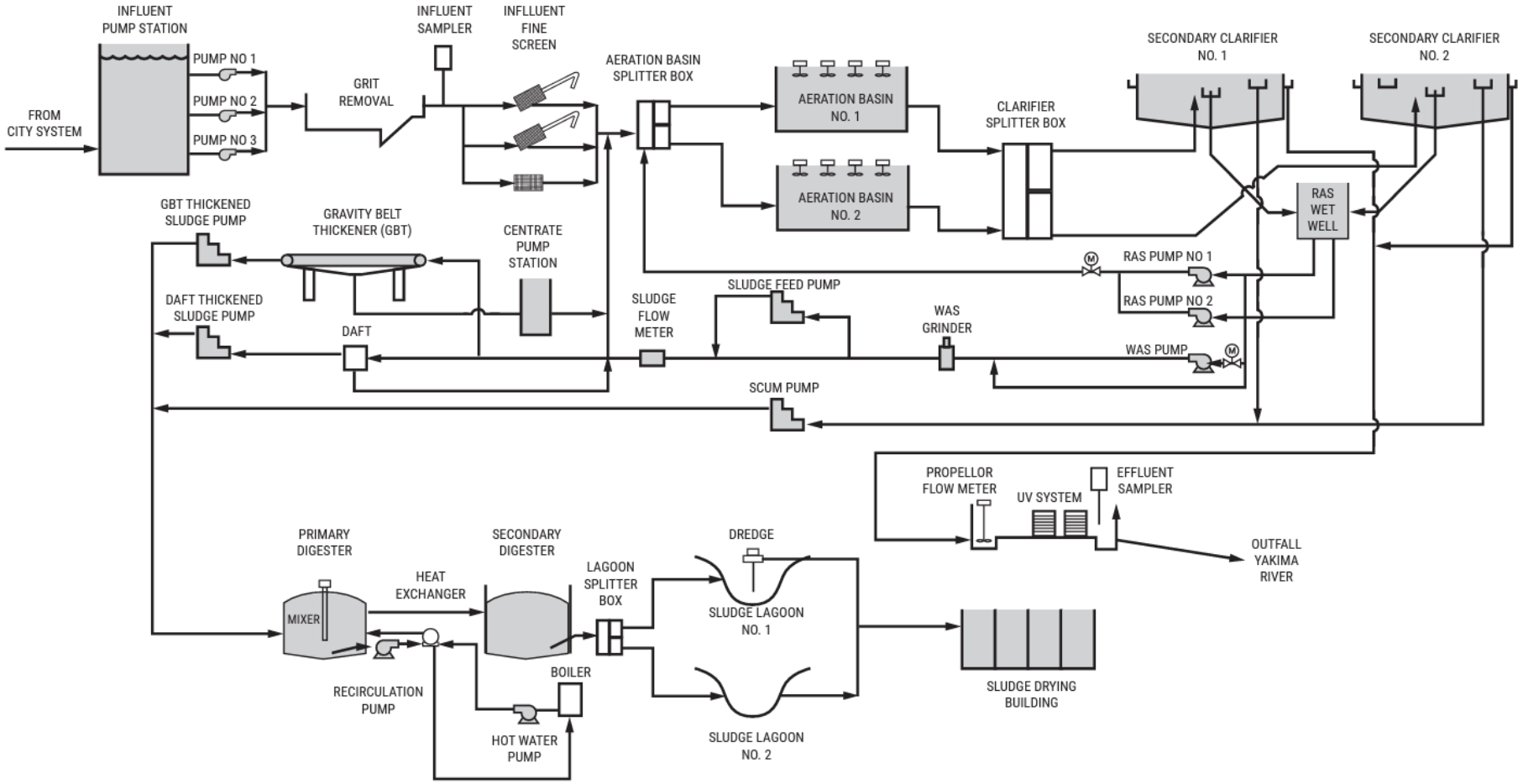


Figure ES1-3: WWTF Process Flow Diagram

1.5 Business Risk and Vulnerability Assessment

The GSP preparation kicked off with a four-day Business Risk and Vulnerability Assessment (BRVA) workshop series where City staff gathered to discuss the various systems, operational risks, potential modes of failure, and opportunities for improvement. City staff from operations and maintenance (O&M), engineering, and management were included in these conversations. This holistic gathering of City stakeholders ensured a comprehensive analysis of the City's risks by discussing potential failures and their impact on the City's business plan. The BRVA is designed to baseline unit process and system performance, vulnerabilities, and failure modes based on input from stakeholders. Institutional knowledge is collected from City staff along with record data to review performance objectives and identify known functional failures and risks of selected unit processes or systems.

Assets were allocated into major and minor asset categories. The 9 major system unit processes are outlined below:

- Headworks
- Aeration Basins
- Primary Clarification
- Secondary Clarifiers
- UV Disinfection
- RAS System
- Gravity Belt Thickener
- Anaerobic Digester
- Sludge Lagoons and Drying Beds

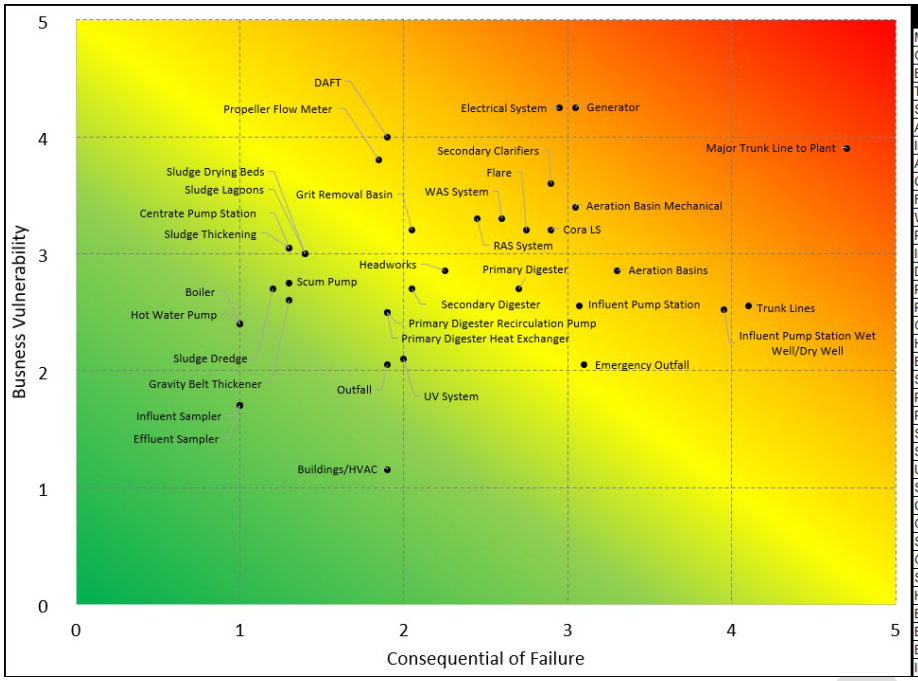
Organizing the City's wastewater assets into these unit processes was done based on a review of existing flow diagrams and schematics.

The BRVA outcomes prioritize needs using a relative risk score and profile to direct attention to the most critical systems. Unit processes are prioritized based on consequential ranks, asset vulnerabilities, organizational vulnerabilities, and opportunities for improvement.

1.5.1 BRVA Findings

The intent of the BRVA is to identify the most vulnerable unit processes that might impact the ultimate performance of the City's facilities and systems; systems that might put the City at risk regarding safety, public regulation, service, public image, and economic categories. Figure 6 depicts the risk ranks for all 36 assets within the 9 major systems evaluated during the BRVA, highlighting those assets identified with the highest risk. The BRVA findings do not always necessitate the need for Capital Improvement Projects, sometimes projects identified can be resolved through maintenance efforts. It is important during this phase to identify high impact performance needs and focus on resolutions to those at the conclusion of all the evaluations.

DRAFT



Unit Process	Risk Score
Major Trunk Line to Plant	18.33
Generator	12.96
Electrical System	12.54
Trunk Lines	10.46
Secondary Clarifiers	10.44
Aeration Basin Mechanical	10.37
Influent Pump Station Wet Well/Dry Well	9.97
Aeration Basins	9.41
Cora LS	9.28
Flare	8.80
WAS System	8.58
RAS System	8.09
Influent Pump Station	7.82
DAFT	7.60
Primary Digester	7.29
Propeller Flow Meter	7.03
Grit Removal Basin	6.56
Headworks	6.41
Emergency Outfall	6.36
Secondary Digester	5.54
Primary Digester Heat Exchanger	4.75
Primary Digester Recirculation Pump	4.75
Sludge Lagoons	4.20
Sludge Drying Beds	4.20
UV System	4.20
Sludge Thickening	3.97
Centrate Pump Station	3.97
Outfall	3.90
Scum Pump	3.58
Gravity Belt Thickener	3.38
Sludge Dredge	3.24
Hot Water Pump	2.40
Boiler	2.40
Buildings/HVAC	2.19
Effluent Sampler	1.70
Influent Sampler	1.70

Figure ES1-4: System Level Total Risk Score

1.6 Wastewater Collection System Analysis

A working model of the wastewater collection system was updated using available data, historical plans, and BRVA workshop results, identifying capacity-deficient areas during storm events. The system largely comprises 1930s vitrified clay pipes, 1960-1980 asbestos cement or concrete pipes, and post-1980 PVC pipes. The City is working to separate combined sewer systems in approximately 12 downtown blocks.

After inventorying the City's sewer system, including manhole locations, invert elevations, pipe diameters, slopes, material, age, and BRVA workshop results, it was determined that attribute data was insufficient for a comprehensive working hydraulic model. During the course of this plan, the City O&M teams were able to continue filling in data gaps that enabled Kennedy Jenks to generate a hydraulic trunk model for high level decision-making and system planning. This trunk model is a skeletal model which is less detailed than a full pipe model but includes all pipes with diameters greater than or equal to 18-inches. Sewer demands throughout the entire collection system were allocated to the nearest manhole along the trunk to ensure the modeled inflow would reflect actual customer usage patterns, providing a realistic and spatially accurate representation of how wastewater enters the collection system. The system does not contain flow metering devices at this time, so water billing data and historical influent data from the WWTF was considered. To better calibrate a model, the City would need to capture flow monitoring data for improved accuracy and effectiveness. A Flow Metering Plan was developed for the City to strategically place flow meters in each subbasin to accurately gauge system flows and capacity limitations.

Figure ES1-5 outlines recommended locations for flow meter placement.

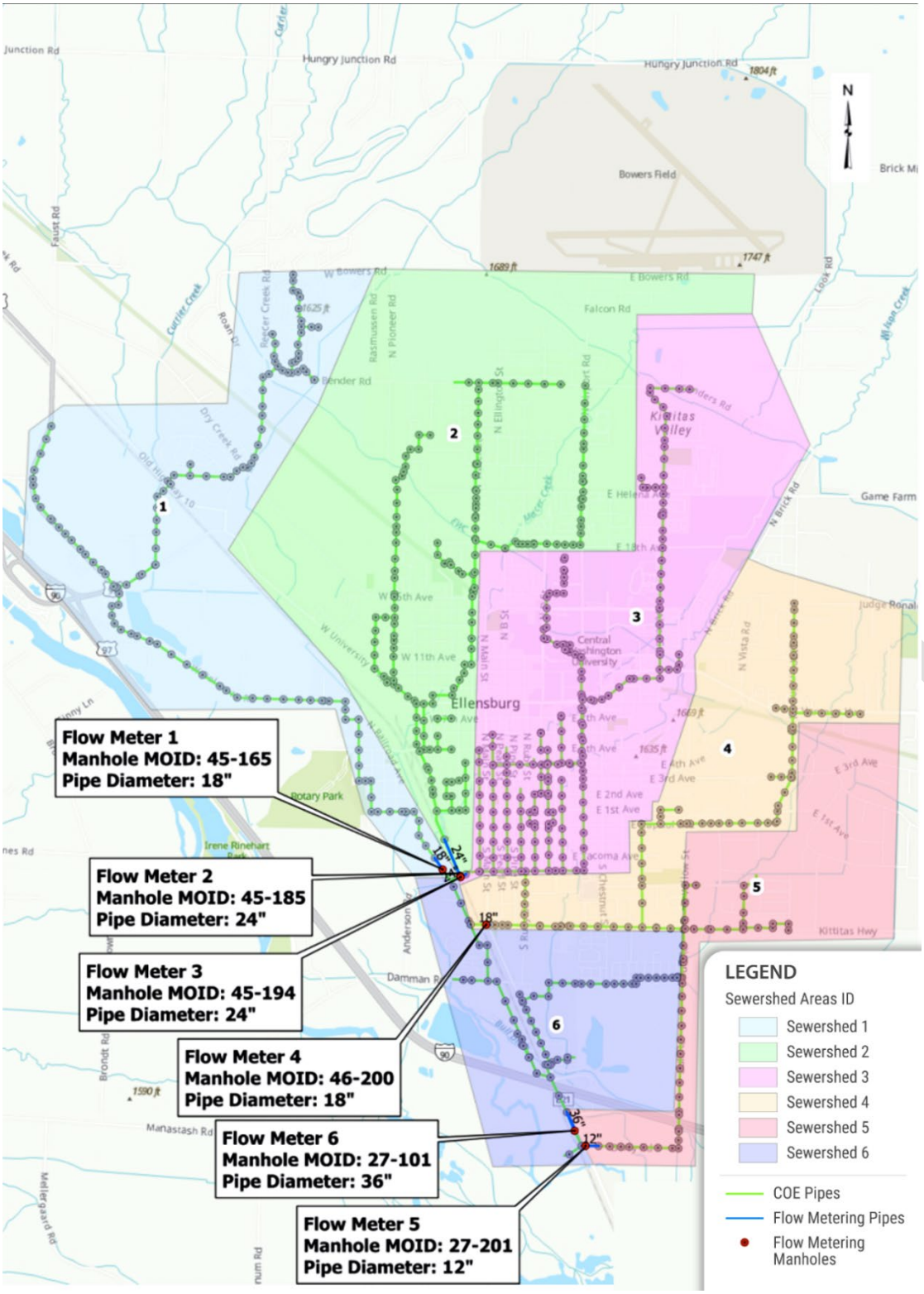


Figure ES1-5:Flow Metering Plan

Using the available data, a hydraulic model was developed in AquaTwin Sewer v15.0. Water billing records from 2023-2023 were used to estimate sewer generation by customer type. The data were adjusted to match influent flow records from the WWTF between 2016 and 2024. The resulting average dry-weather flow is 2.11 MGD. A peaking factor of 3.35 was applied to represent wet-weather conditions.

Future flows were estimated based on a 2% annual growth rate through 2044, resulting in a projected ADWF of 3.45 MGD and a peak wet weather flow (PWWF) of 11.5 MGD.

Model simulations indicate that the collection system has adequate capacity under both existing and future conditions. No pipe segments exceed the 60% depth-to-diameter (d/D) criterion for dry-weather flow or the 80% criterion for wet-weather flow. One 18-inch pipe segment along East Manitoba Avenue approaches the upper threshold and should be reviewed in future planning. Several upstream pipes along North Wenas Street show velocities below 2 feet per second (ft/s) during dry weather, suggesting a need for periodic cleaning. All modeled velocities meet or exceed 2 ft/s under future flows.

1.6.1 Inflow and Infiltration Analysis

An inflow and infiltration (I/I) evaluation was completed using influent flow and rainfall data from 2016–2024. Infiltration rates were compared with U.S. EPA criteria of 120 gallons per capita per day (gpcd) for dry-weather periods and 275 gpcd for wet-weather events.

Table ES1-4: Summary of Infiltration Analysis during Dry Weather Periods (2016-2024)

Year	Population	Sewer Service Population	Maximum Daily flow (MGD)	Maximum Daily flow (gpd)	Per Capita Flow (gpcd)	Month
2016	19,310	20,115	3.53	3,530,000	175	August
2017	19,550	20,355	3.33	3,330,000	164	June
2018	19,660	20,465	3.52	3,520,000	172	July
2019	19,960	20,765	3.15	3,150,000	152	June
2020	20,797	21,602	3.21	3,210,000	149	July
2021	19,530	20,335	3.52	3,520,000	173	July
2022	20,940	21,761	3.36	3,360,000	154	August
2023*	21,359	22,100	3.26	3,260,000	148	August
2024*	21,786	22,138	3.53	3,530,000	159	July

*Based on Census population

The analysis shows that infiltration exceeds the EPA threshold each year, indicating that groundwater is entering through aging clay and concrete pipes. Inflow remains below the threshold, suggesting it is not a significant concern. The City will continue its cured-in-place pipe (CIPP) rehabilitation program and perform closed circuit television (CCTV) inspections and smoke testing to locate and repair infiltration sources.

DRAFT

1.6.2 Pump Station Assessment

The City operates one active pump station (PS), located on Cora Street, which is approximately 40 years old and have had minimal upgrades since their installation. The Cora Street PS is a steel wet well with two submersible centrifugal pumps. Two additional pump stations are planned for future service: the Foster Lift Station, which is currently under construction and expected to be operational soon, and the Mallard Meadows Lift Station, which has not yet been constructed. The City used to have a second PS, at First Avenue, but it is currently offline and will no longer be used by the City.

A field investigation of the Cora Street PS was conducted to visually evaluate the condition of the wet well and controls. A draw-down test was also completed to monitor the efficiency of each pump. The PS assessment showed advanced wear and corrosion within the Cora Street PS and the draw down tests showed that the pumps were working under their efficiency; each 650 gpm pump only sustained an output of 290 gpm and 317 gpm, respectively. In addition to pump efficiency, the configuration within the station has a notable ragging issue where an 8-inch pipe cuts down to two 4-inch pipes upstream of the wet well. There is also no telemetry at the station and simply a beacon that has no backup power.

1.6.3 Collection System Considerations

While the current wastewater facilities generally have sufficient capacity to accommodate existing and future flows, some considerations for the collection system are listed below:

- 18-inch pipe segment along East Manitoba Avenue is approaching its upper threshold, indicating a moderate level of risk and potential need for further evaluation during detailed design or future planning.
- Multiple pipe segments, particularly within the norther portion of the system and along N Wenas Street, may require enhanced cleaning and maintenance practices due to being modeled with velocities below the 2-fps threshold under existing dry weather flow.
- Future dry and wet weather flows are expected to maintain sufficient velocities throughout the gravity system since no pipe segments are modeled with velocities below the 2-fps threshold under future flows.
- Installation of flow meters to effectively inventory the system and generate a productive system model for further analysis.
- The City needs to prioritize an I/I investigation to perform repair and replacement of collection system piping affected by excessive infiltration. This would include video inspection and smoke testing of the collection system.
- If retained, the City would have to consider replacement as part of the 20-year CIP, however they are currently moving forward with the efforts to install the previously proposed gravity sewer.

DRAFT

- The full condition of aging pipes within the collection system, especially VCP and concrete pipes that were installed starting in the 1930s, is not fully known. While some pipe segments can be repaired, it may be necessary for the City to replace much of these lines as they reach the end of their service lives to minimize I/I and other maintenance issues. To address this aging infrastructure, approximately 10,000 feet of sewer pipe per year may need to be replaced. Instituting a repair and replacement (R&R) funding program would facilitate this effort, as well as other I/I issues, utilizing video inspection tools for condition assessment, or addressing potential capacity constraints using hydraulic modeling.

1.7 Wastewater Treatment Facility Analysis

1.7.1 Process Model

Desktop calculations were used to estimate the process capacity of solids stream and BioWin was used for the liquid stream for the existing facility and identify potential treatment bottlenecks in the projected 2044 design flow and loading conditions. Currently, the WWTF meets the permitted effluent TSS and BOD_5 concentration limits (30 mg/L and 30 mg/L as the monthly average, respectively) and the present removal requirements (85% removal). However, based on the flow projection, the MMF is expected to exceed the permitted limit in about 10 years, while the PIF is projected to surpass the limit roughly 15 years from now, later in the planning period.

Design conditions in 2044 were estimated based on applying the OFM 20-year growth management population projections, which forecasts a 2% growth rate for the sewer service area. The sewer service area includes both the City limits and the UGA. Projected maximum monthly (MM) BOD_5 loads and the MM TSS loads approach the permitted limit, but do not exceed; MM BOD_5 load being 9,100 pounds per day (lbs/day) of a permitted 10,000 lbs/day limit, and a MM TSS load of 7,800 lbs/day of a permitted 8,000 lbs/day limit as seen in Table 4-12.

A hydraulic model of the facility was created to check whether all design flows can flow by gravity without causing overflow or cause a weir to be submerged in any part of the WWTF. The approach for the hydraulic model analysis measured the following:

- Current PIF
- Design Maximum Daily Flow (MDF) and PIF
- Assumed 100-year flood water level of the Yakima River

This identified if there were hydraulic bottlenecks at the WWTF.

Initially four scenarios were developed to assess the secondary process capacity:

- Scenario 1 – Design maximum monthly load (MML) for both aeration basins in service at 9 degree C

- Scenario 2 – Design average annual load (AAL) for one aeration basin offline at 14 degree C (maintenance mode)
- Scenario 3 – Design AAL for both aeration basins in service at 14 degree C (typical operation)
- Scenario 4 – AAL for near-term (2026) for one aeration basin offline at 14 degree C (demonstrating the implementation of aeration improvements).

For the capacity assessment, it assumed the minimum solids retention rate (SRT) needed for these temperatures, and the secondary process can run within the typical mixed liquor suspended solids (MLSS) range of 3000 to 4000 mg/L.

Adequate capacity was found for all scenarios except Scenario 2 which showed that the aeration basin has 24% less capacity than the Design AAL. This triggered an additional 5 scenarios, measuring the dissolved oxygen (DO) in the aeration basins, and secondary clarifier capacity scenarios:

- Scenario 5 – Design MML for one aeration basin in service at 19 degrees C and a DO of 2 mg/L
- Scenario 6 – Design MDL for one aeration basin in service
  - A: at 19 degrees C and a DO of 0.65 mg/L
  - B: at 9 degrees C and a DO of 1.3 mg/L
- Scenario 7 – AAL for near-term (2026) for one secondary clarifier offline (maintenance mode)
- Scenario 8 – Design MML for both secondary clarifiers online (typical operation)
- Scenario 9 – Design PIF for both secondary clarifiers online (peak flow)

1.7.2 WWTF Considerations

Overall, there was no overflow condition detected for any of the 9 Scenarios, however there were notable variables to consider:

- The freeboard in the aeration basin splitter box may decrease to less than one foot in 2044, at PIF, which will limit availability for any additional capacity.
- The weir located on the aeration basin splitter box was estimated to be submerged in all design flow conditions check with the addition of increased headloss. This could lead to uneven flow distribution between the two aeration basins.
- The water level at the UV disinfection system may exceed the high-water level (HWL) alarm set point at 2044 PIF, which will limit availability for any additional capacity and affect disinfection quality.

DRAFT

- The aeration basins showed insufficient capacity for all scenarios with high oxygen demand. The aeration capacity of 8 aerators can be 32% less than the maximum estimated demand, therefore 2 more aerators should be added to each basin. The City currently operates with 6 aerators online and 2 off, for a total of 8 aerators. If all aerators were to be used, they could meet the aeration demand until about 2028. However, using all eight aerators without on/off cycling would eventually eliminate anoxic conditions in the aeration basins, resulting in a lack of alkalinity recovery and poorer microorganism settleability without anoxic selector. Leading to an increase in the sludge volume index and accelerate the secondary clarifiers reaching their treatment capacity. Basins should be cleaned as soon as possible to alleviate additional stress on the system.

- The secondary clarifiers showed insufficient capacity for both design MMF and design PIF, with the capacity showing 30% less than capacity needed for design flows. As the City experiences more growth, this capacity will only increase and the WWTF may lose effective process control.

DRAFT

1.8 Capital Improvement Plan

From the analysis of the wastewater collection system and the WWTF rehabilitation and programmatic upgrades the list of projects in the 20-year Capital Improvement Plan (CIP) is presented in Table ES1-5, outlining the relative Class 5 Opinion of Probable Construction Cost (OPCC).

Table ES1-5: City of Ellensburg 20-Year CIP

	Project	Replacement	Upgrade	Expansion	Opinion of Probable Project Cost[(1)]	Projected Years Work will be Conducted
CIP-01	RAS Building Improvements	•			$ 3,200,000	2025 - 2026
CIP-02	Aeration Improvements		•		$ 1,900,000	2026 - 2026
CIP-03	Grit Classifier and Grit Pumps		•		$ 1,600,000	2026 - 2027
CIP-04	New Secondary Clarifier Associated with New RAS and WAS Pumps			•	$ 23,100,000	2027 - 2028
CIP-05	Headworks Improvements with New Grit and Screening Equipment		•	•	$ 8,800,000	2029 - 2030
CIP-06	New Aeration Basins and Blower Building		•		$ 51,600,000	2031 - 2033
CIP-07	Replacement of Sludge Collection Mechanism of Two Existing Secondary Clarifiers		•		$ 13,700,000	2034 - 3035
CIP-08	Influent Pump Station and One Manhole		•	•	$ 16,700,000	2036 - 2038
CIP-09	UV Disinfection Replacement and Addition		•		$ 4,400,000	2039 - 2040
CIP-10	Digester MCCs Replacement	•			$ 1,800,000	2041 - 2044
	Totals				$ 126,800,000	2024 - 2044
R&R	Collection System R&R Program		*As Needed*		$250,000	In perpetuity from 2027

Notes:

(1) Class 5 OPCC, in 2025 dollars

1.9 Financial Analysis

DRAFT

Section 2: Introduction

2.1 City Background

The City of Ellensburg, Washington (City) is located in central Kittitas County just east of the Cascade Range along Interstate 90 and as per State of Washington's Office of Financial Management (OFM), the City's 2023 population was 20,900. The City owns and operates approximately 77 miles of sanitary sewer pipe, one active PS, and a WWTF. The City's sewer system serves residential, business, commercial and industrial customers, and provides sewer service to the Central Washington University (CWU) campus.

The collection system is largely comprised of vitrified clay pipe installed in the 1930's. From 1960 to 1980 most of the pipe installed was asbestos cement pipe or concrete pipe, and from the 1980s on, mostly PVC has been installed. Approximately 12 blocks of the downtown area have combined sewer systems, which the City has been working towards separating. The PS, located on Cora Street, is approximately 40 years old and have had minimal upgrades since their installation. The Cora Street PS is a concrete wet well with two submersible centrifugal pumps.

The WWTF is an extended aeration activated sludge process providing secondary treatment of wastewater. Raw wastewater enters the influent wet well through a 42-inch interceptor sewer and is pumped to the plant headworks. The wastewater is degritted, screened and sent to the two aeration basins where floating mechanical aerators provide air and mixing for the activated sludge process. Flow continues to the two secondary clarifiers where the activated sludge biomass is separated from the plant effluent. Secondary effluent is sent through ultraviolet (UV) disinfection channels prior to being discharged to the Yakima River.

The solids are wasted from the activated sludge process and thickened in a gravity belt thickener. Waste sludge is sent to an anaerobic digester system and stored in sludge lagoons until it can be pumped to drying beds. Dried biosolids are hauled off site for beneficial reuse by land application.

2.2 Purpose and Scope

This General Sewer Plan (GSP) is prepared for the City as an update to the Wastewater Treatment Facility Engineering Report completed in 2015 and to meet the requirements of the Washington Administrative Code (WAC) Chapter 173-240-050 and the Revised Code of Washington (RCW) Chapter 90.48 and Chapter 36.70A (Growth Management Act). The GSP identifies and develops a program for collection system and WWTF improvements over the next 20 years. The purpose of the GSP is to provide the City with a comprehensive guide that can be used to assist the City with managing and operating existing wastewater infrastructure, planning for future expansions and upgrades and maintaining compliance. It provides the public and regulatory agencies with information on the City's plans for future sewer system growth and assists with policy development and decision-making. Table 2-1 outlines the WAC requirements for this plan.

DRAFT

Table 2-1: GSP Requirements per WAC 173-240-050

WAC 173-240-050 Reference Paragraph	Description of Requirement	Location in GSP
3a	Purpose and need for proposed plan	Section 2
3b	Who owns, operates, and maintains system	Section 2, 9
3c	Existing and proposed service boundaries	Section 3
3d	Layout map showing boundaries; existing sewer facilities; proposed sewers; topography and elevations; streams, lakes; and other water bodies; water systems	Sections 3, 5
3e	Population trends	Section 3
3f	Existing domestic and/or industrial wastewater facilities within 20 miles	Section 3, 4, 7
3g	Infiltration and inflow problems	Section 4, 7
3h	Treatment systems and adequacy of such treatment	Section 5, 6, 8
3i	Identify industrial wastewater sources	Section 3, 4, 7
3j	Discussion of water systems	Section 3
3k	Discussion of collection alternatives	Section 7
3l	Define construction cost and O&M costs	Sections 10, 11
3m	Compliance with water quality management plan	Section 2
3n	SEPA compliance	Appendix A

This GSP considers projections for a 20-year period out to 2044, as well as a build-out scenario, prioritizing capital improvement projects based on zoning, growth projections, regulatory requirements, project cost and system benefit. The GSP evaluates the City's sewer collection system and wastewater treatment facilities, all of which are owned and operated by the City. The GSP identifies capital improvement projects designed to meet the needs of the planning period through 2044.

This GSP performed a system analysis of the City's sewer collection system and wastewater treatment facilities using existing flow and load data, a WWTF process model to perform scenario analysis and a hydraulic model for the WWTF identifying future capacity limitations, hydraulic bottlenecks and projected peak day and peak hour flows for the planning period. The GSP included a system wide condition assessment. The GSP uses the system analysis and system-wide condition assessment to establish recommendations for risk-based prioritization of near-term and mid-long term asset improvements. This GSP also provides a SEPA Checklist in conformance with WAC 197-11-960 and City Standards, along with capital improvements and a financial analysis to outline an implementation plan for the identified capital improvements.

2.3 Regulatory Requirements

The City is responsible for managing and operating the City's wastewater collection and treatment system according to existing federal, state, county, and local regulations. The GSP has been developed in accordance with the requirements in WAC 173-240-050 and will be submitted to Ecology for approval.

DRAFT

The WWTF operates under the National Pollutant Discharge Elimination System (NPDES) permit WA0024341. The wastewater discharge permit was issued on 9 November 2018 and is due for renewal 31 December 2023. Under the current permit, the WWTF is allowed a maximum month design flow (MMDF) of eight million gallons per day (MGD) for flows or waste loads. Table 2-2 provides a summary of the requirements under the current NPDES permit. Copies of the NPDES permit and fact sheet are included in Appendix B.

2.3.1 Federal Regulations

The Federal Water Pollution Control Act of 1972 (PL 92-500), as amended by the Clean Water Act of 1977 (PL 95-217) and the Water Quality Act of 1987 (PL-100-4) – commonly referred to as the Clean Water Act (CWA) – are the federal laws governing wastewater collection, treatment, and disposal. The CWA gave the United States Environmental Protection Agency (EPA) authority to implement pollution control programs such as developing rules that set water quality standards. The EPA has the authority to delegate enforcement to the states, when state regulations are at least as strict as the federal regulations. In the State of Washington, Ecology has primacy from the EPA to administer and enforce the CWA.

Federal regulations for biosolids treatment and disposal are in Title 40 Part 503 of the Code of Federal Regulations (Part 503). The EPA's Part 503 regulations classify biosolids as Class A EQ, Class A, or Class B based on pathogen density, vector attraction reduction, and pollutant concentrations achieved through treatment. Biosolids applied to the land must meet one of these classifications.

Class B biosolids are produced using a Process to Significantly Reduce Pathogens (PSRP), including aerobic/anaerobic digestion, composting, lime stabilization, and drying. Restrictions apply to food crop harvesting, animal grazing, and public access to land treated with Class B biosolids. Class A biosolids, are achieved through a Process to Further Reduce Pathogens (PFRP), such as composting, heat drying, and pasteurization, offer greater flexibility for use and sale due to fewer restrictions. To classify biosolids as Class A using anaerobic digestion, the process must meet time-temperature criteria or obtain PFRP equivalency from the EPA's Pathogen Equivalency Committee (PEC).

Part 503 regulations also cover pollutant concentrations, vector attraction reduction, and management practices. Effective industrial pretreatment generally results in low pollutant levels. Class A biosolids that meet low pollutant concentration criteria qualify as Exceptional Quality (EQ) and can be distributed or sold to the public with minimal restrictions.

2.3.2 Washington State Regulations

The governing Washington State laws for the planning and designing of wastewater facilities are the Revised Code of Washington (RCW) 90.48.110. Washington Administrative Code (WAC) Section 173-240 implements the “plans and specifications” from RCW 90.48.110 and includes the requirements for engineering reports, plans and specifications, and general sewer plans. WAC Section 173-240 includes the following:

- Planning requirements and review procedures

- Plan contents
- Requirements for engineering reports for specific projects, ownerships, operation and maintenance
- Public notification procedures for construction of wastewater facilities

Title 90.26 of the RCW establishes Washington State law governing the use of reclaimed wastewater including treatment requirements according to types of use**.** WAC 173-308 is the state regulation that governs the management, beneficial use, and disposal of biosolids generated by wastewater treatment processes. WAC 173-308 meets to exceeds the requirements stated in the federal Part 503 rules.

Ecology conducts a Quality Assurance Project Plan for Yakima River Monitoring. This water quality management plan regulates discharges from wastewater facilities through the NPDES program, referenced in Section 2.4.

The State of Washington's Growth Management Act (GMA) was enacted by the 1990 Legislature, and its administrative regulations were adopted by Ecology in 1992. The GMA regulations are contained in Section 365-195 WAC and require all counties and cities with specified populations and growth rates to meet the requirements of the Act. One of the requirements of the GMA is development of a comprehensive plan. GSPs must include maps and descriptive text covering the objectives, principles, and standards used to develop the plan. One of the required elements of the comprehensive plan, which relates to the planning for and construction of wastewater collection and treatment facilities, is the capital facilities plan element. The capital facilities plan element must meet the requirements of RCW 36.70A.070. These requirements include:

- An inventory of existing capital facilities owned by public entities, including the locations and capacities of these facilities
- A forecast of the future needs for the capital facilities
- The proposed locations and capacities of expanded or new capital facilities
- At least a six-year plan that will finance such capital facilities within projected funding capacities and clearly identifies sources of public money for such purposes
- A requirement to reassess the land use element if the probable funding falls short of meeting existing needs

2.4 Compliance Status

The WWTF continues to operate under the NPDES Permit WA-0024341, issued and regulated by Ecology, January 2019. Table 2-2 provides a summary of the requirements under the current NPDES permit. Copies of the NPDES permit and fact sheet are included in Appendix A.

DRAFT

Table 2-2: NPDES Permit Requirements

Design Criteria	Units	Design Quantity	
Maximum Month Flow	mgd	8	
Peak Instantaneous Design Flow	mgd	15	
Maximum Month Influent BOD_5 Loading	lbs/day	10,000	
Maximum Month Influent TSS Loading	lbs/day	8,000	
Parameter		**Effluent Limitations**	
		Average Monthly	**Average Weekly**
BOD_5	lbs/day	1,5005	2,250
	mg/L	30	45
TSS	lbs/day	1,200	1,800
	mg/L	30	45
Fecal Coliform	# colonies /100 mL	100	400
Total Ammonia (as NH3-N)	mg/L	NA	8.2
pH		Between 6.0 and 9.0	

Notes:

mgd – million gallons per day
lbs/day – pounds per day
mg/L – milligrams per liter
mL – milliliter

Additionally, the City's sewer system must operate under guidelines from Ecology's Orange Book. The Orange Book serves as guidelines for the design of sewage collection, treatment, and reclamation systems; providing guidance to municipalities and consultants to ensure design is consistent with public health, water quality, and biosolids management objectives for the State of Washington. It also sets the minimum requirements and limiting factors utilized by Ecology and the Washington State Department of Health (DOH) for review of plans and specifications and to assist in the preparation of plans, specifications, reports, and other data.

2.5 Previous Planning Documents

The City has several recent reports which were used in the development of the flows and loads assessment. It includes:

1. **2015 WWTF Engineering Report:**

   The City developed a WWTF Engineering Report in 2015, which was submitted to and approved by Ecology, and was a 20-year plan for both the WWTF and the City's collection system. It included flows and loads projection, evaluation of existing facilities, identification of WWTF and collection system improvements, and a financing plan.

2. **2018 Aeration Basin Study:**

   During the development of the 2015 WWTF Engineering Report, a main switchboard failure at the WWTF, which temporarily crippled the aeration system and led to an emergency repair, highlighted concerns about the WWTF's electrical system and aeration system capacity. Due to these concerns, the City developed a WWTF Aeration

Basin Study in 2018 which identified and evaluated four different ASI which included modifications to the existing aeration basins as well as construction of new aeration basins.

3. **2021 Comprehensive Plan:**

   The City developed a 20-year comprehensive planning document for growth rates and all City infrastructure which details the City limits, population, and UGA. It was initially developed in 2017 and has been updated in 2018, 2019 and 2021.

The existing wastewater infrastructure described within the GSP build off the relevant information from these previous plans, combined with added information from site visits, City staff interviews, record drawings, and regulatory documentation.

2.6 Ownership and Management

The City owns and is responsible for managing the wastewater collection and treatment infrastructure within the City limits and the Kittitas County UGAs as described in Sections 5 and 6.

2.7 Plan Overview

The remainder of the GSP is organized according to the sections and appendices summarized below.

Section 3: Planning Area Characteristics

A description of the Ellensburg sewer system service area characteristics and an overview of the service area boundaries and extents.

Section 4: Historical and Projected Flows and Loads

A description of the historical and projected flows and loads to the City's WWTF for the planning period.

Section 5: Existing Wastewater Facilities

A summary of the existing wastewater sewer collection system and treatment facility.

Section 6: Business Risk and Vulnerability Assessment

Section 7: Wastewater Collection System Analysis

A summary of the collection and conveyance system analysis, including existing conditions and planning projections.

DRAFT

Section 8: Wastewater Treatment Facility Analysis

A description of the current condition and capacity of the City's existing wastewater facilities. This section includes an identification of deficiencies used to inform capital improvements discussed in later sections.

Section 9: Operations and Maintenance

A summary and description of the organizational structure and responsibilities for the City's operations and maintenance activities.

Section 10: Capital Improvements Plan

A summary and prioritized list of the recommended capital improvements, including recommendations for plan implementation.

Section 11: Financial Analysis

An overview of the City's plans for financing the capital improvement projects identified in the GSP.

DRAFT

Section 3: Planning Area Characteristics

3.1 Introduction

This section provides a description of the City's sewer system service area characteristics and an overview of the service area boundaries and extents. The characteristics include topography, water resources, water supply, land use, and zoning which are used to assess existing and future wastewater service needs. Planning and service area population trends and forecasts are also discussed in detail in Section 3.4.

3.2 Service Area, Zoning, and Land Use

The City encompasses approximately 7.6 square miles within its City limits and an additional 7.1 square miles within its UGA. Sewer service is confined to within both of these areas. Additionally, there are approximately 350 residences served by the City that are located outside of the City limits. The Kittitas County dwelling population density is estimated to 2.3 residents per household, as per the latest comprehensive plan. Figure 2-1 shows the City limits, UGA, and zoning. As per City officials, the total combined extents of the existing City limits and the UGA are not anticipated to increase during the planning period (2022-2044). Changes to the City limits are anticipated to be limited to incorporation of existing UGA.

As per City officials, there are no known large business and/or significant industrial users anticipated within the planning period. There are a number of known planned housing development due for construction in the next 5-10 years which are discussed further in Section 2.3.

3.2.1 Service Area

The City is responsible for the infrastructure and operations and maintenance for wastewater collection and treatment within the City's boundaries and the adjacent UGA. The service area information is based upon the City's 2021 Comprehensive Plan as well as data from the Washington State Office of Financial Management. The City encompasses approximately 7.6 square miles within its City limits and an additional 7.1 square miles within its UGA. Sewer service is confined to within both of these areas. Figure 3-1 shows the City limits and UGA.

DRAFT

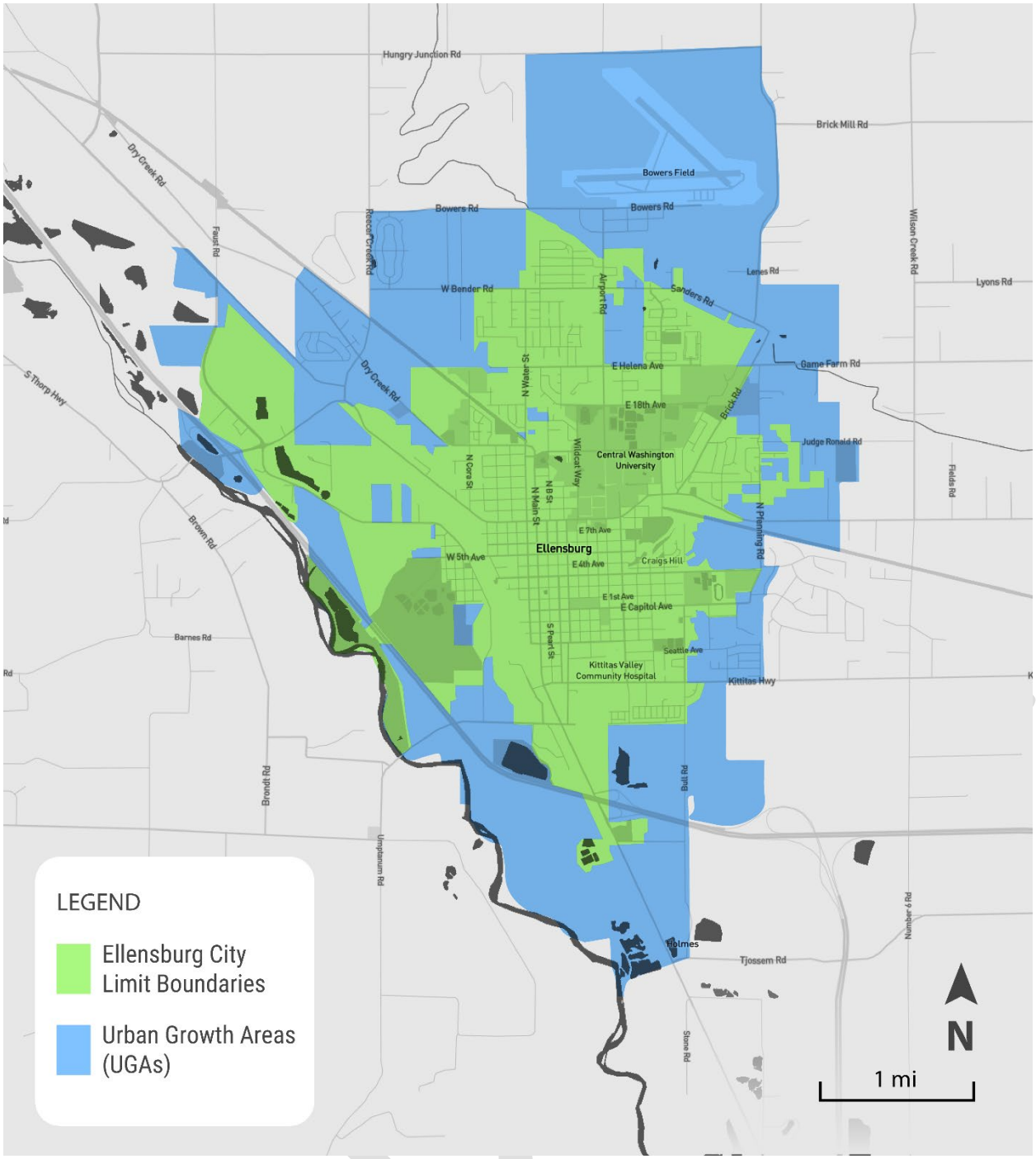


Figure 3-1: City of Ellensburg Sewer Service Area Map

As per City officials, the total combined extents of the existing City limits and the UGA are not anticipated to increase during the planning period (2022-2044). Changes to the City limits are anticipated to be limited to incorporation of existing UGA.

3.2.2 Zoning and Land Use

The City's 2021 Comprehensive Plan and the City's 2021 Housing Action Plan provide information on the existing and proposed land use within the sewer service area boundaries and corresponding planning area as illustrated in Figure 3-2. The City's zoning code included five residential districts, a manufactured home district, and three commercial districts that allow for multifamily development. The current annual housing production rate is 107 units/year. The City needs an average annual projection of 281 units to meet 2037 populations targets.

DRAFT

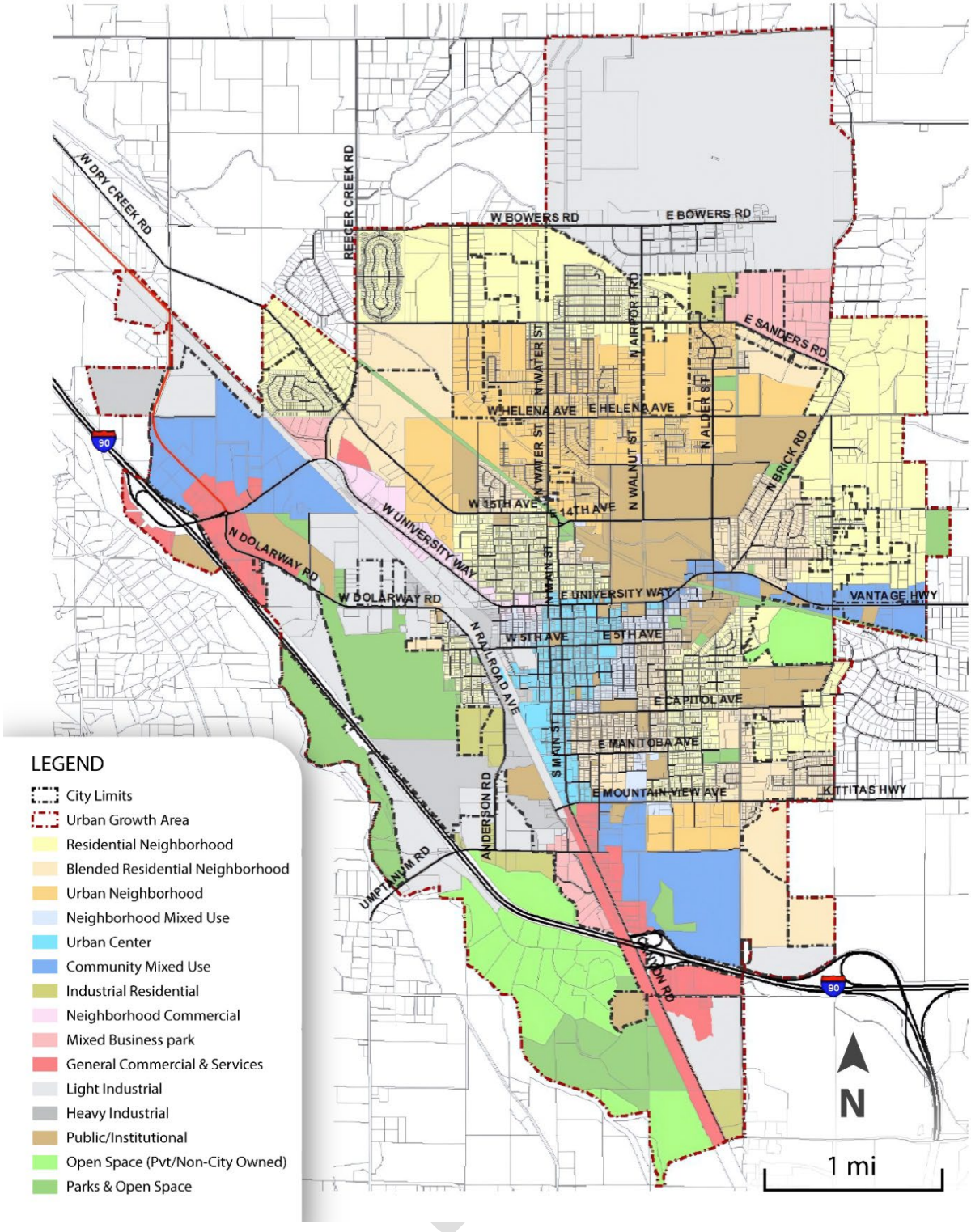


Figure 3-2: City of Ellensburg Zoning and Land Use Map

The 2021 Housing Action Plan identifies goals that include the production of more residential units, allow greater flexibility within the zoning code, and strategically rezoning areas of the city for more mixed-use development.

3.3 Surrounding Area Characteristics

3.3.1 Topography

Located in Kittitas Valley, the City is located southwest of the Wenatchee Mountains, east of the Wenatchee National Forest, and north of Manastash Ridge as seen in Figure 3-3. The City's service area elevations range from 1,420 feet to 1,720 feet above mean sea level, sloping southwest to the Yakima River.

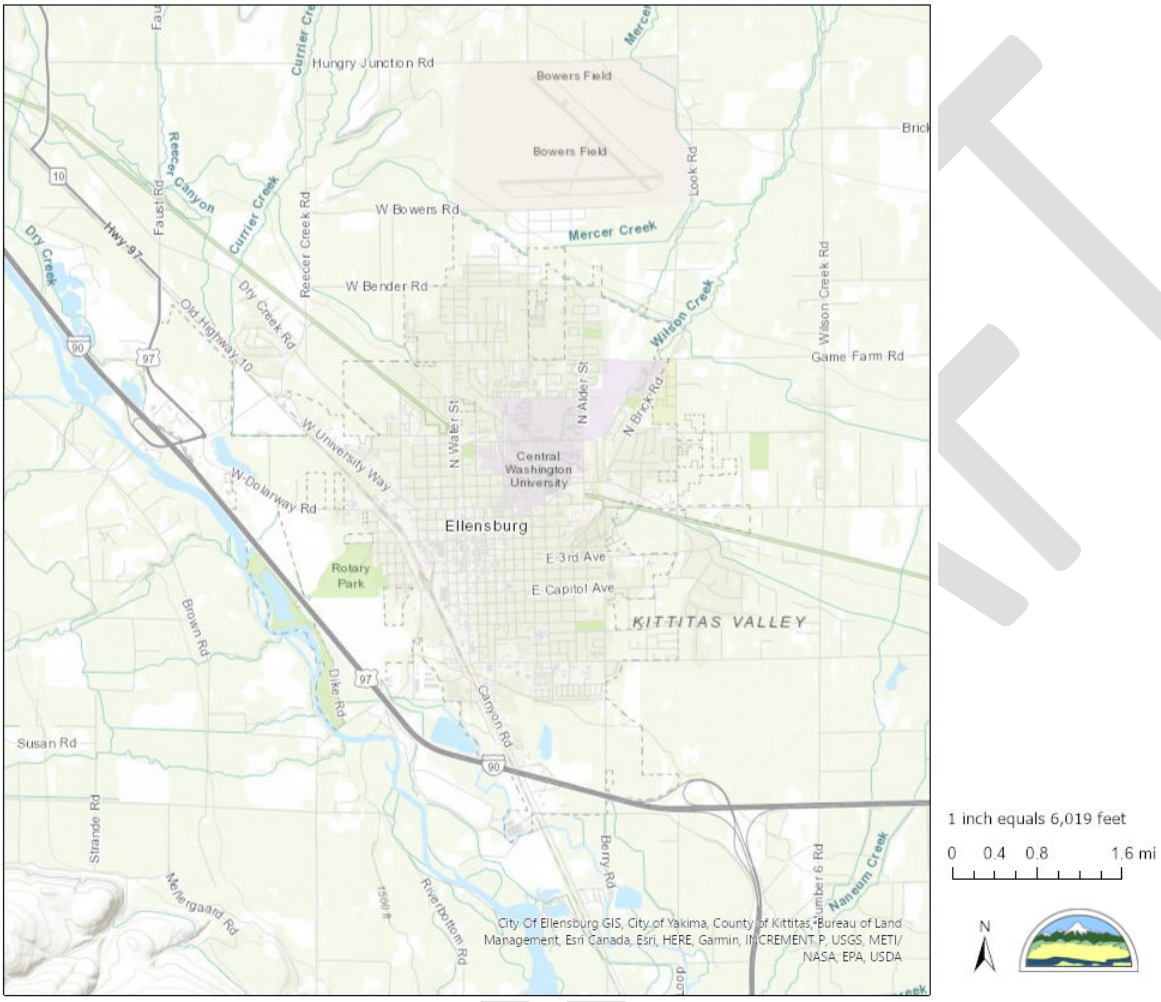


Figure 3-3: City of Ellensburg Topographic Map

3.3.2 Water Resources

Water resources in the WWTF service area include the Yakima River, Wilson Creek and several creeks that flow into the Yakima River. Additionally, there are numerous small ponds within the City limits and UGA including Bull Run, Dolarway Road, Goose Inn, Hanson Pit, and Mattoon.

3.3.3 Water Supply System

The City owns and manages a water supply system that serves the area within the City limits as well as the UGA. The City takes water from 11 wells and the largest, City Well, is located near the Yakima River. The wells provide a maximum yield of 4.26 MGD. The water system supplies residential, commercial, industrial, and government uses.

3.4 Growth Management Act

The Growth Management Act (GMA) was established in 1990 to require cities and counties to develop comprehensive plans and regulations to manage and guide growth and development. As part of the planning process, counties are required to determine boundaries for an urban growth area or areas, where certain urban services, including sewers, are provided. These UGAs are intended to be capable of containing future growth through a twenty-year planning period, while development occurring outside the UGA boundaries is expected to be low density and with sufficient acreage capable of supporting on-site sewage disposal systems that conform to DOH regulations.

Under the GMA, urban services are prohibited outside of UGA boundaries, except for in limited circumstances when necessary to protect basic public health and safety and the environment, and when such services are financially supportable at rural densities and do not permit urban development, per RCW 36.70A.110(a) and WAC 365-196-320(1)(c). In some cases, sewer service is allowable outside of the UGA if the City has entered into a pre-existing, contractually binding agreement to provide this service to property outside of the UGA boundary. In these cases, sewers may be satellite systems that are limited to serve the qualified and defined parcels, or a sewer extension may be “tight-lined” to convey wastewater from the qualified and defined parcels into the UGA for connection to the existing sewer system.

3.5 Population

This chapter summarizes the current and projected populations for the WWTF service area for the project planning period of 2024to 2044 The information is based on the City’s 2021 Comprehensive Plan as well as data from the OFM.

3.5.1 Existing Population

3.5.1.1 Residential

According to the City’s 2021 Housing Needs Assessment, estimated population of the City within its UGAs was 22,879 people, which grew approximately 14% from is 20,786 population from 2015. This represents an average growth rate of 1.9%, aligning with the OFM data from

2010 census count to 2020. The City has a regional growth target of 2.1% annual growth rate, which was place a targeted population of 32,540 by 2037.

3.5.1.2 Commercial/Industrial

The City has approximately 500 commercial/industrial wastewater customer connections. The classification is based upon potable water consumption from which sewer rates are calculated. The City has two signification industrial discharges, which are Twin City Foods (TCF) and the Iron Horse Brewery (IHB). TCF is a local frozen vegetable packing facility that was established in 1965 and is one of the largest businesses in the City. The facility is mainly operated from May through October with reduced activities for the remainder of the year. Per NPDES permit No. ST-5507 (see Appendix B), TCF is permitted to discharged up to 100,000 GPD to the City's collection system. For the remainder of the year, TCF discharges to effluent sprayfields.

The IHB discharges wastewater from brewing activities to the City's collection system year-round. Per NPDES Permit No. ST0501278 (see Appendix B) up to 13,000 GPD of wastewater pretreated for pH neutralization is discharged to the collection system.

3.5.1.3 Central Washington University

Central Washington University (CWU) is a major economic, social, and cultural influence for the City. According to the 2021 Housing Needs Assessment, 50% of the population falls between the ages of 15 and 30, which reflects the large student population at CWU. The WWTF serves CWU's nearly 10,000 students. As per CWU's 2019-2029 Capital Master Plan, CWU anticipates increasing the campus student population to 12,000 in the next few years. As per their website, as of the fall of 2022 CWU has a student body population of 10,327 of which 2,800 live on campus with the remainder living predominantly in the City or UGA. While the students themselves are not considered City residents, their off-campus residences are connected sewer customers. Likewise, the on-campus students and the rest of the CWU campus is considered a commercial connection to the WWTF. There is no single point of connection between CWU and the City and therefore their flows are not metered but rather calculated based upon potable water consumption.

3.5.2 Future Population

As per the City's 2021 Comprehensive Plan, the City utilizes population projections developed by the OFM. The City uses the OFM data as a basis for their planning purposes. According to the data, the City had a population of 20,797 in 2020. In addition to the population within the City limits, there are an estimated 350 residences with a population of 861 served by the WWTF within the UGA.

In terms of growth, the OFM provides low, medium, and high projections. The City forecasts an annual growth rate of 1.9% for both the City and the UGA for the planning period, which falls within OFM's projection ranges. Population forecasts for the planning period are detailed in Table 3-1.

DRAFT

Table 3-1: Ellensburg WWTF Service Area Population Projections 2022-2044

	Population	
Year	City Limits	Service Area
2020	20,797	-
2022	20,940	21,761
2033	26,036	27,037
2044	32,373	33,617

3.5.3 Near Term Development

There are a number of known residential housing developments in various stages of planning and construction throughout the City limits. As seen in Table 3-1, these developments are anticipated to add up to 11 connections/residences for the next 5 -10 years as see in Figure 3-4.

DRAFT

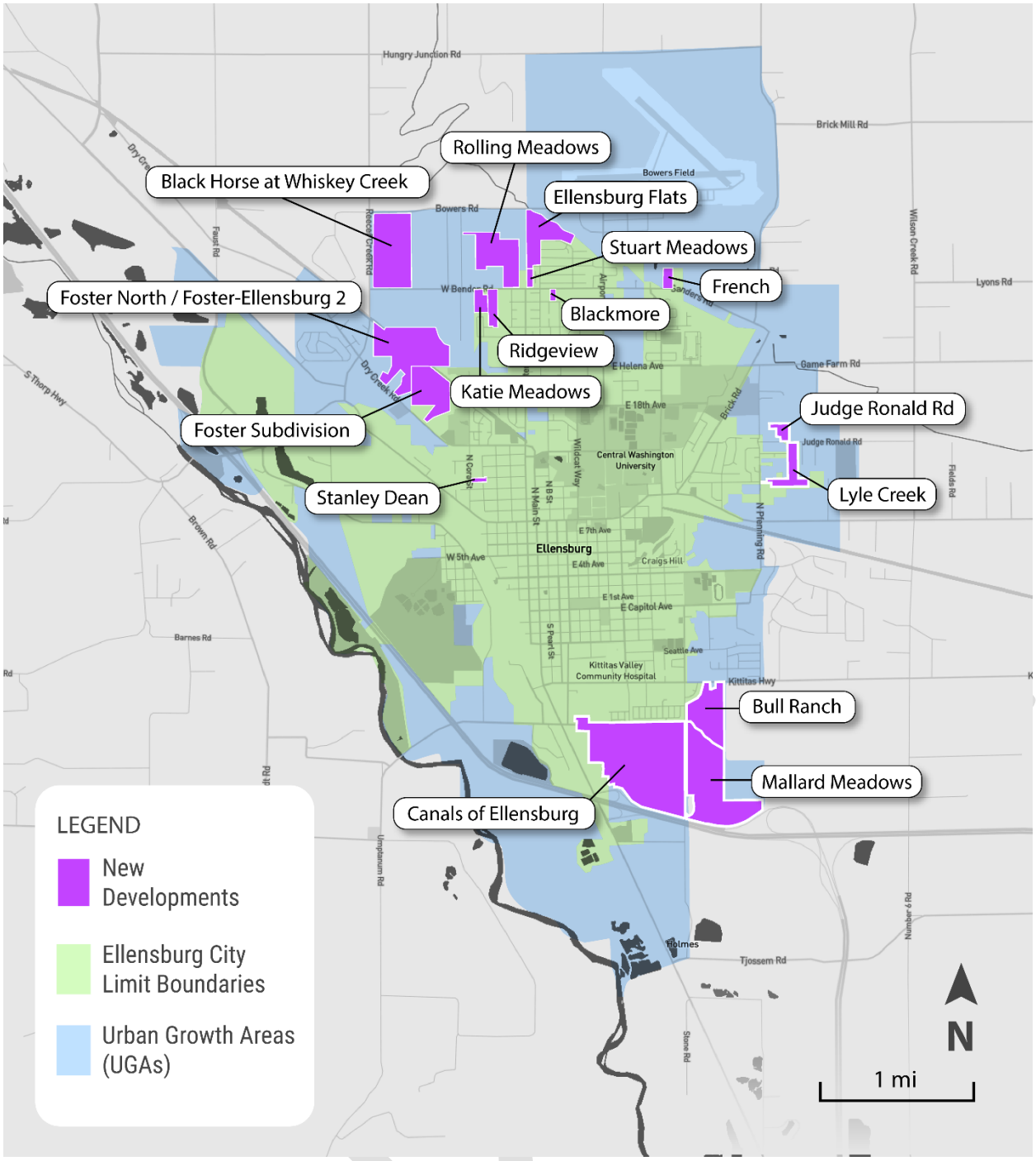


Figure 3-4: City Growth Plan

Section 4: Historical and Projected Flows and Loads

4.1 Introduction

This Section summarizes wastewater characteristics for the City's WWTF, including:

- Historical WWTF flows and loads
- Projected 2044 flows and loads

Flow and load projections are compared with the conditions in the current NPDES permit and used as design criteria for capacity evaluation and recommended facility improvements. The influent wastewater characterization is based on the discharge monitoring reports (DMRs) and WWTF operating data from January 2016 to June 2022, along with additional sampling data from a 10-day wastewater sampling event conducted by the City in June 2022.

4.2 Historical WWTF Flows and Loads

The DMRs were provided for the period January 2016 through June 2022. This period includes periods of above and below average rainfall as well as pre-COVID 19 pandemic (2016-2019) years. Figure 4-1 presents the daily influent flow with its running 30-day average flow in MGD. The annual average dry weather flow (AADWF), annual average flow (AAF) and maximum month flow (MMF) estimated each year are also presented. Following are several observations related to the historical influent flows:

- For the study period, AAF peaked in 2016-2017 and has since remained consistent.
- The City's average rainfall is 8.9 inches and was above average in 2016-2017 and below average from 2018-2021.

The MMF peaked in 2016-2017 and was lower in the following years. It was typically observed in late spring each year.

DRAFT

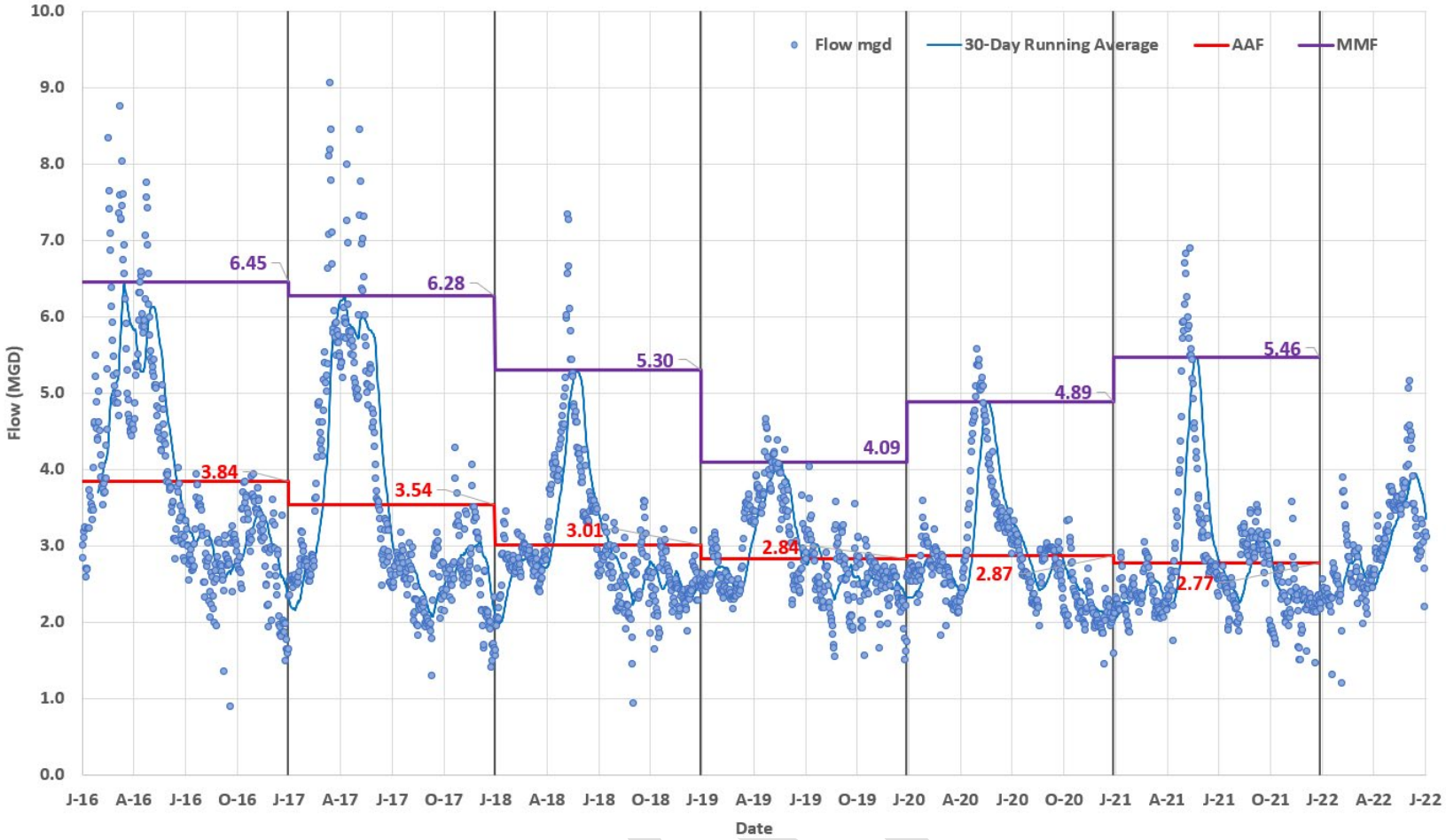


Figure 4-1: Ellensburg WWTF Influent Flow 2016 - 2022

As shown in Figure 4-1, which presents the base flow as well as various flow averages and annual rainfall totals, the peak AAF and MMF correlate to the high rainfall total experienced in 2016 and 2017. Through discussions with the City, it is understood that inflow and infiltration (I&I) play a major role in WWTF influent flows during periods of wet weather as well as during the spring snowmelt.

Table 4-1: Historical WWTF Influent Flow Summary

Parameter	2016	2017	2018	2019	2020	2021	Average
Annual Average Dry Weather Flow(1) (AADWF), MGD	2.31	2.07	1.96	2.29	2.02	2.03	2.11
Annual Average Flow (AAF), MGD	3.84	3.54	3.01	2.84	2.87	2.77	3.14
Maximum Month Flow(2) (MMF), MGD	6.45	6.28	5.30	4.09	4.89	5.46	5.41
Maximum Day Flow (MDF), MGD	8.76	9.06	7.34	4.66	5.58	6.89	7.05
Peak Hour Flow(3) (PIF), MGD	12.9(3)	12.9(3)	NA	NA	NA	NA	NA
Annual Rainfall(4), inches	12.23	11.83	6.85	8.65	5.80	5.80	NA

Notes:

(1) Minimum 30-day running average flow reported for the year
(2) Maximum 30-day running average flow reported for the year
(3) Highest peak hour flow rate in 2016 and 2017 reported in the 2018 WWTF Aeration Basin Study (2018 Aeration Basin Study) by Gray & Osborne, Inc. No peak hour flow rate was recorded after 2017.
(4) Rainfall data provided for Yakima airport station in Washington from National Oceanic Atmospheric Administration's Climate Data Online

While the AAF and MMF flows have varied during the study period, the AADWF at the WWTF has remained relatively constant. These flows are indicative of a fairly constant service area population during the study period. Likewise, although the MMF and maximum day flow (MDF) has increased in the last 3 years, the MMF and MDF in 2021 were still less than those observed in 2016. The annual rainfall has reduced more substantially in recent years and may have reduced the I/I flows. City staff noted that the City has been implementing a sewer pipe relining program for over 10 years, which is tasked with attenuating I&I in the system. These improvements, coupled with the reduced rainfall, are two major factors in the relatively lower increase in MMF and MDF in recent years.

Flow peaking factors were estimated for each year from the historical flows using the ratios of various flow conditions such as AAF/AADWF and MMF/AFAF, etc., as shown in Table 4-2.

DRAFT

Table 4-2: Ellensburg WWTF Influent Flow Peaking Factors 2016-2021

Peaking Factors	2016	2017	2018	2019	2020	2021	Design Peaking Factors
AAF/AADWF	1.66	1.71	1.54	1.24	1.42	1.37	1.49
MMF/AAF	1.68	1.78	1.76	1.44	1.71	1.97	1.97
MDF/AAF	2.28	2.56	2.44	1.64	1.95	2.48	2.23
PIF/AAF	3.36	3.65	NA	NA	NA	NA	3.50

Notes:

(1) AAF = AADWF x peaking factor of AAF/BF+0.015 MGD (Historical AAF from TCF+IHB from Table ES1-2).
(2) MMF = AAF x peaking factor of MMF/AAF.
(3) MDF = AAF x peaking factor of MDF/AAF.
(4) PIF = 2024 AAF x 3.50 (Historical peaking factor of PIF/AAF)

The peaking factors for the study period from 2016 to 2021 were averaged and selected as the flow peaking factor to develop design flows except for the MMF and the peak instantaneous flow (PIF). For the MMF, the maximum value from the six flow peaking factors was selected to establish the design MMF which is the most critical design flow in the secondary treatment capacity. For the PIF, two flow peaking factors were used to project the design PIF. The average (i.e., 3.50) of the two peak hour flow (PIF)/AAF historical peaking factors was used to estimate PIF corresponding to 2022 AAF.

Another peaking factor, estimated using the following formula provided in the Orange Book, was applied to estimate the PIF for the portion of AAF increased from 2022 AAF to the projected year:

$$Peaking\ Factor = (18+\sqrt{P}) / (4+\sqrt{P}),\ P = population\ in\ thousands$$

Figure 4-2 and Figure 4-3 present the influent biochemical oxygen demand (BOD_5) load and total suspended solids (TSS) load respectively in terms of pounds per day (LBS/DAY) for the WWTF. The daily influent loads with its running 30-day average and the annual average load (AAL) and maximum month load (MML) estimated for each year are also presented in these figures. Several observations related to the influent wastewater loads are listed in the following:

Both the AA BOD_5 load and AA TSS load have been relatively constant for the past 6 years.

The MM TSS load was typically observed late spring which seems to have more correlation to the MMF whereas the MM BOD_5 load was observed in not only late spring but in winter months as well.

The average monthly BOD_5 and TSS loads were typically low during the middle of summer months, which is probably related to the reduction in residential students during the summer months. A notable exception to this was the 2020 COVID pandemic year.

DRAFT

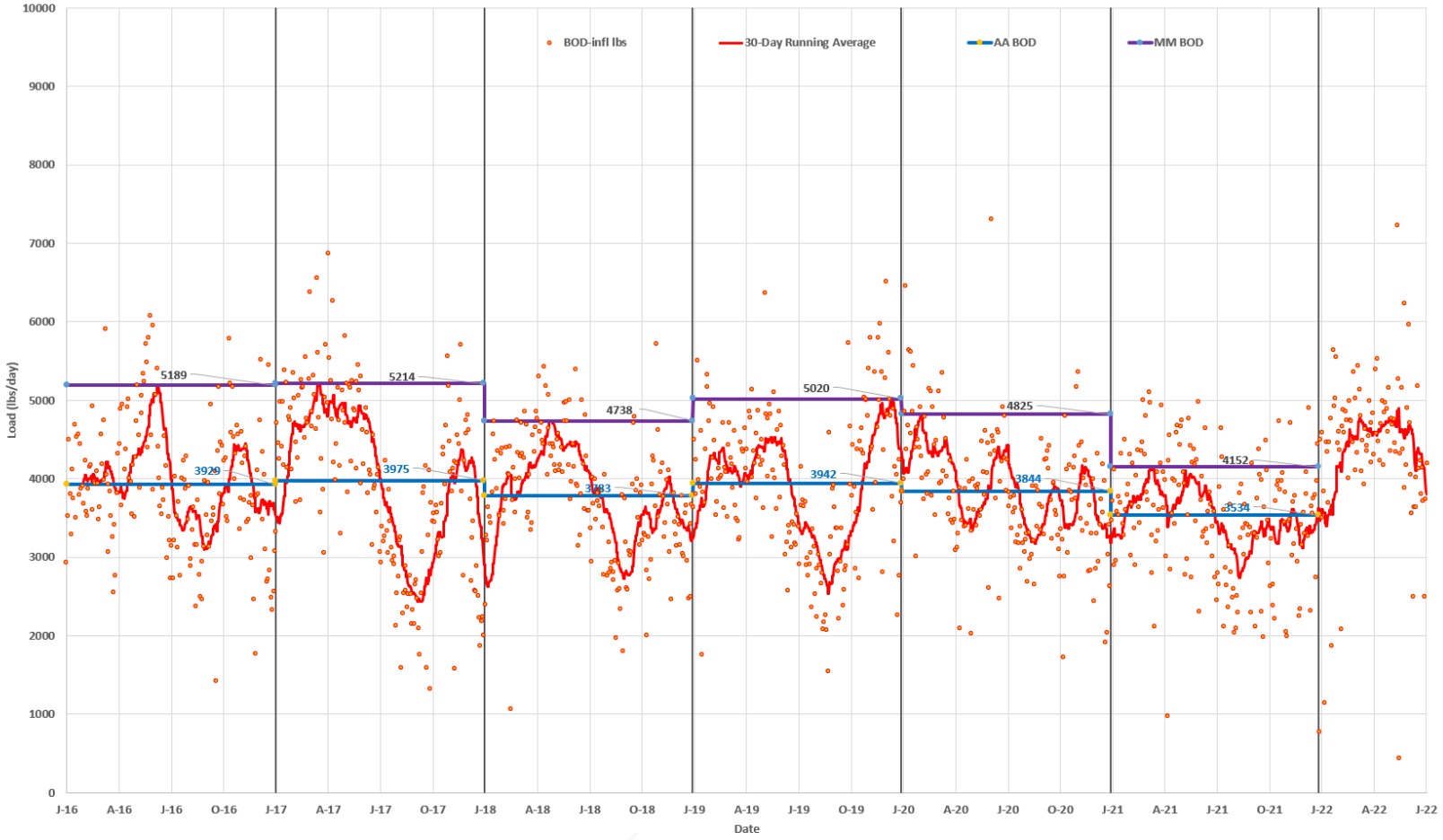


Figure 4-2: Ellensburg WWTF Influent BOD_5 Load 2016 - 2022

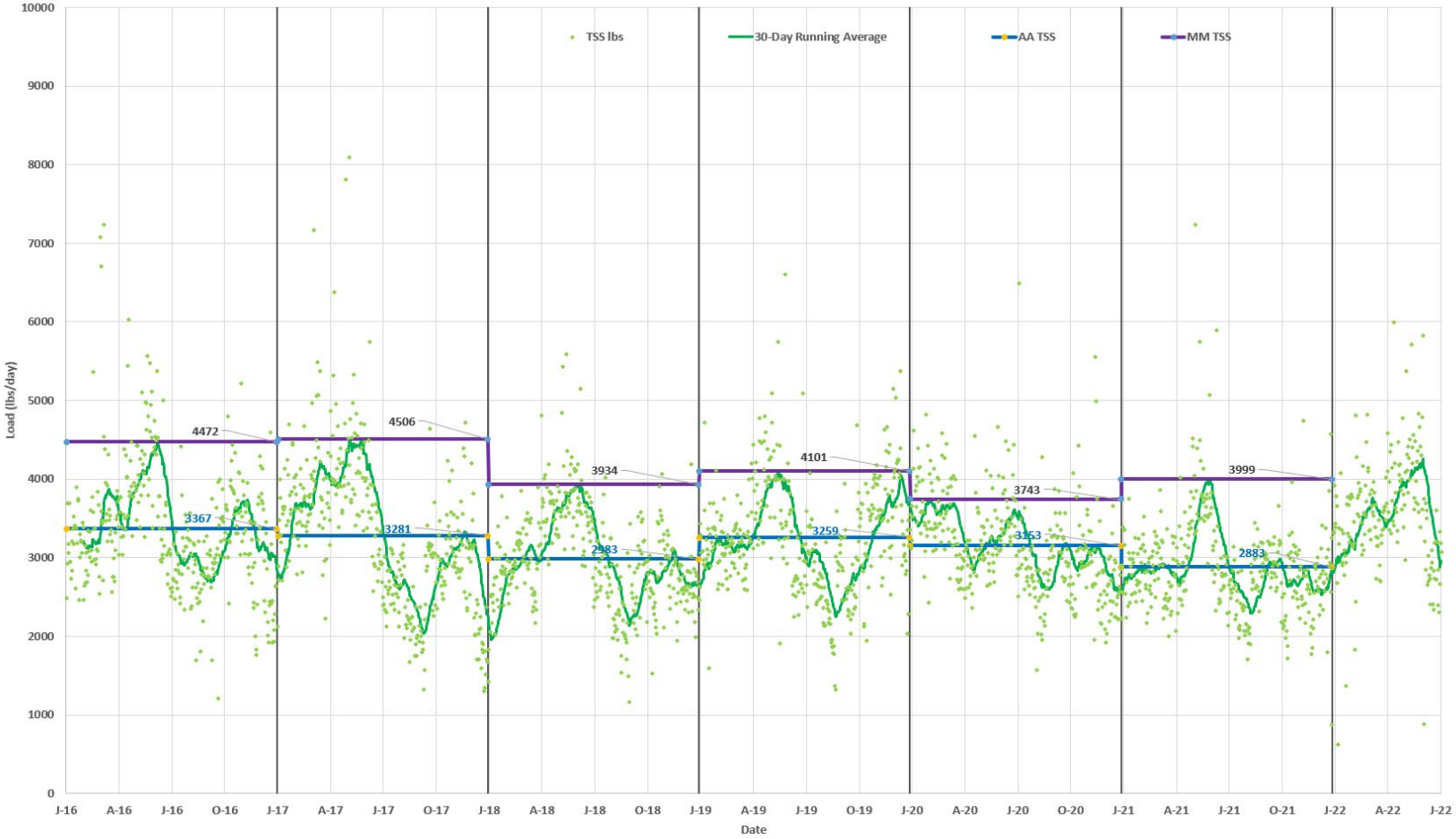


Figure 4-3: Ellensburg WWTF Influent TSS Load 2016 – 2022

Table 4-3 summarizes the influent waste BOD_5 and TSS loads each year along with the maximum day load (MDL). The average annual BOD_5 and TSS generation rates [pounds per day per capita (lbs/day/c)] are also provided for each year.

Table 4-3: Ellensburg WWTF Influent Load Summary 2016-2021

Loads	2016	2017	2018	2019	2020	2021
AA BOD_5 Load, lbs/day	3,929	3,975	3,783	3,942	3,844	3,534
MM BOD_5 Load, lbs/day	5,189	5,214	4,738	5,020	4,825	4,152
MD BOD_5 Load, lbs/day	6,072	6,873	5,721	6,507	7,303	5,101
AA TSS Load, lbs/day	3,367	3,281	2,983	3,259	3,153	2,883
MM TSS Load, lbs/day	4,472	4,506	3,934	4,101	3,743	3,999
MD TSS Load, lbs/day	7,234	8,091	5,585	6,602	6,487	7,229
AA BOD_5 Load per Capita, lbs/day/c	0.20	0.20	0.18	0.19	0.18	0.17
AA TSS Load per Capita, lbs/day/c	0.17	0.16	0.15	0.16	0.15	0.14

Notes:

(1) AA - Average Annual
(2) MM – Maximum Month
(3) MD – Maximum Day

The historical average annual BOD_5 generation rates varied from 0.17 to 0.20 lbs/day/c whereas those for TSS varied from 0.14 to 0.17 lbs/day/c. The highest BOD_5 and TSS generation rates were used to project the average annual BOD_5 and TSS loads later. Load peaking factors were estimated based on these loads for each year. Table 4-4 presents the load peaking factors estimated for each year with the design peaking factors selected to establish design loads.

Table 4-4: Ellensburg WWTF Wastewater Load Peaking Factors 2016-2021

Peaking Factors	2016	2017	2018	2019	2020	2021	Design Peaking Factors
BOD_5 Peaking Factors							
MML/AAL	1.32	1.31	1.25	1.27	1.25	1.17	1.32
MDL/AAL	1.55	1.73	1.51	1.65	1.90	1.44	1.63
TSS Peaking Factors							
MML/AAL	1.33	1.37	1.32	1.26	1.19	1.39	1.39
MDL/AAL	2.15	2.47	1.87	2.03	2.06	2.51	2.18

The historical maximum load peaking factor was selected as the design peaking factor to establish the design MML. The MML is the most critical design load condition that the secondary process should treat to meet the required discharge water quality. Therefore, a more conservative peaking factor was selected for design. For the maximum day load (MDL), the average of the six load peaking factors was selected as the design peaking factor.

The flow and load of two industrial dischargers, TCF and IHB were analyzed separately and are not correlated to the City's population.

TCF is a local frozen vegetable packing facility that was established in 1965 and is one of the largest businesses in the City. TCF repacks processed product brought to the facility to

DRAFT

consumer size packaging and discharges wastewaters generated by washing and conveying vegetables. The facility is mainly operated from May through October and the activities for the remainder of the year are reduced. Per NPDES Permit No. ST0005507 (see Appendix B), TCF is permitted to discharge its wastewater to the City's collection system November through March of each year when it produces minimal wastewater. For the remainder of the year, TCF discharges to effluent spray fields Table 4-5 presents the discharge limits for the flow, BOD_5, TSS and pH to the City's WWTF per NPDES Permit.

Table 4-5: TCF Discharge Limits (Permit No. ST0005507)

Parameter	Average Monthly	Maximum Daily
Flow	Not applicable	100,000 gpd
BOD_5	2,043 mg/L	3,957 mg/L
TSS	250 mg/L	445 mg/L
Residual Chlorine	Not applicable	0.05 mg/L
pH		5.5 - 9.0

IHB is another local industrial user that discharges wastewater from brewing activities to the City's collection system year-round. The wastewater collected at IHB is pretreated for pH neutralization before discharging to the collection system. The discharge limits for flow, BOD_5, TSS and pH are established in the contract between the City and IHB executed on November 1, 2019 and presented in Table 4-6. The Contract is located as the appendix to the Permit ST0501278 (see Appendix B).

Table 4-6: IHB Discharge Limits (Permit No. ST00501278)

Parameter	Average Monthly	Maximum Daily
Flow	8,000 gpd	13,000 gpd
BOD_5	19,000 mg/L	25,000 mg/L
TSS	5,000 mg/L	8,000 mg/L
pH	≥ 5.5 and < 9	

The historical DMR data were obtained for these two industrial users for the period of 2017 to 2021 and a summary of the effluent data is presented in Table 4-7.

DRAFT

Table 4-7: IHB Discharge Data 2017 - 2021

Parameter	2017	2018	2019	2020	2021	Average
TCF+IHB Combined Wastewater						
Flow, gpd	13,629	14,606	13,727	15,212	15,285	14,500
BOD_5, lbs/day	471	435	491	430	429	450
TSS, lbs/day	97	133	68	77	115	100
TCF Wastewater						
Flow, gpd	33,943	32,403	39,866	42,490	42,037	38,100
BOD_5, lbs/day	244	127	226	172	74	170
TSS, lbs/day	34	13	15	23	27	20
IHB Wastewater						
Flow, gpd	4,246	3,889	4,398	3,719	3,698	4,000
BOD_5, lbs/day	500	379	558	446	389	450
TSS, lbs/day	99	54	62	92	72	80

TCF effluent contains less BOD_5 and TSS loads as compared to those in the IHB effluent although its flow was high. The combined flows and loads from the two industries were relatively constant. Because the AADWF occurs during the summer when TCF is not discharging to the WWTF and because IHB's DMRs record daily flows and loads, these two flow streams can easily be separated from the rest of the WWTF's influent flows and loads at any point during the year. By separating out TCF and IHB, the population projections will only be applied to the appropriate portions of the WWTF influent. The average of the combined flows and waste loads from 5 years were added in the projection of AAFs and AALs as described later.

4.3 Projected Wastewater Flows and Loads

The populations, base flows, and the average annual BOD_5 and TSS loads were used to project the influent wastewater AAFs and AALs over a 22-year planning horizon through 2044. The historical peaking factors selected as the design peaking factors were used to project the MMFs, MDFs, PIFs, MMLs, and MDLs corresponding the average values.

The 2015 WWTF Engineering Report contained an analysis of potable water consumption which was used as a proxy for WWTF influent flow generation. The analysis included calculating per capita water consumption rates (53 gpd per capita) and equivalent residential units (ERU) based upon City data during non-irrigation periods of the year. By factoring in the average household contains 2.3 residents and using the assumption that 90% of the water consumed became wastewater, the average ERU generated 122 gpd of wastewater (AADWF). This calculation was revisited using 2016-2021 data which yielded a lower result (99 gpd/ERU).

A 2014 study by King County (*Updated Planning Assumptions for Wastewater Flow Forecasting July 2014*, King County) calculated water consumption rate for inside Seattle and outside Seattle were established to be 46 and 54 gpd per capita respectively. The 53 gpd per capita calculated in the 2015 WWTF Engineering Report is in line with these calculations and is a more conservative planning number than the more recent calculation and therefore is used for the projections.

By applying the known population number and average per capita wastewater influent generation, the size of the WWTF influent flow can be determined. Likewise, by subtracting the

residential flow from the AADWF, the remaining flow is from commercial connections to include CWU (Table 4-8).

As per the 2021 Comprehensive Plan, commercial and residential flows are anticipated to grow at the same rate (i.e., 2 percent) and therefore maintain the same relative ratios. Therefore, the base flow at the WWTF was assumed to be increased proportionally to sewer service population. Table 3-8 summarizes projection for the base flow, residential flow and commercial flow and the corresponding equivalent residential units (ERU).

Table 4-8: Ellensburg Population and WWTF AADWF Flow Projection 2022-2044

Year	Sewered Population	AADWF MGD	Residential Flow[1] MGD	Commercial Flow[2] MGD
Historical Average[3]	20,606	2.10	1.09	1.02
2022	21,761	2.23	1.15	1.08
2034	27,578	2.83	1.46	1.37
2044	33,617	3.45	1.78	1.67

Notes:

(1) Residential flow estimated assuming 53 gpdc.
(2) Commercial flow estimated by subtracting Residential flow from Annual Average Dry Weather Flow.
(3) Average from 2016 through 2021.

Design flows are projected through the planning period by relating historical base flow to the corresponding average annual flow and the design flow peaking factors estimated for the maximum month flow, maximum day flow and the peak instantaneous flow. The projected design flows are summarized in Table 4-9 below.

DRAFT

Table 4-9: Ellensburg WWTF Projected Influent Wastewater Flows 2022-2044

Flows	Peaking Factors	2022	2034	2044
AADWF, MGD	N/A	2.2	2.8	3.4
AAF(1), MGD	1.49	3.3	4.2	5.1
MMF(2), MGD	1.97	6.6	8.3	10.1
MDF(3) , MGD	2.23	7.4	9.4	11.5
PIF(4) , MGD	See Note 4	11.7	13.9	16.1

Notes:
(1) AAF = AADWF x peaking factor of AAF/BF+0.015 MGD (Historical AAF from TCF+IHB from Table ES1-2).
(2) MMF = AAF x peaking factor of MMF/AAF.
(3) MDF = AAF x peaking factor of MDF/AAF.
(4) PIF = 2024 AAF x 3.50 (Historical peaking factor of PIF/AAF) + Added AAF x population-based peaking factor (2.51 for 2034 and 2.43 for 2044, respectively).

The highest BOD_5 and TSS generation rates estimated from the historical data were 0.20 and 0.17 lbs/day/c respectively, which are comparable to typical per capita TSS and BOD_5 loading of 0.2 lbs/day. The AAL was estimated based on these generation rates and the population with the addition of the historical average load from the TCF and IHB. The MML and the MDL were estimated by applying the design load peaking factors to the AAL. The projected waste loads are presented in Table 4-10 below.

Table 4-10: Ellensburg WWTF Projected Influent Wastewater BOD_5 and TSS Loads 2022-2044

Loads	Peaking Factors	2022	2034	2044
AA BODL(1), lbs/day	N/A	4,800	6,000	7,200
AA TSSL(2), lbs/day	N/A	3,800	4,800	5,800
MM BODL(3), lbs/day	1.32	6,300	7,900	9,500
MM TSSL(4), lbs/day	1.39	5,300	6,700	8,000
MD BODL(5), lbs/day	1.63	7,800	9,800	11,700
MD TSSL(6), lbs/day	2.18	8,300	10,500	12,600

Notes:
(1) AA BOD_5 Load = 0.20 lbs/day/c x population + historical AA BODL of TCF and IHB (450 lbs/day).
(2) AA TSS Load = 0.17 lbs/day/c x population + historical AA TSSL of TCF and IHB (100 lbs/day).
(3) MM BOD5 Load = peaking factor of MM BODL/AA BODL x AA BODL.
(4) MM TSS Load = peaking factor of MM TSS/AA TSSL x AA TSSL.
(5) MD BOD5 Load = peaking factor of MD BODL/AA BODL x AA BODL.
(6) MD TSS Load = peaking factor of MD TSS/AA TSSL x AA TSSL.

WWTF staff completed an extensive sampling and testing program for 10 consecutive days, from 7 June 2022 through 16 June 2022. The sampling and testing event included influent flow, chemical oxygen demand (COD), BOD_5, total Kjeldahl nitrogen (TKN), ammonia, and TSS among other parameters. The results were used establish a wastewater flow characterization for the WWTF. From the received and analyzed data, the ratio of the average annual TKN to the average annual influent BOD_5 is estimated to be 0.19 in the sampling analysis and was used to project influent TKN loads (TKNL) as presented in Table 4-11.

DRAFT

Table 4-11: Ellensburg WWTF Projected Influent TKN Loads 2022-2044

Loads	2022	2034	2044
AA TKNL, lbs/day	910	1,140	1,370
MM TKNL, lbs/day	1,200	1,500	1,810
MD TKNL, lbs/day	1,480	1,860	2,220

The current NPDES permit (Permit No. WA0024341, see Appendix A) for the WWTF was issued in November 2018 and will expire in December 2023. Influent limits from the current NPDES permit are summarized in Table 4-12.

Table 4-12: Ellensburg WWTF Existing NPDES Permit Influent Limitations

Parameter	Influent Permit Limit
Maximum Month Design Flow	8.0 MGD
Peak Instantaneous Design Flow	15 MGD
BOD_5 for Maximum Month	10,000 lbs/day
TSS for Maximum Month	8,000 lbs/day

Updated flow and load projections were compared with actual historical data, as presented on Figure 4-4 through Figure 4-7. The projections indicate that the WWTF will reach its permitted influent flow capacity within the next 10 years while its permitted influent BOD_5 and TSS limits will be reached outside of the 2022-2044 planning period.

DRAFT

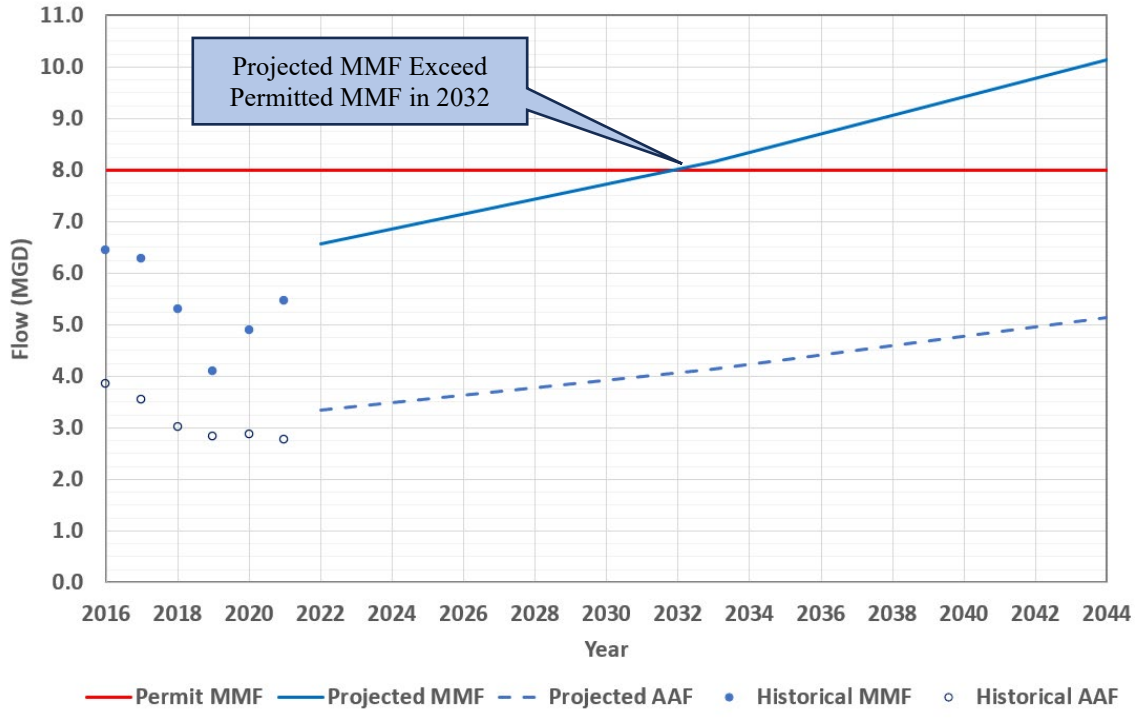


Figure 4-4: Projected Influent AAF and MMF

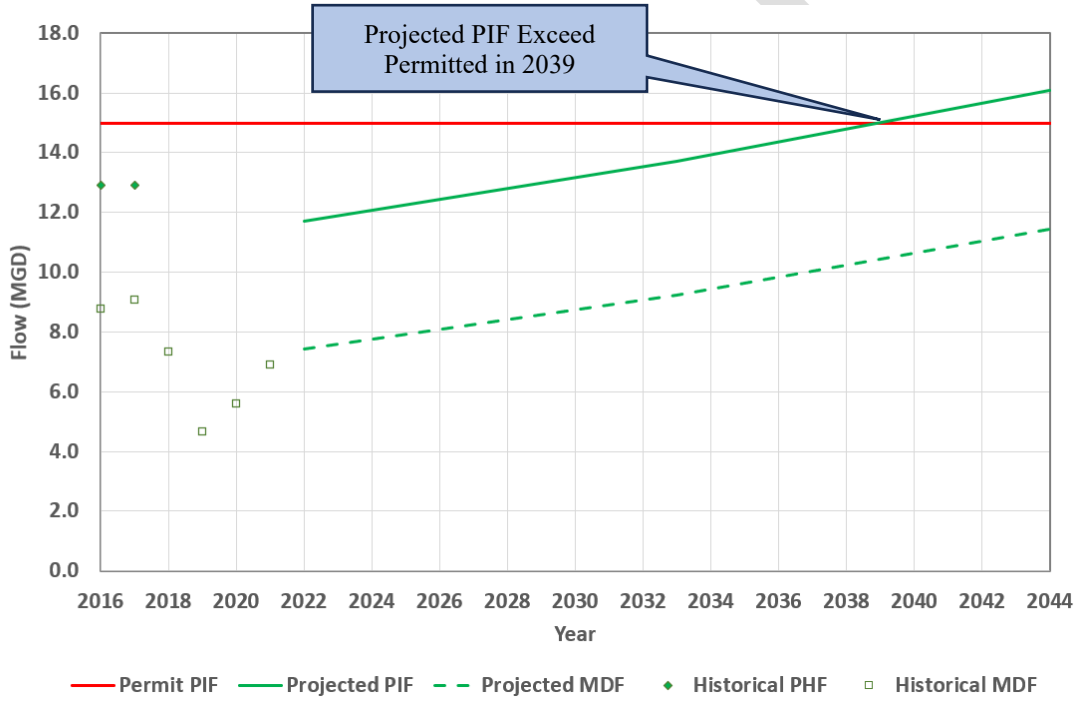


Figure 4-5: Projected Influent MDF and PIF

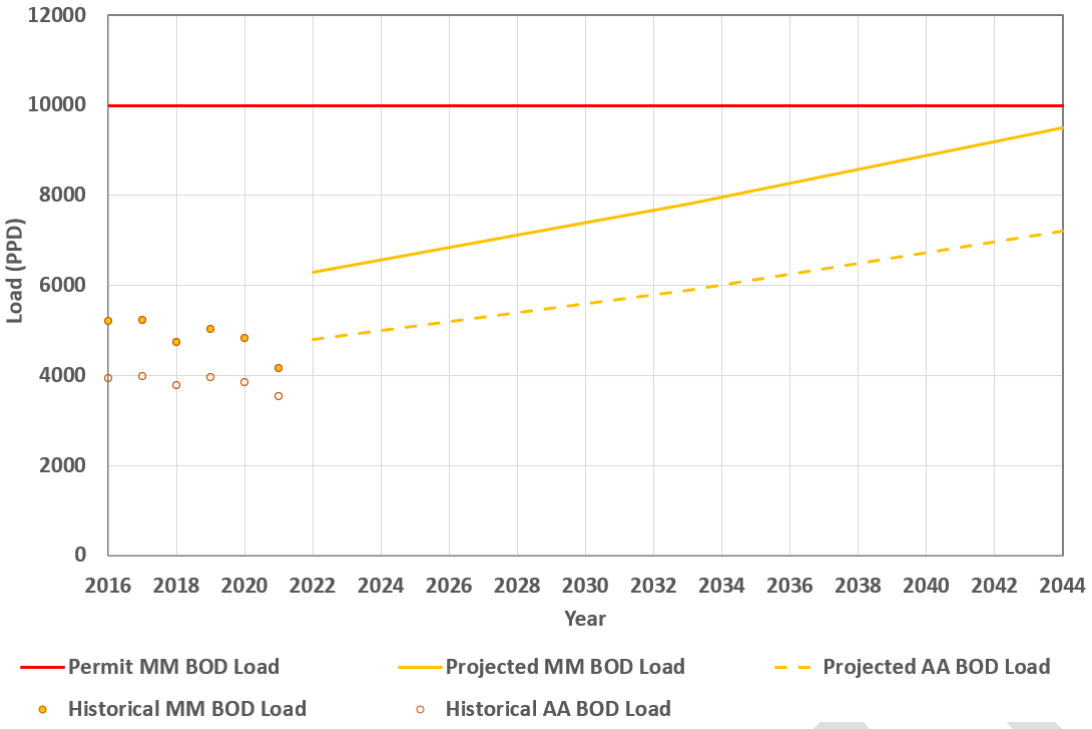


Figure 4-6: Projected Influent BOD_5 Load

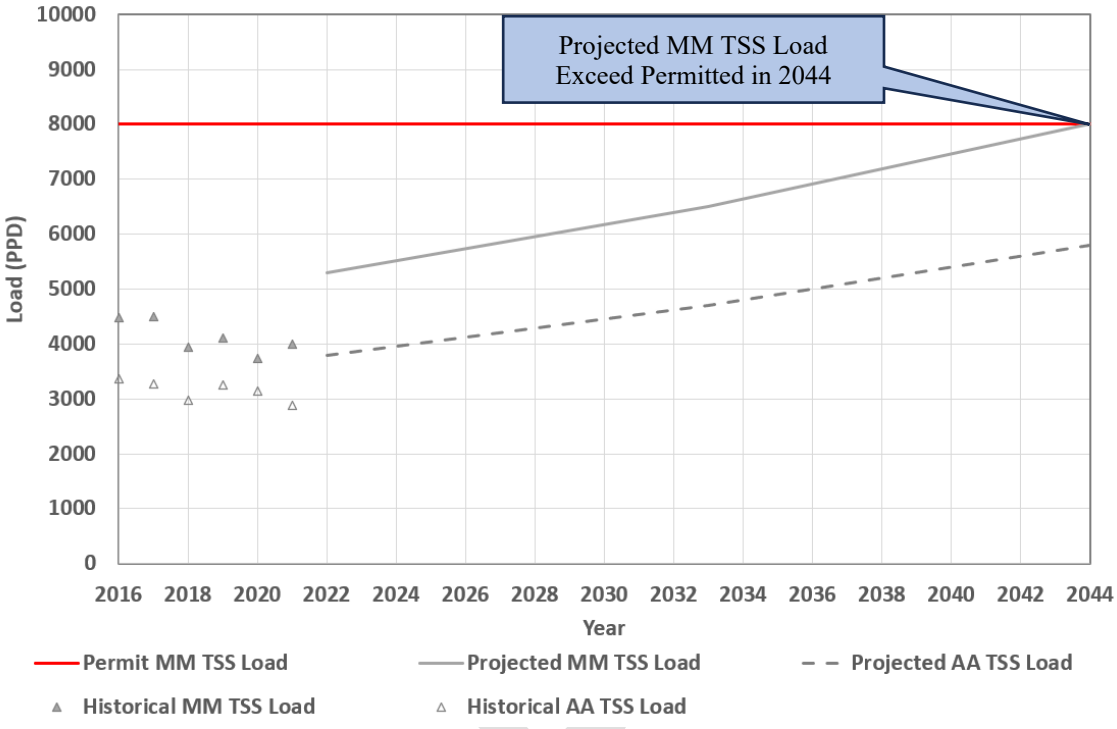


Figure 4-7: Projected Influent TSS Load

4.4 Design Criteria

The projected influent conditions were compared with the influent conditions allowed in the current permit and the design criteria were selected using the greater value of the two conditions. The design criteria are summarized in Table 4-13 and are used for WWTF capacity assessment and evaluation of expansion and upgrade alternatives.

Table 4-13: Summary of Design Criteria

Parameter	Design Criteria	Permit	2044
AAF, MGD	5.1	NA	5.1
MMF, MGD	10.1	8.0	10.1(3)
MDF, MGD	11.5	NA	11.5
PIF, MGD	16.1	15.0	16.1(3)
AA BOD_5 Load, lbs/day	7,600(1)	7,600(1)	7,200
MM BOD_5 Load, lbs/day	10,000	10,000	9,500
MD BOD_5 Load, lbs/day	12,300(1)	12,300(1)	11,700
AA TSS Load, lbs/day	5,800(1)	5,800(1)	5,800(3)
MM TSS Load, lbs/day	8,000	8,000	8,000(3)
AA TKN Load, lbs/day	1,400(2)	1,400(2)	1,400(3)
MM TKN Load, lbs/day	1,900(2)	1,900(2)	1,800
MD TKN Load, lbs/day	2,300(2)	2,300(2)	2,200

Notes:

(1) The conditions are derived from the design peaking factors based on the maximum month loads.
(2) The TKN to BOD5 ratio of 0.19 applied to BOD5 Load..
(3) Projected 2044 parameters that meet or exceed design criteria or permitted values.

DRAFT

Section 5: Existing Wastewater Facilities

5.1 Introduction

This Section of the GSP evaluates the City's existing wastewater treatment facilities at the WWTF. This assessment determines the condition of existing treatment infrastructure and its ability to treat current and projected flows and loads and to meet NPDES permit discharge requirements. Systems impacted by permit or capacity issues are further detailed in Section 8 The evaluation includes a description of the current capacity and condition of the WWTF processes and identifies deficiencies and areas for improvement to inform recommendations for future system upgrades and expansions. The following sources of information were referenced for this section:

- 2018 Fact Sheet for City of Ellensburg Wastewater Treatment Facility NPDES permit WA0024341.
- 2015 Report WWTF Engineering Report

5.2 Description of Existing Collection System

The collection system consists of approximately 77 miles of sanitary sewer pipe and one PS. The sanitary sewer pipe material within the City consists of vitrified clay, asbestos cement, concrete pipe, and PVC. Approximately 12 blocks of sewer service have combined sewers. Figure 5-1 presents a map of the overall existing sewer system and is enclosed at the back of this Report.

DRAFT

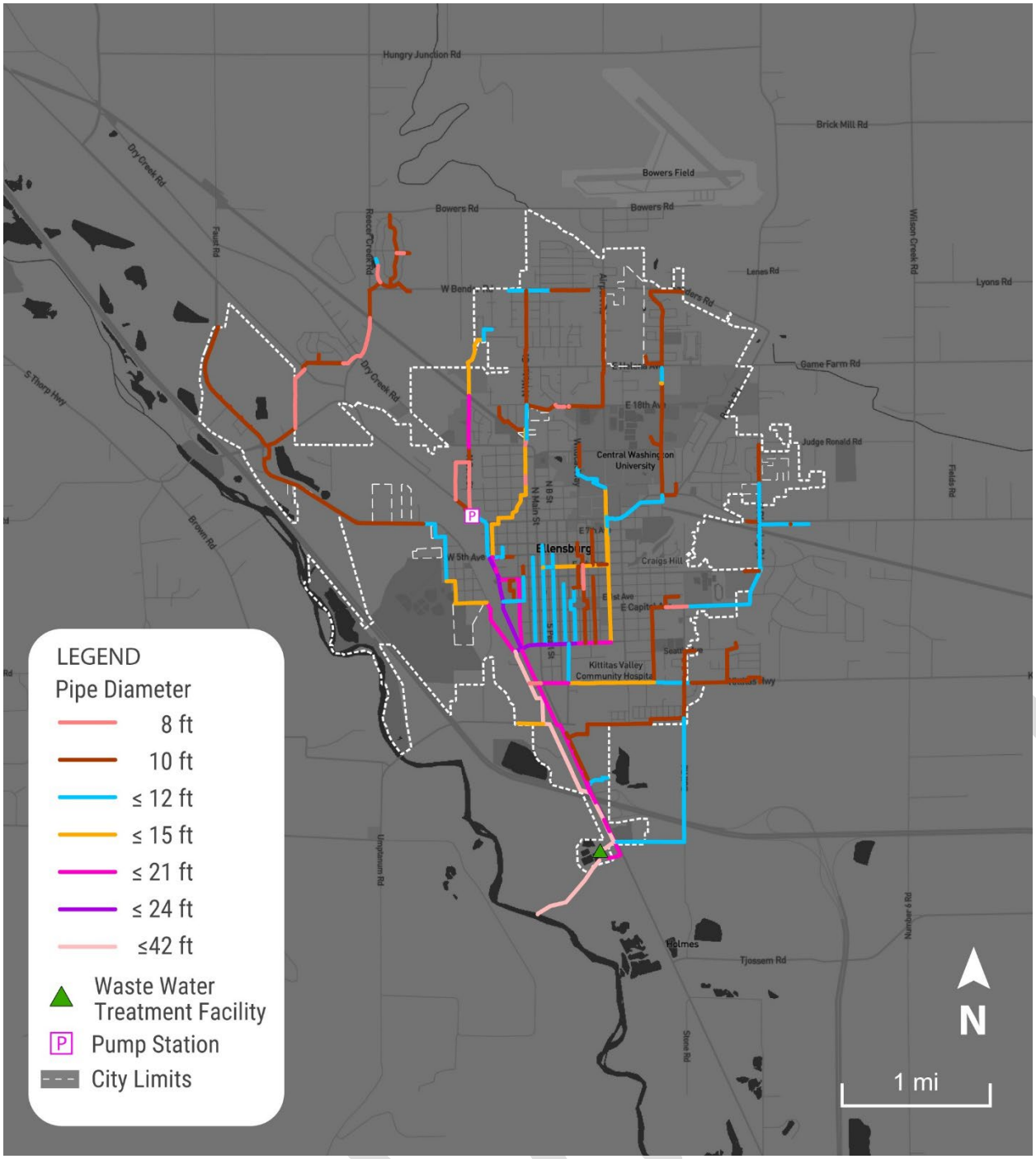


Figure 5-1: Overall Existing Sewer System

5.2.1 Pump Stations

Currently the Cora Street PS is the only active facility, consisting of a concrete wet well with two submersible pumps. The First Avenue PS is currently offline and will no longer be used by the City; it is not addressed as part of this plan. Two additional pump stations are planned for future operation: the Foster Lift Station, which is under construction and expected to be operational soon, and the Mallard Meadows Lift Station, which has not yet been constructed. There are also several privately owned and operated sewage pump stations that are not evaluated as part of this plan. Table 5-1 presents detailed information on the City owned and operated PS.

Table 5-1: Pump Station Information

Characteristic	Cora Street Pump Station
Pump Manufacturer	Hydromatic S4HVX
Quantity of Pumps	2
Type	Submersible, Centrifugal
Capacity at TDH	650gpm
Motor	10 hp
Power	230V/3-phase
Standby Generator	None

Notes:
(1) Two additional pump stations are planned for future service
(2) The Foster Lift Station (currently under construction) and the Mallard Meadows Lift Station (not yet constructed).

5.2.2 Collection System Piping

The City's collection system dates back to the 1930s, when much of the installed pipe consisted of vitrified clay pipe (VCP). From 1960 to 1980 most of the pipe installed was asbestos cement pipe (AC) or concrete pipe, and most pipe since the 1980s, has been PVC pipe. While the City has steadily separated sanitary and stormwater sewers, approximately 12 blocks in the downtown area remain reliant on the combined system.

Figure 5-2 presents a map of the pipe diameters of the existing sewer system and is enclosed at the back of this Report.

DRAFT

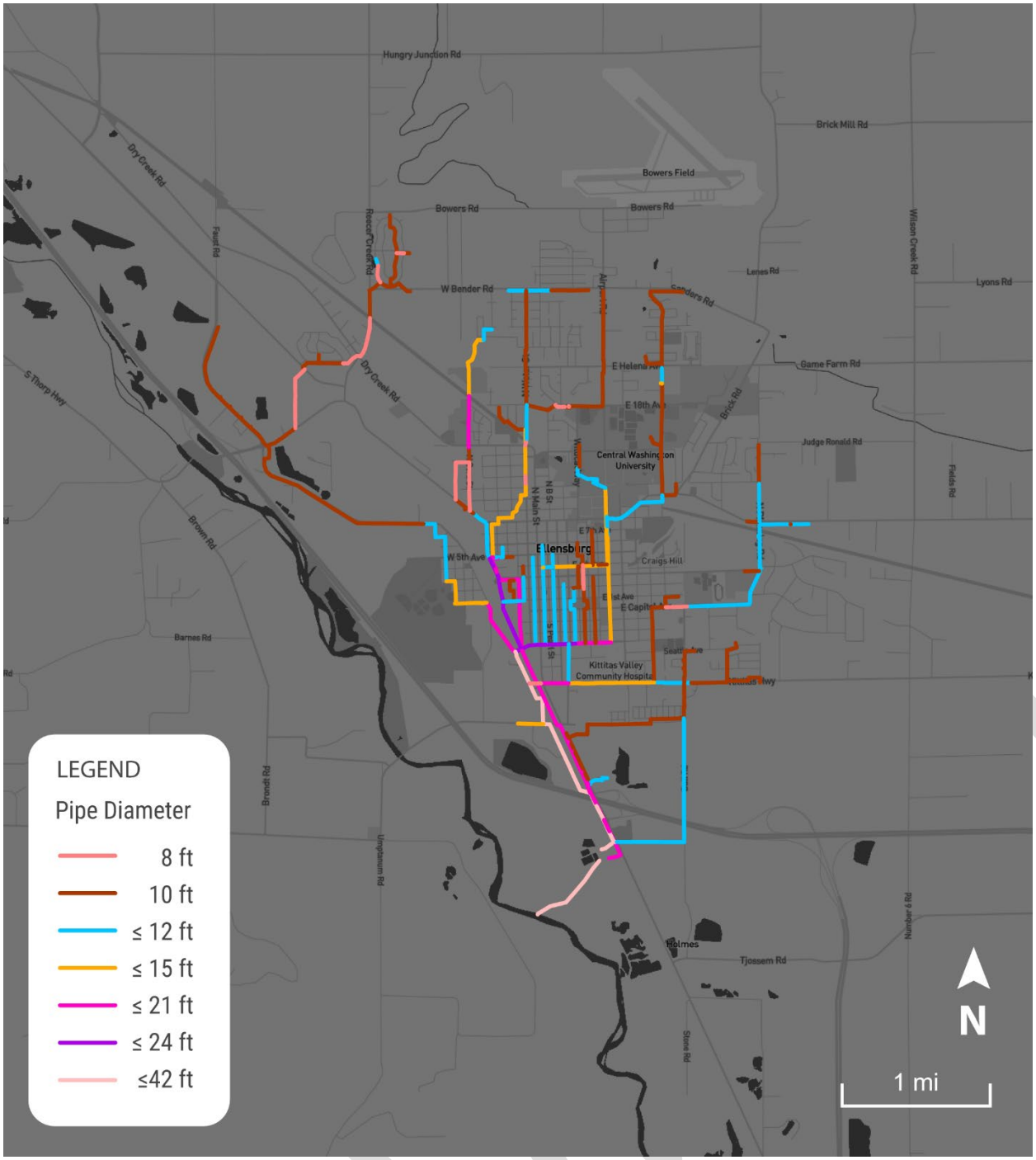


Figure 5-2: Pipe Diameters

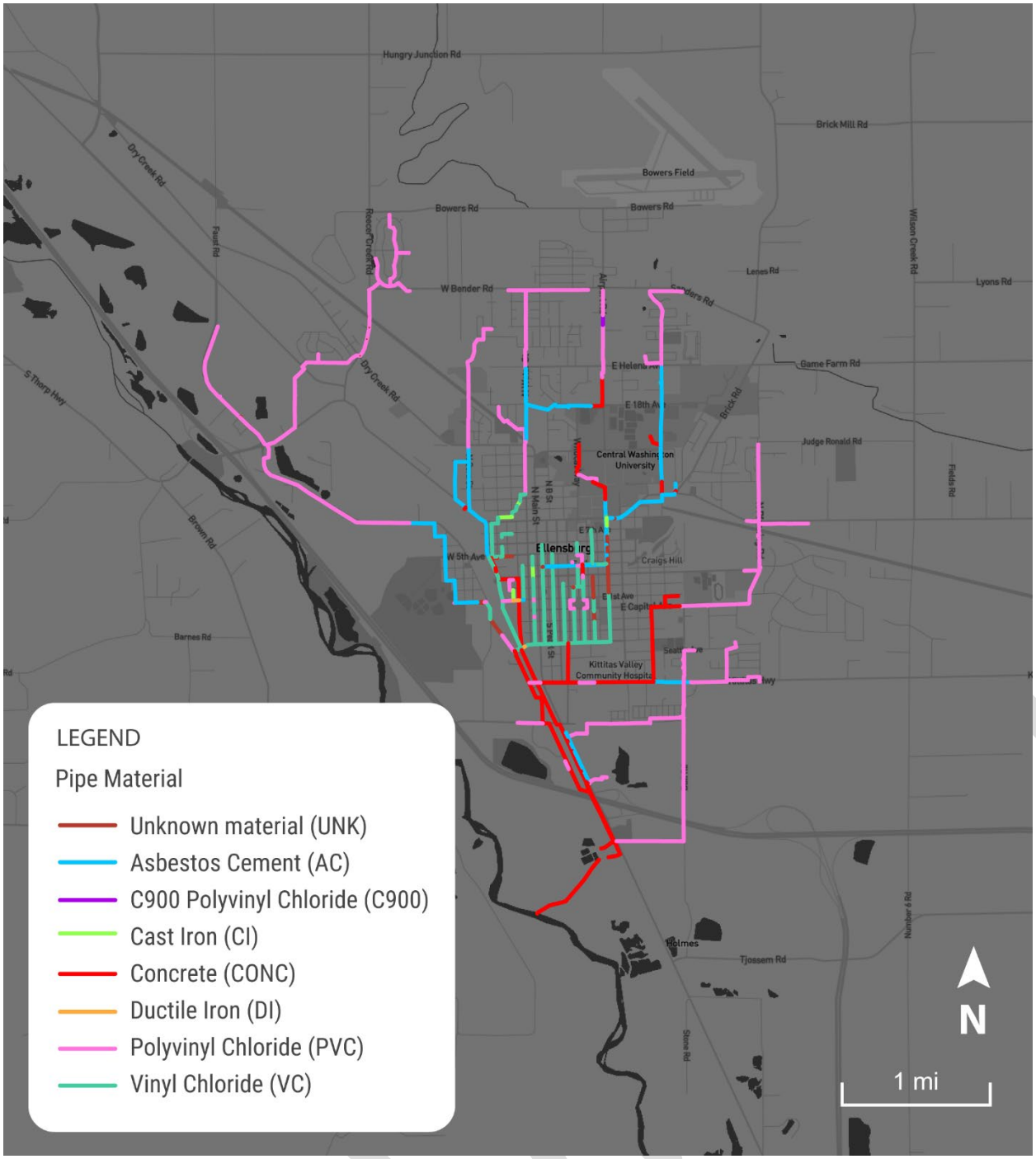


Figure 5-3: Pipe Material

Table 5-2 presents an inventory of collection system pipe material and associated total lengths of pipe.

Table 5-2: Collection System Pipe Inventory

	Length (ft) by Material													
Diameter	**Conc**	**PVC**	**VC**	**AC**	**CI**	**DI**	**L***	**ABS**	**Wood**	**HDPE**	**C900**	**Total Feet**	**Total Miles**	**% Total**
4"	0	0	0	0	0	0	0	0	0	0	1,260	**1,260**	**0.24**	**<1**
6”	7,488	1,485	16,690	1,930	0	0	0	0	0	0	0	**27,593**	**5.23**	**7**
8"	50,840	105,409	23,205	33,890	120	102	730	1,670		0	0	**215,966**	**40.90**	**53**
10"	5,795	36,072	7,830	11,035	335	40	700	0	0	0	325	**62,132**	**11.77**	**15**
12"	1,855	12,826	14,340	10,230	0	78	0	0	0	175	0	**39,504**	**7.48**	**10**
14"	0	0	1,725	4,143	143	0	0	0	0	0	0	**6,011**	**1.14**	**1**
15"	3,320	5,770	3,315	0	0	0	3,145	0	0	200		**15,750**	**2.98**	**4**
18"	1,685	1,345	2,500	0	0	0	0	0	0	0	0	**5,530**	**1.05**	**4**
21"	45	0	0	0	0	0	0	0	0	0	0	**45**	**0.01**	**<1**
24"	0	0	5,075	0	125	0	365	0	0	0	0	**5,565**	**1.05**	**1**
36"	7,720	0	0	0	0	0	0	0	560	0	0	**8,280**	**1.57**	**2**
42"	3,307	0	0	0	0	0	0	0	1,190	0	0	**4,497**	**0.85**	**1**
TC	14,673	0	0	0	0	0	0	0	0	0	0	**14,673**	**2.78**	**4**
Total	**96,728**	**162,907**	**74,680**	**61,228**	**723**	**220**	**4,940**	**1,670**	**1,750**	**375**	**1,585**	**406,806**	**77**	**100**

Conc = Concrete PVC = Polyvinyl Chloride; VC = Vitrified Clay; AC= Asbestos Cement; CI = Cast Iron; DI = Ductile Iron; L = Lined Pipe; ABS = Pressure Pipe; Wood = Wood Stave; Wood = Wood Stave; HDPE = High Density Polyethylene; C900 = PVC Pressure Pipe (force mains)

DRAFT

As described in the table above, the system consists of approximately 77 miles of sanitary sewer. This includes 1,750 feet of wood stave pipe, which served as the interceptor sewer that conveyed wastewater to the original WWTF on Wilson Creek, but was abandoned when the City discontinued using the original WWTF during high flow events.

5.3 Description of Existing Wastewater Treatment Facility

The WWTF is located west of Interstate 90 adjacent to the Yakima River and Wilson Creek in the southern portion of the City limits near Canyon Road and Berry Road. From the 1930s to 1970s, the City had an established collection system and WWTF that provided primary-level treatment. In 1974, the City converted the original plant into a secondary treatment facility. During this time, the City also modified the collection system so that in the event of a major storm the plant reaches maximum capacity, flow could be diverted to an overflow structure to the primary plant. In 2001, the City took this structure offline by isolating it from the sanitary sewer system by permanently sealing the influent pipe with cement.

5.3.1 Flow Path

The WWTF uses an extended aeration activated sludge process for secondary treatment of wastewater. A 42-inch diameter sewer interceptor along Canyon Road conveys wastewater flows to the influent pump station where it is pumped to the plant headworks. The headworks features a grit classifier and drum screens which remove inorganics including grit and debris that can damage equipment and inhibit the activated sludge process. The grit and debris/screenings are collected in containers for off-side disposal at a landfill.

Downstream of the headworks, the flows enter one of two aeration basins. Aeration is provided via floating mechanical aerators which provide air for both mixing and to support the activated sludge process. Effluent from the aeration basins flows to one of two secondary clarifiers where the activated sludge is separated from the effluent via flocculation and settling. Effluent from the secondary clarifiers, also known as secondary effluent, is disinfected using ultraviolet light before ultimate discharge to the Yakima River.

The activated sludge collected from the bottom of the secondary clarifiers is either recycled back to the aeration basins to reseed the activated sludge process or it is wasted. Wasted sludge is thickened using a gravity belt thickener before it is sent to an anaerobic digester for stabilization. From the digester, the digested sludge is stored in lagoons until it can be pumped to drying beds. The dried, stabilized biosolids are stored and then hauled off-site for beneficial reuse via land application. Figure 5-4 shows the Process Flow Diagram for the WWTF as described here.

DRAFT

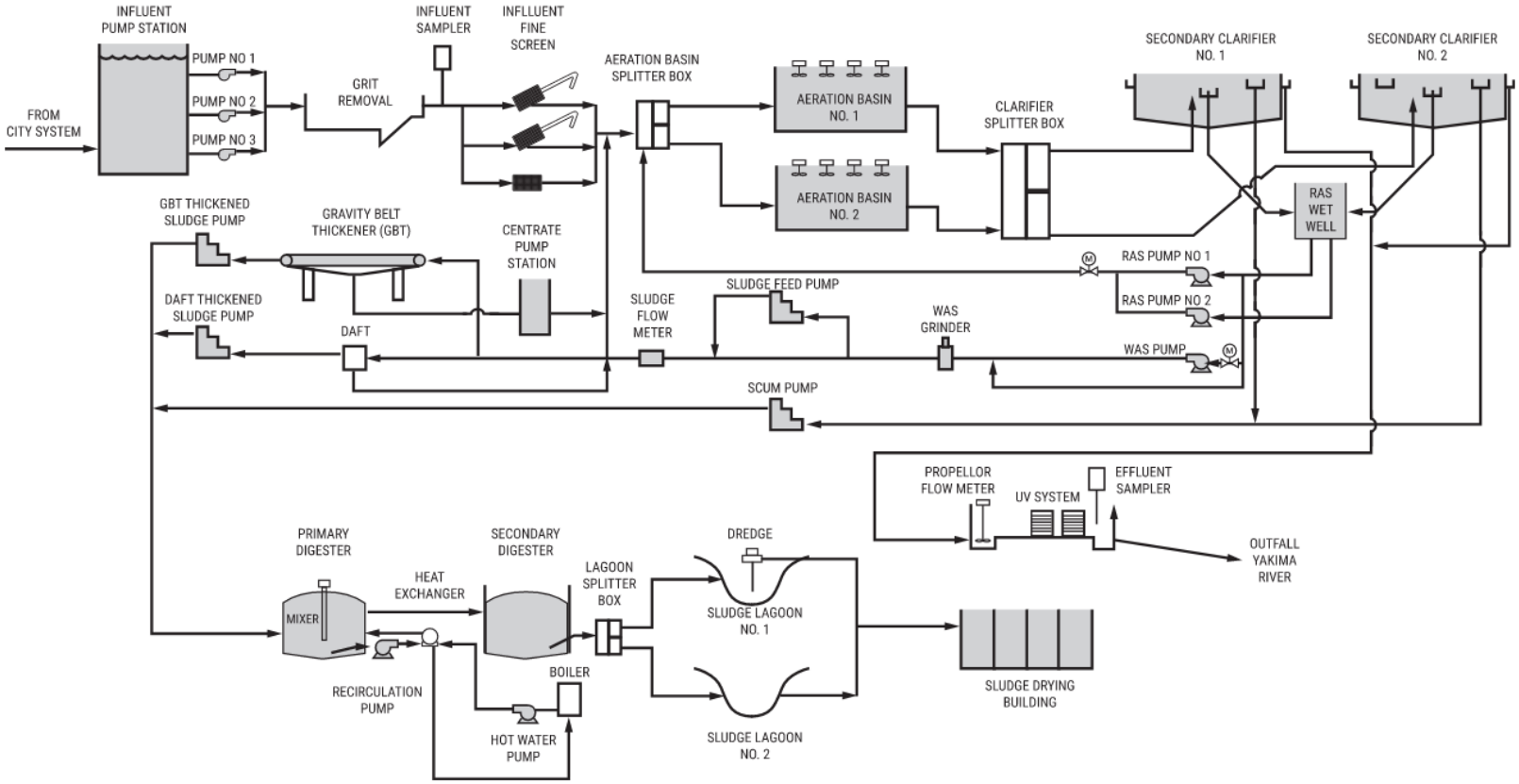


Figure 5-4: WWTF Process Flow Diagram

5.3.2 WWTF Unit Process Descriptions

5.3.2.1 Influent Pump Station

The influent pump station collects wastewater from a 42-inch concrete gravity sewer line. This station features a 26-foot diameter circular reinforced concrete structure, divided into a wet well and a dry well by a one-foot-thick reinforced concrete wall. The wet well is located below ground, while the above-ground portion includes a block building housing pump controls, electrical equipment, and a standby generator for the WWTF.

Raw wastewater flows into the wet well of the pump station, where it is pumped to the grit chamber using one or more of the three centrifugal pumps. Pump operation is automated, with an air bubbler level sensing system monitoring the wet well levels. Two of the pumps are equipped with 100-hp variable speed drives, allowing the system to adjust pump output according to the incoming wastewater flow. This setup reduces the frequency of pump starts and minimizes flow surges into the treatment facility. The third pump, a 60-hp variable speed pump, is utilized during low flow conditions to manage minimum wastewater volumes effectively.

Influent flow metering is available via three exterior mounted magnetic flow meters: one on each IPS pump discharge. Their accuracy is insufficient for process control, so the effluent flow meter is used for flow-paced sampling and other control functions.

5.3.2.2 Grit Chamber and Removal

Raw wastewater arrives from the collection system containing sand, rocks, and other heavy inert solid materials, which are classified as grit. The primary reason for removing grit is to prevent excessive wear on the pumps and other downstream process equipment. Grit will also settle and accumulate in the aeration basin and digesters over time, reducing operational capacity. Grit removal is accomplished by a detritus tank. A screw conveyor (grit washer) with water sprays is used to separate and remove inorganic grit and other readily settable material for disposal. Detention times is typically less than one minute. The grit system is over 50 years old and is showing considerable wear.

5.3.2.3 Headworks Screens/Automated Fine Screens

Influent wastewater flows from the grit chamber to two wedge-wire basket fine screens. The fine screens screen plastics, rags, and other debris larger than 1/4-inch in diameter. In addition to the two mechanical fine-screens, the is a manual bypass bar screen, which is used if the mechanical fine screens are out of service or cannot pass all the influent flow. The mechanical screens convey and dewater screenings in the wastewater flow stream. The dewatered screenings are then discharged into a receptacle for landfill disposal.

The mechanical screen operates automatically based on water levels. As screenings accumulate, they raise the upstream water level, triggering the screen to activate. Solids are collected by a scraper and transported up a tube, where they are compacted, washed, and dewatered by an auger with water sprays. Drain water is returned to the channel, while solids are discharged into a dumpster.

DRAFT

The peak hydraulic capacity with both screens in operation is 15.0 MGD. If the screens become overloaded or fail, influent will overflow to a manual bar screen, which provides basic protection from large debris entering the aeration basin. The City replaced the screen baskets in 2023.

5.3.2.4 Aeration Basins

Flow from the plant headworks enters the aeration basin splitter box, where it mixes with return sludge from the secondary clarifiers. The flow is then distributed into two aeration basins through central pipes. In the basins, microorganisms in the activated sludge break down the incoming waste, which provide food, nutrients, and water. Oxygen is supplied by floating mechanical aerators to support the biological process.

The plant operates a complete mix activated sludge system, ensuring that incoming waste is evenly distributed throughout the basin for efficient oxygen transfer and treatment. This setup minimizes the impact of sudden organic or hydraulic loads.

Effluent from each aeration basin flows over a weir into a 30-inch pipe, which combines into a 42-inch pipe leading to the secondary clarifier splitter box. The overflow weir in each outlet controls the water level in the basins,

There are 8-50-hp surface aerators in the aeration basin. Each aerator has an oxygen transfer rate of 2.8 lbs/hp/hour, providing a total oxygen transfer of 1,120 lbs/hour. At a rate of 2.0 lbs/hp/hour, the total would be 800 lbs/hour.

Currently, the aerators are operated in a staggered "on/off" mode to conserve energy. Each aerator runs about 75% of the time, leaving the surrounding area anoxic for the remaining 25-percent. Denitrification can occur during the off time, which may help reduce aeration demand by using nitrate as an oxidant and allowing for alkalinity recovery.

5.3.2.5 Secondary Clarifiers

After treatment in the aeration basins, the mixed liquor flows by gravity to a splitter box near the RAS pump station. The flow is divided between two 85-foot diameter secondary clarifiers, where biological solids settle and are separated from the effluent.

Most of the settled biological solids (activated sludge) are removed through sludge withdrawal pipes connected to the rotating clarifier mechanisms. The sludge flows by gravity to the sump at the center of the clarifier, then to the RAS pump station, which is discussed in the following Section. From there, the return sludge is pumped back to the aeration basin inlet and mixed with incoming wastewater. Solids not returned to the aeration basins are removed as waste activated sludge.

The clarifiers have historically had poor settling sludge due to the bacterial population in the aeration basin. Typically, a well-settling sludge has a sludge volume index (SVI) of between 80 mg/L to 150 mg/L, where SVI is a measure of the settling characteristics of the sludge.

DRAFT

5.3.2.6 Return Activate Sludge

The return activated sludge (RAS) pump station is located between the two clarifiers, with the wet well on the south side of the WWTF. RAS flows by gravity from the clarifiers to the wet well and is pumped back to the aeration basins. While most solids from the clarifiers are returned via the RAS, some are removed as waste activated sludge (WAS), which is thickened and sent to the digestion process. Scum from the clarifiers and final settling tank can also be pumped to the digesters or thickening processes.

The RAS system includes two constant-speed pumps that operate continuously, with a control valve to regulate RAS flow. The sludge return rate is manually set through the valve controller, which adjusts the valve position to maintain a consistent wet well level. This level, measured by a bubbler system, controls RAS flow by establishing a head differential between the clarifier sump and the wet well.

The secondary clarifiers are designed for rapid sludge removal, which prevents septic conditions but leads to low RAS concentrations, typically between 2,500 and 6,000 mg/L. As a result, a higher RAS pumping rate is needed to return sufficient biomass to maintain the desired MLSS in the aeration basins.

The two clarifier RAS systems are connected and operate together, not independently. Sludge is withdrawn from both clarifiers and flows by gravity to a central RAS pump station wet well. Due to differences in pipe lengths and potential blockages, the RAS flow may become unbalanced between the two clarifiers, leading to uneven sludge return rates. This can result in reduced flow from one clarifier compared to the other, especially if one has thicker sludge or if a blockage occurs.

5.3.2.7 Effluent Flow Meter

Effluent from the secondary clarifiers flows to the entrance of the former chlorine contact tank via a 36-inch pipe. At the end of the pipe is a propeller meter. The flow meter signal is used to monitor flow out of the plant and control disinfection. This value is also reported in the WWTF's DMRs. Presently the City's NPDES permit requires only effluent flow measurement

5.3.2.8 Ultraviolet Disinfection

Secondary effluent flows to the final settling tanks and then to the ultraviolet disinfection system (UV), located in the area previously used for chlorine disinfection. The UV building was constructed over part of the former chlorine contact tank, while the remaining portion serves as a settling tank, now covered with aluminum to prevent algae growth. Effluent disinfection reduces the concentration of pathogenic microorganisms to safeguard water quality in the receiving stream

The UV system is a Trojan 3000 low-pressure system installed in 1991. After passing through the covered final settling tanks, the flow enters the UV building, where the UV bulbs are suspended horizontally in the flow channels, parallel to the flow. Once disinfected, the treated effluent is discharged into the Yakima River through a single outfall pipe.

DRAFT

5.3.2.9 Effluent Outfall

The outfall pipe is buried in the bed of the Yakima River and extends about 48 feet from the shore and is part of the original 1974 installation. The section from the last manhole to the diffuser is made of 48-inch diameter corrugated metal pipe, capped with concrete. It ends in a diffuser consisting of six vertical steel pipes, spaced four feet apart, extending just above the riverbed and pointing downstream. Each 14-inch diameter pipe has a 10-inch diameter orifice. The minimum water depth above the diffuser is approximately 10 feet.

5.3.2.10 Solids Treatment Facilities (Solids Stream Process)

The WWTF's solids treatment facilities include a waste activated sludge pump, sludge feed pump, gravity belt thickener (GBT), dissolved air flotation thickener (DAFT), primary and secondary anaerobic digesters, a sludge lagoon, and drying beds. Class B biosolids are produced through anaerobic digestion. Under WAC 173-308, anaerobic digestion is recognized as a method for significantly reducing pathogens, meeting Class B pathogen reduction standards if the mean cell residence time in the digester exceeds 15 days at temperatures between 35°C and 55°C. Vector attraction reduction is achieved when the volatile solids in the are reduced by at least 38% during the digestion process. The City currently uses a gravity belt thickener with a DAFT unit for redundancy. The DAFT was installed as part of the original WWTF and can be used when the gravity belt thickener is out of service. The thickened sludge is sent to the primary digester which uses a draft tube mixer. The digester is heated by a single boiler and heat exchanger.

5.3.2.11 Waste Activated Sludge

A portion of the activated sludge, called waste activated sludge (WAS), is removed to maintain the desired SRT and MLSS in the aeration basin. This is done either by the WAS pump in the recirculation pump station or the sludge feed pump in the thickening room, which pumps to the GBT or DAFT. A flow meter in the thickening room measures the WAS flow. A sludge grinder system in the WAS line grinds all sludge to protect the thickening equipment. The grinder is interlocked with both the WAS and sludge feed pumps, ensuring it operates during the wasting cycle. Scum pumping is manually controlled, with scum from the secondary clarifiers and abandoned chlorine contact tank pumped daily to the primary digester.

Both the WAS and sludge feed pumps serve to waste sludge to the GBT or DAFT. The WAS pump was installed in 2010 during the GBT upgrade, while the sludge feed pump dates back to the centrifuge installation in 1982. Thickening reduces the volume of sludge sent to the anaerobic digesters, minimizing the required digester volume and heating. A polymer solution is mixed with the waste sludge before it enters the GBT or DAFT to improve flocculation and thickening.

The GBT thickens sludge by draining free water through a porous belt. Thickened sludge is removed to the digester system, while the filtrate is discharged to the centrate pump station and returned to the aeration basins. The DAFT serves as a backup to the GBT. It uses dissolved air released as microscopic bubbles that float the sludge to the surface, where it is scraped off and pumped to the primary digester. The remaining water flows by gravity back to the aeration basin.

5.3.2.12 Anaerobic digesters

The anaerobic digesters treat waste sludge thickened in either the GBT or DAFT units, along with scum from the secondary clarifiers. The primary digester is mixed using a roof-mounted draft tube mixer to keep solids suspended. As fresh sludge enters the primary digester, an equal volume of mixed sludge is displaced into the secondary digester. The secondary digester, which is not mixed or heated, serves primarily as a settling and storage tank, allowing solids to settle while some digestion still occurs.

Liquid from the secondary digester, called digester supernatant, overflows into the aeration basin inlet. It contains nitrogen, phosphorus, and suspended solids, and has a high oxygen demand. The settled sludge solids are then either conveyed by gravity or pumped to the sludge lagoon.

Gas produced during digestion is collected in the floating dome of the secondary digester and used to fuel the boiler, which heats the primary digester to maintain a temperature of about 35°C.

5.3.2.13 Sludge Storage Lagoons/ Sludge Drying Beds

Biosolids from the anaerobic digestion process are conveyed to one of two sludge lagoons by gravity or pumping. The lagoons serve as storage facilities, allowing for additional stabilization and liquid-solid separation. The clarified liquid (supernatant) from the lagoons is returned to the plant influent. Solids are removed using a dredge and pumped to the drying beds, though the sludge grinder originally installed for this purpose is no longer in use.

Since the installation of fine screens in 1991, inert solids in the lagoons have significantly decreased. Dredging the sludge lagoons is an ongoing, weather-dependent activity. Typically, one lagoon is filled for a year while the other is emptied, with WWTF staff alternating between them annually. Lagoon levels are managed via an adjustable telescoping valve in the decant structure, directing supernatant flow to the influent pump station.

Sludge dredged from the storage lagoon is conveyed to drying beds for final drying and disposal. The drying beds, built in 1982 with two additional beds added in 1993, consist of concrete walls and a paved floor. Some originally had drains, but these are no longer in use. The primary function of the drying beds is to further dewater the sludge under natural conditions, reducing volume and disposal costs. The drying beds are not required to meet Class B biosolids standards, as these are achieved through anaerobic digestion.

DRAFT

Section 6: Business Risk and Vulnerability Assessment

The City's GSP preparation kicked off with a four-day Business Risk and Vulnerability Assessment (BRVA) workshop series where City staff gathered to discuss their various systems, operational risks, potential modes of failure, and opportunities for improvement. City staff from operations and maintenance (O&M), engineering, and management were included in these conversations. This gathering of City stakeholders ensured a comprehensive analysis of the City's risks by discussing potential failures and their impact on the City's business plan. The BRVA is designed to baseline unit process and system performance, vulnerabilities, and failure modes based on input from stakeholders. Institutional knowledge is collected from City staff along with record data to review performance objectives and identify known functional failures and risks.

The BRVA outcomes prioritize needs using a relative risk score and profile to direct attention to the most critical systems. Unit processes are prioritized based on consequential ranks, asset vulnerabilities, organizational vulnerabilities, and opportunities for improvement.

6.1 BRVA Workshop Series

Record documents were collected by KJ to generate a basic asset hierarchy of unit processes within the WWTF and collection system. Using this asset hierarchy, the framework and agendas for the BRVA workshop series were compiled and approved by the City. Stakeholders were invited to subsequent meetings allowing KJ to record institutional knowledge and notable areas of concern. Key discussion points during each workshop focused on asset and process performance, maintenance management, safety management, and document management. The BRVA workshop series agenda is outlined in the table below:

Table 6-1: BRVA Workshop Agenda

Date	Workshop	Description	Attendees [1]
May 23, 2022	Service Levels, Corporate Risk Matrix Development	City's Vision & Mission, Agency Performance Objectives, Consequence of Failure Identification & Impact Scale, System Condition Scale, and BRVA Workshop Outline & Approval	1, 2, 3, 4, 5
May 25, 2022	Workshop 1	Review Elements of the BRVA Tool, general flow path overview and initial concerns, Influent Pump Station, Grit Removal & Fine Screens	1, 3, 4, 5
May 31, 2022	Workshop 2	Aeration Basins, Clarifiers, RAS & WAS Systems, Sludge/Scum Feed System, Centrate, Gravity Belt Thickener, DAFT, Digesters	1, 3, 4, 5

Date	Workshop	Description	Attendees [1]
June 1, 2022	Workshop 3	Lagoons, Drying Beds, Effluent System, UV System, Outfall, Laboratory, Electrical Systems, Collection System, Wrap-up and Review	2, 3, 4, 5

Notes:

(1) **City Management:** Michael Hegleson
(2) **City Engineers:** Derek Mayo
(3) **City O&M Superintendents:** Brad Coffey
(4) **City O&M staff:** Daniel Walker, Bryan Redland, Christopher Holmes, JD Zidby
(Not all in attendance for each workshop referenced)
(5) **KJ:** Gerald Fejarang, Michael Lubovich, Andrew Perez, Mackenzie Capaci, Steven Dutschke, Christopher Baersten (Stoll)

6.1.1 BRVA Goals

The service levels meeting, and subsequent four-part workshop series was planned and implemented to gather key City staff in a single room with the purpose of collecting information on the current state of major assets to determine necessary improvements, while relating it to an agreed upon parameters of operating conditions. The group focused on reviewing equipment conditions, maintenance practices, documentation, and staff concerns that characterize process reliability. Although each facility comes with unique challenges, including maintenance accessibility issues, asset age, design issues, and influent loading changes due to community water conservation measures, they all share common problems relative to reliable documentation control and a history of plant operations and maintenance practices.

6.1.2 Level of Service

The kickoff meeting focused on service levels and the development of a corporate risk matrix based on the City's goals and unique ability to manage and respond to different types of risks. Kennedy Jenks facilitated a conversation to develop a mission and vision statement for the City Publics Works and Utilities Department.

> **Mission**: To resiliently, reliability and transparently manage and provide essential life services including water, wastewater, stormwater, power, streets, solid waste while protecting public safety, the environment and ensuring the City continues to value its small-town character, its residents and businesses through innovative, sustainable and cost-effective practices
>
> **Vision:** To build and proactively maintain a department that sets the standards for tomorrow's generation, and to share our success and support the advancement of the Public Works profession as servant leaders.

Conducting risk analyses are inherently subjective, so the risk matrix serves as a tool to transform the subjective discussion into objective outcomes. The risk matrix helps achieve this by identifying functional failure, business impacts when failure occurs, and using the risk outcomes to streamline prioritization of City needs. City staff were given the opportunity to

DRAFT

develop, refine, review and comment on the risk matrix before it was used during the BRVA workshops to confirm group consensus on the consequences and scoring criteria.

The risk matrix developed for the City is a 5 by 5 matrix that includes condition rating and probability of failure on the vertical access and various levels of consequence along the horizontal access. The risk matrix (Figure 6-1) provides a color-coded illustration of the potential risk as it relates to the system condition rating and consequential criteria.

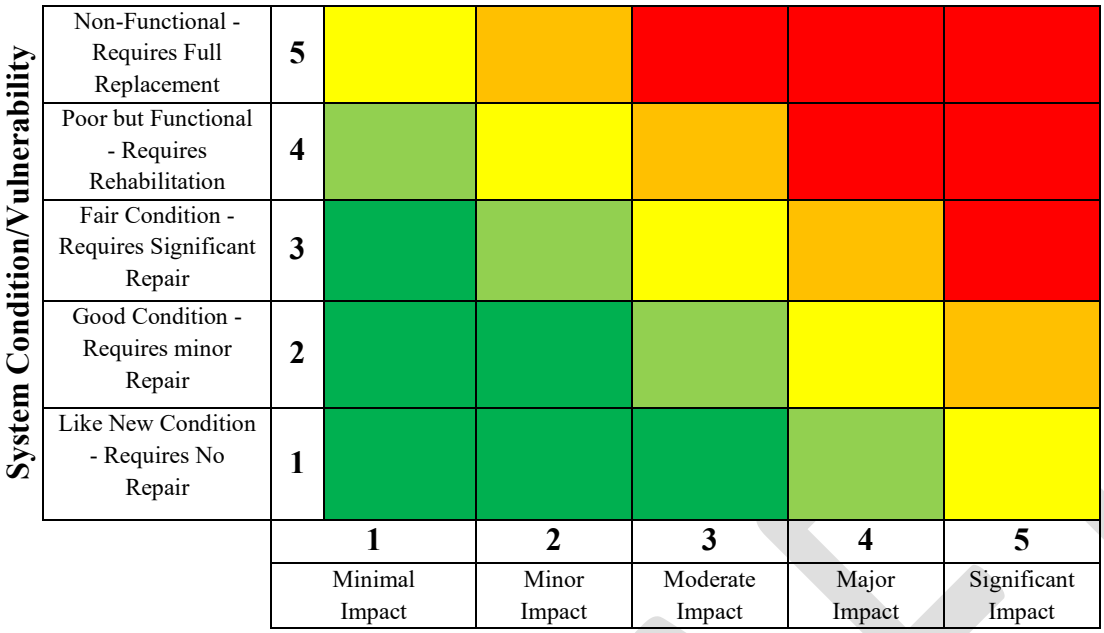


Figure 6-1: City Risk Matrix and Scoring

This matrix was used to develop the risk scores for the BRVA group workshops. In terms of the risk matrix anatomy, the red shaded sections indicate the exposure to risk is high as it relates to likelihood of a threat impacting the asset due to vulnerable condition and significant consequence of failure. The green shaded sections indicate assets in good condition with a low probability and/or minimal consequence of failure. Scoring descriptions and guidance are provided in the following sections. The system level consequential risk determined by the analysis is essentially the product of vulnerability and consequence that results from a failure event.

6.1.3 BRVA Approach

The BRVA approach is intended to bring City management, engineering, and O&M staff together to identify the nexus between business risk, capital improvements, and asset performance to identify the opportune area(s) to manage City assets most effectively. Each staffing outlet offers unique insight into vulnerabilities within the system. Providing an opportunity for each of these groups to openly discuss system concerns establishes a foundation for effective management of assets.

The BRVA approach is centered around a collaborative workshop series with City staff to baseline unit processes and system performance, vulnerabilities, and failure modes. This high-level assessment directs attention to the most critical City wastewater facilities and systems based on consensus from workshop participants. Figure 6-2 illustrates a generic example of how BRVA outcomes are presented to prioritize decision making. System components are ranked from high to low risk based on consequential criticality and business vulnerabilities and can be sorted by plant class or risk type.

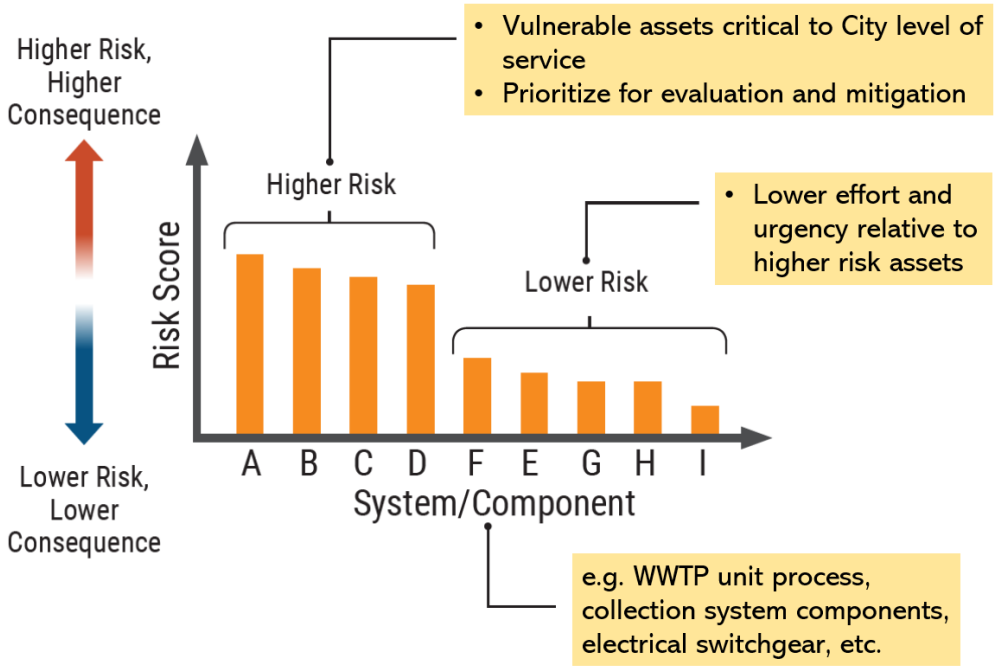


Figure 6-2: Example of Relative Risk Score and Profile

The BRVA workshops were designed to capture an objective opinion of the City's risk, based on a consequential and vulnerability risk assessment of the Division's facilities, systems, and assets. This was completed by evaluating the desired function, ability to meet performance objectives, and existing O&M business processes for each unit process. While a complete profile of every asset is ideal for a comprehensive risk evaluation, for the purposes of this series, assets were allocated into major and minor asset categories. The 9 major system unit processes are outlined below:

- **Aeration Basins**
- **Primary Clarification**
- UV Disinfection
- RAS System
- Anaerobic Digester
- Sludge Lagoons and Drying Beds

Organizing the City's wastewater assets into these unit processes was done based on a review of existing flow diagrams and schematics.

There are four major elements of the BRVA:

The **first element** is to establish functional performance through general knowledge of the system by inquiring about the function of the system, performance criteria expected by the system, the key process indicators that the operator measures to meet system functional performance, and whether a failure event is evident to the operator.

The **second element** is to identify the consequential impact relative to safety, environmental, service quality, public image and fiscal.

The **third element** is to establish vulnerability of the business operating, maintaining and managing City facilities and systems by determining the condition of each unit processes relative to physical condition of the system, the degree of potential safety risks, the abnormal and standard operating procedures, O&M training program, management of change processes, and maintenance management systems.

The **fourth element** of the BRVA is to collaboratively identify improvement opportunities, from a high level, business system improvements including any O&M procedural improvements, replacement of critical assets, or re-engineering of the systems to reduce the vulnerability score.

For each system and asset, the BRVA participants defined the system and assessed the consequence of failure and collective vulnerability of the system by carefully asking a series of strategic questions and applying the scoring approach defined in Section 6.5. The steps outlined in the following table describe the BRVA approach to asset evaluation and align with the first three elements described above. The outcome of the asset evaluation is to identify business system improvements, as described by the fourth element above.

DRAFT

Table 6-2: RVA Approach to Asset Evaluation

Steps	Evaluation	Outcome
Define Asset Functional Attributes	- Functional Statement - Performance Objectives - Failure Modes and Detectability - Potential Improvement/ Mitigation	Compiled notes for each asset according to knowledge collected from City Staff
Assess Consequence of Failure	- Safety - Environmental and Regulatory Impact - Quality of Service/Delivery - Public Image - Fiscal Impact	Each Scored 1 to 5 Each category assigned a weighted multiplier
Assess Collective Vulnerability of Asset	- Existing Condition of Asset - Resiliency - Reliability Engineering Support - Asset Management Strategy - Corrective or One-Time Recommendations	Each Scored 1 to 5 Each category assigned a weighted multiplier

The following section provides a depiction of the weighted values for each of the O&M business elements used to develop an arithmetic mean and determine the vulnerability rating for each unit process as it relates to the condition of each business element. The weighted values can be adjusted based on observations made during the BRVA and based on the results of continued assessments, can then be used to calibrate these results and to make adjustments, as necessary.

6.1.4 Business Vulnerability

The system vulnerability is based on Work Execution Management (WEM), asset condition, training, safety condition, resiliency, and reliability. This condition rates the various business systems and assets that support the operations, maintenance and engineering management that directly impact the vulnerability of the business. If the systems and assets are in excellent condition, then the vulnerability of the business is minimized. However, if the systems and assets are in poor condition, then the vulnerability of the business is greater. The condition ratings, listed in Table 6-3, were used to develop the City's risk matrix.

DRAFT

Table 6-3: Condition Rating and Scoring Criteria

Impacts to City	Weight	Score: 1 Excellent Condition	Score: 2 Good Condition	Score: 3 Fair Condition	Score: 4 Needs Attention	Score: 5 Very Poor
WEM	15%	No Action	Minor corrective action	Major corrective action	Needs Improvements	Strategic Overhaul
Asset Condition	23%	No Action	Minor corrective action	Major corrective action	Rehabilitation/Needs Improvement	Full Replacement
Training	10%	No Action	Minor corrective action	Major corrective action	Needs Improvement	Strategic Overhaul
Safety Condition	30%	No Action	Minor corrective action	Major corrective action	Rehabilitation/Needs Improvement	Full Replacement
Resiliency	20%	No Action	Minor corrective action	Major corrective action	Needs Improvement	Strategic Overhaul
Reliability	2%	No Action	Minor corrective action	Major corrective action	Needs Improvement	Strategic Overhaul

DRAFT

6.1.5 Consequence of Failure (Criticality)

Failure consequence provides a way of rating the business impact of a failure event and is a relative measure of the outcome when a unit process experiences functional failure and impedes intended engineered function of the unit process. Consequential elements were based on the following categories: Public & Staff Health and Safety, Environmental & Regulatory Impact, Quality of Service and Continuity, Public Image, and Fiscal Impact. The specific criteria and relative weight of these categories were reviewed with the City and structured around their business objectives. Table 6-4 displays the criticality scoring matrix developed. The weighting values were approved by City prior to the BRVA workshop series. These weightings are used to calibrate results of the consequence of failure of an asset to determine its criticality to the business.

DRAFT

Table 6-4: Consequence of Failure Scoring

Impacts to City	Weight	Score: 1 Minimal Impact	Score: 2 Minor Impact	Score: 3 Moderate Impact	Score: 4 Major Impact	Score: 5 Significant Impact
Public & Staff Health & Safety	30%	No injury or minor injury – contusions & lacerations, first aid, non-recordable or near miss	Minor to moderate injury – contusions & lacerations w/out lost time - recorded	Moderate injury/lost time or restricted duty – OSHA triggered action	Major serious health issues (acute & chronic) & long-term injuries – disabling	Fatalities
Environmental & Regulatory Impact	25%	No negative impacts on environment, public health, or regulatory compliance. 100% Permit Compliance.	No negative impacts on environment or public health Permit violation – No Action from DOE Possible minor compliance issues related to water quality e.g., items related to secondary standard such as taste and odor, hardness etc.	Minor negative impact on environment and/or public health Permit Violation – Action from DOE Compliance issues – exceed MCL but does not require boil water	Moderate negative impact to the environment and/or public health; Compliance - major permit violation	Significant negative impact to the environment and/or public health; major permit violation Compliance Water quality major permit violation – Have to shut water off
Quality of Service and Continuity	15%	No impacts on service delivery or customers	Localized community impact / minor disruption.	Moderate localized long-term impact. Community short-term service disruption.	Community wide impacts with potential long-term service disruption	Service area-wide impacts or highly acute localized impacts that have long-term service outages
Public Image	10%	No impact, odor complaint, or complaint to staff	No significant social media and no local media coverage. Response managed by staff.	Social media activity and minor local media coverage. City Council may receive complaints to be responded to by staff.	Local media coverage with Board of Directors potentially involved in response. Potential long-term impact to community confidence in the City.	Lead story in local media and/or possible national or industry coverage. Significant impact to community confidence in the City.
Fiscal Impact	20%	0 < $2500 Minor cost that can be covered within an operational or CIP budget authorization	$2500 < X < $25K Costs can be covered by reallocating authorized funding in operational or CIP budgets	$25K < X < $200K Non-emergency requires board to appropriate additional funding	$200K<X<$1M Emergency repair triggered. requires board to appropriate additional funding in an amount that affects the next FY CIP.	X > $1M Emergency repair triggered. requires board to appropriate additional funding in an amount that affects funding availability in multiple future FY's

DRAFT

6.1.6 BRVA Findings

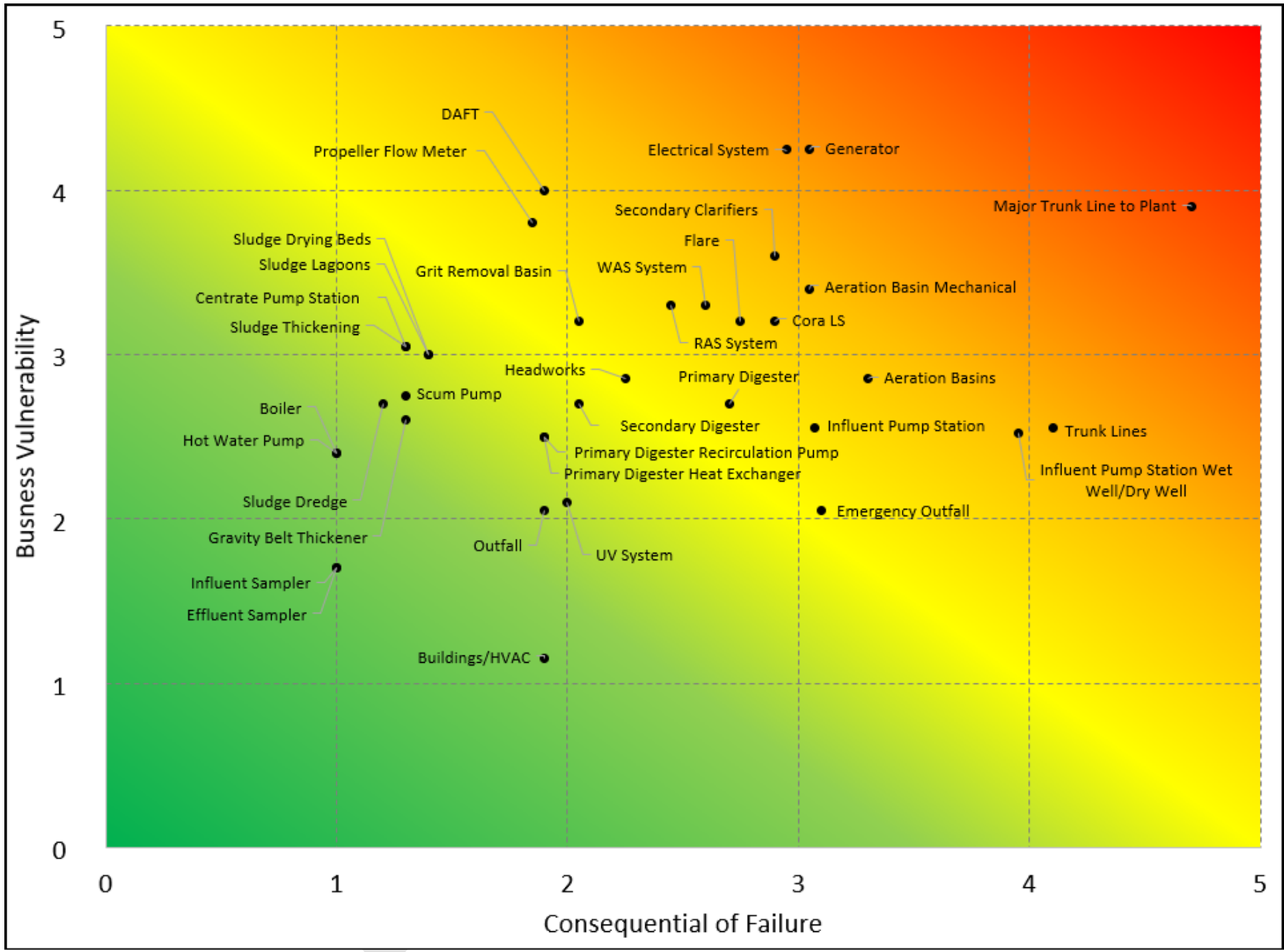
The following subsections summarize the results of the BRVA by the overall process risk scores and highlight the consequential and vulnerability rankings that make up the total risk score.

6.1.6.1 Unit Process Risk Scores

The intent of the BRVA is to identify the most vulnerable unit processes that might impact the performance of the City's facilities and systems; systems that might put the City at risk regarding safety, public regulation, service, image, and economic categories. After the BRVA was completed, risk ranking for each unit process was calculated by taking the weighted arithmetic mean of the criticality scores and multiplying it to the arithmetic mean of the vulnerability scores. Figure 6-3 illustrates the risk score results on a scatter plot for the 36 assets evaluated. Assets shown in the upper right red area indicate risks from a criticality and vulnerability perspective that are higher than those shown in the yellow or green areas. This data visually shows that 20 of the 36 are listed as needs improvements or higher, 13 are in fair condition, and only two assets were denoted as in good condition.

Based on feedback from City staff, the assets considered highly critical and in need of attention are the collection system trunk lines, the WWTF electrical system, secondary clarifiers, the flare, the emergency outfall, and the RAS System.

DRAFT



Unit Process	Risk Score
Major Trunk Line to Plant	18.33
Generator	12.96
Electrical System	12.54
Trunk Lines	10.46
Secondary Clarifiers	10.44
Aeration Basin Mechanical	10.37
Influent Pump Station Wet Well/Dry Well	9.97
Aeration Basins	9.41
Cora LS	9.28
Flare	8.80
WAS System	8.58
RAS System	8.09
Influent Pump Station	7.82
DAFT	7.60
Primary Digester	7.29
Propeller Flow Meter	7.03
Grit Removal Basin	6.56
Headworks	6.41
Emergency Outfall	6.36
Secondary Digester	5.54
Primary Digester Heat Exchanger	4.75
Primary Digester Recirculation Pump	4.75
Sludge Lagoons	4.20
Sludge Drying Beds	4.20
UV System	4.20
Sludge Thickening	3.97
Centrate Pump Station	3.97
Outfall	3.90
Scum Pump	3.58
Gravity Belt Thickener	3.38
Sludge Dredge	3.24
Hot Water Pump	2.40
Boiler	2.40
Buildings/HVAC	2.19
Effluent Sampler	1.70
Influent Sampler	1.70

Figure 6-3: Asset Criticality Heat Map

6.1.7 BRVA Key Observations

6.1.7.1 Business Vulnerability

When assessing an O&M program, identifying the constraints placed on the O&M staff should be the top priority. The O&M staffing constraints can negatively impact how a facility is operated, maintained, and managed. City Management must strive to achieve a delicate balance between risk, costs, and performance/compliance by staffing the facilities with well qualified and the appropriate staffing levels. Anything that constrains the system can significantly impact this delicate balance and should be addressed to prevent forcing O&M staff into a reactive state of operating and maintaining the facility assets. These constraints would likely be further exacerbated by not having adequate business processes/practices in place, which are necessary to sustain system performance. Inadequate business processes/practices could leave the City vulnerable to increased exposure to business risk(s), threat likelihood(s) and/or system functional failure(s). Such business practices are listed below with observations made during the BRVA workshops:

6.1.7.1.1 **Work Execution Management (WEM):**

The BRVA provided a glimpse into how work is executed at City facilities. WEM is the lifecycle of a work order; including identification of an issue, confirmation, documentation, resource planning, work execution, functional review, and close out. It was found that a Computerized Maintenance Management System (CMMS) tool is being used, but not necessarily to its full extent. The City's CMMS tool can be further leveraged to integrate SCADA with additional assets, feed O&M lifecycle data into financial systems, and be used to optimize enterprise planning and performance tracking. A more formalized approach to incorporate information collected during Operator Routine Duties (ORDs) into CMMS would help facilitate workflow uptime and capture undocumented operator knowledge. Where possible, programable work orders based on asset age, seasonal inspection schedules, and manufacturer guidelines should be integrated into CMMS to streamline O&M efforts.

6.1.7.1.2 **Asset Knowledge/Condition:**

In general, staff were knowledgeable about the various systems and their supporting functions. However, there could be issues with data attribute information and documented design intent relative to design specifications and performance expectations. Collection system lines are on a programmed CIPP plan and flushing and relining is regularly performed. At the plant, most notably were concerns over basins that cannot be cleaned or inspected due to lack of capacity. Additionally, it was noted that the electrical units are not regularly assessed and typically cabinets are avoided until there is an apparent issue.

6.1.7.1.3 **Workforce Reliability & Training:**

This practice is key to every asset management program because it connects the physical asset to the human asset. If one wants an asset to perform its expected function, then that asset must be operated and maintained correctly. This is only achieved by ensuring that comprehensive competency-based training is offered by the City.

DRAFT

The BRVA highlighted that the City staff feels sufficiently capable of completely required tasks, but that most knowledge transfer is conducted via peer-to-peer training. While this is not unique to this facility, documented training especially for more specialized tasks is vital for long term retention and growth.

6.1.7.1.4 **Workforce Safety Features and Culture:**

The City maintains strong safety policies and encourages staff to be accountable while performing work. The BRVA identified that while safety practices are in place, and that staff feel adequately safe while working, there are opportunities for greater implementation of physical safety controls (including but not limited to signage, striping, and guarding). There was also specific tasks, such as operating the bubbler for the WAS system, that require O&M to reach over the railings along the deck of the secondary clarifier. This requires breaking the plane of a confined space which could be mitigated with an alternative system. Other safety concerns could be mitigated on a maintenance level, such as replacing all safety life rings around basins and establishing a program for frequent checks on ropes, pests, and dry rot.

6.1.7.1.5 **Process Resiliency:**

There are asset reliability issues in the form of lacking maintenance programs including written and approved Standard Operating Procedures (SOPs), Abnormal Operating Procedures (AOPs) and Emergency Response Plans (ERPs), robust spare parts program, and instances where equipment with the ability to be run in a lead-lag setting in not operated as such. This operational strategy impacts the reliability of equipment and may affect the rate of component level wear and tear, which inherently impacts the mean time between failure and the level of future renewal investments required.

6.1.7.1.6 **Engineering for Maintenance Reliability and Asset Performance Tracking:**

There appears to be room for improvement in this category with respect to documenting system functions at the unit process level, leveraging a formal risk methodology, and using root cause analysis processes for key engineering tools to: 1) support O&M, 2) leverage reliability principles during the development of capital improvement strategies and design projects, and 3) formalize a management of change process. There is a need for a unified framework for strategic asset management programming that allows the integration of capital improvement planning, longer term design planning, and annual budget planning activities across the various facilities and systems. A goal of this GSP is to provide a strategic approach and framework to bridge organizational policies and business activities (e.g., Capital Improvement Projects (CIP) and Maintenance Projects (MP)) for sustaining the City's service level obligations.

6.1.7.2 Consequential Criticality

Understanding the business impact of failures is essential in prioritizing how and where to act when emergencies or unexpected events occur; is this piece of equipment or infrastructure *critical* to bring my process back online? Criticality is not a measurement of how well the piece of equipment or infrastructure is working, but instead evaluates the consequences that would

DRAFT

result from a potential failure. These consequences are broken down below with observations made during the BRVA workshops:

*6.1.7.2.1 **Public & Staff Health and Safety:***

The health and safety of City staff, its residents, and its businesses is crucial to its overall success and is held paramount to other risk attributes. Notable assets that presented concerns around the health and safety of staff and/or the public revealed during the BRVA include the flare, electrical system, DAFT. Flares present an inherent risk due to the nature of gas being burned off. The current height and location of the flare is near vehicle parking and walkways. It was also noted that the flare often must be manually relite. The electrical system needs to have updated arc flash testing completed and select panels should be removed from class 1 division 1 rooms. Similarly, the DAFT is located in the digester control room, which is class 1 division 1 rated, and could pose additional risks.

*6.1.7.2.2 **Environmental & Regulatory Impact:***

The largest concerns to environmental impact are the influent pump station, where if the pumps go out, the sluice gate will overflow raw sewage into the manhole and could discharge into the creek. Staff was also concerned about contamination to the creek if the aeration basins where to fail, as there are unknown conditions as it relates to the basins structural integrity.

*6.1.7.2.3 **Quality of Service & Continuity:***

Continuity of service is critical to the functionality of a system. From the risk assessment, two (2) major assets were identified as high consequence for this delivery: the influent pump station and the primary digester as both could have long term service disruptions

*6.1.7.2.4 **Public Image:***

How the public views and trusts the City's system is vital in ensuring continued growth and investment into needed and desired projects. The City rated their collection system, influent pump station, emergency outfall, and aeration basins most highly critical.

*6.1.7.2.5 **Fiscal Impact:***

In the event of a failure, the collection system trunk lines and the secondary clarifiers were deemed highest consequence, followed closely by the aeration basins, digesters, RAS/WAS system, and the headworks. Major pieces of infrastructure, like clarifiers and digesters will not only increase cost of long-term repair, but the cost of emergency response services for potential bypass and clean-up. It is vital to keep these under preventative maintenance inspection to avoid premature failure.

DRAFT

6.2 Adjusted Risk Scoring

6.2.1 Field Investigations

KJ brought a team to perform prioritized, as-needed condition and performance assessments at the WWTF and PSs for assets identified as risks during the BRVA. Selection of these assets was based on first the overall risk score, and subsequently assets that received scores of 4 and 5 for either their physical condition or safety condition. Assessments focused on rotating and fixed mechanical equipment and structural evaluations. Field investigations included condition assessments at the WWTF and Cora Street PS.

6.2.1.1 Wastewater Treatment Facility Condition Assessment

The team worked over a two-day period to identify major equipment needing to be replaced or rehabilitated. During the BRVA, the following assets were identified for further evaluation:

- **WWTF**
  - Electrical Systems: Generator, MCCs & Panels
  - Secondary Clarifiers: Secondary Clarifiers Rotating & Fixed equipment
  - Aeration Basins: Rotating Equipment
  - Influent PS: Wet well & Drywell structural & Rotating, Fixed, and Linear equipment,
  - Headworks: Grit Removal Basin Rotating & Fixed Equipment, Fine Screens Rotating and Fixed Equipment
  - Solids: Flare, WAS & RAS System, DAFT, Digesters (heat exchanger, recirculation pump, boiler, hot water pump)
- **Collection System**
  - Cora Street PS, including pump draw down testing and visual inspection of Rotating, fixed, linear, visible & non-destructive structural inspection

Notable observations are described below:

Electrical Systems: The Aeration Basin MCC, Power System MCC, RAS System MCC, DAFT MCC, and the Solids System MCC were rates in very poor condition. The Aeration Basin MCCs are ammonia prone and has been abandoned in place. The Solids System MCC has missing parts, many part not per original design, and the bus capacitor appeared to be nonfunctioning. The headworks electrical system was also in poor condition, mixing non-intrinsically safe equipment with intrinsically safe and the spare parts that were available were aged. There is also inadequate spacing for the lighting panel adjacent to the aeration basin switchboard.

DRAFT

Secondary Clarifiers: Mechanical equipment had excessive corrosion on the rake arm, and the while the structural concrete only had minor cracking, there is a safety concern for the lack of a sidewall guardrail in place, as the wall is not tall enough to be sufficient. Additionally, grating should be installed over the splitter box opening. Complete inspection was limited because the clarifier were in use and cannot be drained. Further inspection should be conducted when possible.

Aeration Basins: The floating aerators presented with excessive noise and mechanical corrosion. The structural concrete only had minor cracking, there is a safety concern for the lack of a sidewall guardrail in place, as the wall is not tall enough to be sufficient. No life rings were in place around the basins and kickplates and grating should be installed at the splitter box. Complete inspection was limited because the basins were in use and cannot be drained. Further inspection should be conducted when possible.

Influent PS: There is no flow switch on the seal water and there is evidence of oil leaking on the discharge check valve. The recirculating seal water pumps and piping presented with excess corrosion and were running hot when inspected. The three knife gates were leaking grease, and all showed packing on the discharge valve sticking out. The flow meter is undersized for the rated accuracy required for the suction/discharge pie diameters present. The sump pump exhibited excessive noise, vibration, and corrosion. The sump pump appeared to run dry and cavitation was observed. Floats in the sump were nonfunctional. Extra bracing has been installed for the monorail and there is evidence of corrosion. In relation to accessibility, there are no stairs to the platforms on the suction side, and the ladder is 0.5” too narrow with less than 30” of landing. Staff was unaware of any NFPA 820 gas monitoring.

Headworks: Excessive corrosion was noted on the grit collector. The grit removal basin concrete has extensive efflorescence and while there is evidence that some major cracks have been repaired, there are still prevailing cracking throughout and notable settlement of the surrounding pavement. The auger is functional but has a large structural crack that carries a high probability of failure in the short term. The grit collector coating system has failed. The fine screens showed excessive corrosion on electrical components,

Solids: The primary and secondary digesters have signs of efflorescence and visible cracks, however inspection was limited due to brick on the outside of the tanks. Visible portions appeared in good condition with minor cracking. Digester recirculation pump had excessive corrosion and leaks. The digester gas methane monitor strobe and panel should be moved outside of the building. The flare had minor signs of corrosion and should be considered for relocation. The gravity belt thickener was in good condition. The DAFT is no in operation and has been idle for years according to O&M staff. City should consider fully decommissioning the unit. The centrate pump station had extensive coating failure but only minimal corrosion, and the vertical turbine pump is not functioning and overflows to the drains. The sludge feed pumps are difficult to access and have no electrical disconnects. The piping is being leaking on and lacks sufficient labeling. Should be considered for rebuild. The RAS system valves and piping had excessive vibration when running but overall where in fair condition. The 90-degree elbow to the pump is not anchored and could cause vibration problems. There is not pressure gauges on the suction or discharge pipe and there is corrosion present due to seal water hardness. The WAS system’s feed trough was leaking but pumps were in fair condition. The Scum pump was in poor

DRAFT

condition receiving high scores for both poor physical condition and poor safety observance, with notable leaking. The sludge lagoons had notable cracks in the pavement.

6.2.1.2 Pump Station Condition Assessment

Two of the City's PS were evaluated to identify major equipment needing to be replaced or rehabilitated. The team assessed Cora Street PS and the IPS. The First Street PS was not assessed during this evaluation per direction for the City that this station is planned to be decommissioned. Notable observations are described below:

Cora Street PS: The physical condition of the wet well showed pervasive corrosion, particularly to the steel shell. The site does not have standby power, and the electrical panel is in very poor condition and has reached obsolescence. The station has no telemetry system and O&M rely on local residence to call when the strobe is flashing.

6.2.1.3 Pump Station Performance Assessment

Pump draw down testing was also conducted at the Cora Street PS and the Influent Pump Station.

Cora Street PS: Cora Street PS has two Hydromatic S4HVX submersible centrifugal pumps that rated for a firm capacity of 650 gpm. The draw down assessment at the Cora Street PS saw an average pump rate of 290.5 gpm for Pump 1 and 316.5 gpm for Pump 2.

Influent PS: The IPS has three vertical, non-clog centrifugal pumps. Pumps 1 and 2 are rated for 7,150 gpm and Pump 3 is rated for 4,550 gpm; the draw down assessment indicated the average pump rate for Pump 1, 2 and 3 respectively to be approximately 4,650 gpm, 5,137 gpm, and 3,751 gpm.

The pump draw down testing concluded that Cora Street PS and the IPS are not up to adequate performance specifications. Additionally, it was concluded that Pump 2 pumps approximately 500 gpm more than Pump 1 due to wet well hydraulics and Pump 3 pumps approximately 750 gpm more than the flow meter reads.

6.2.2 Risk Score Validation & Calibration

The condition assessments confirmed many of the findings from the BRVA interviews however some asset scores were recalibrated to reflect existing conditions more accurately. The following graph depicts adjustments made to the BRVA risk scores:

DRAFT

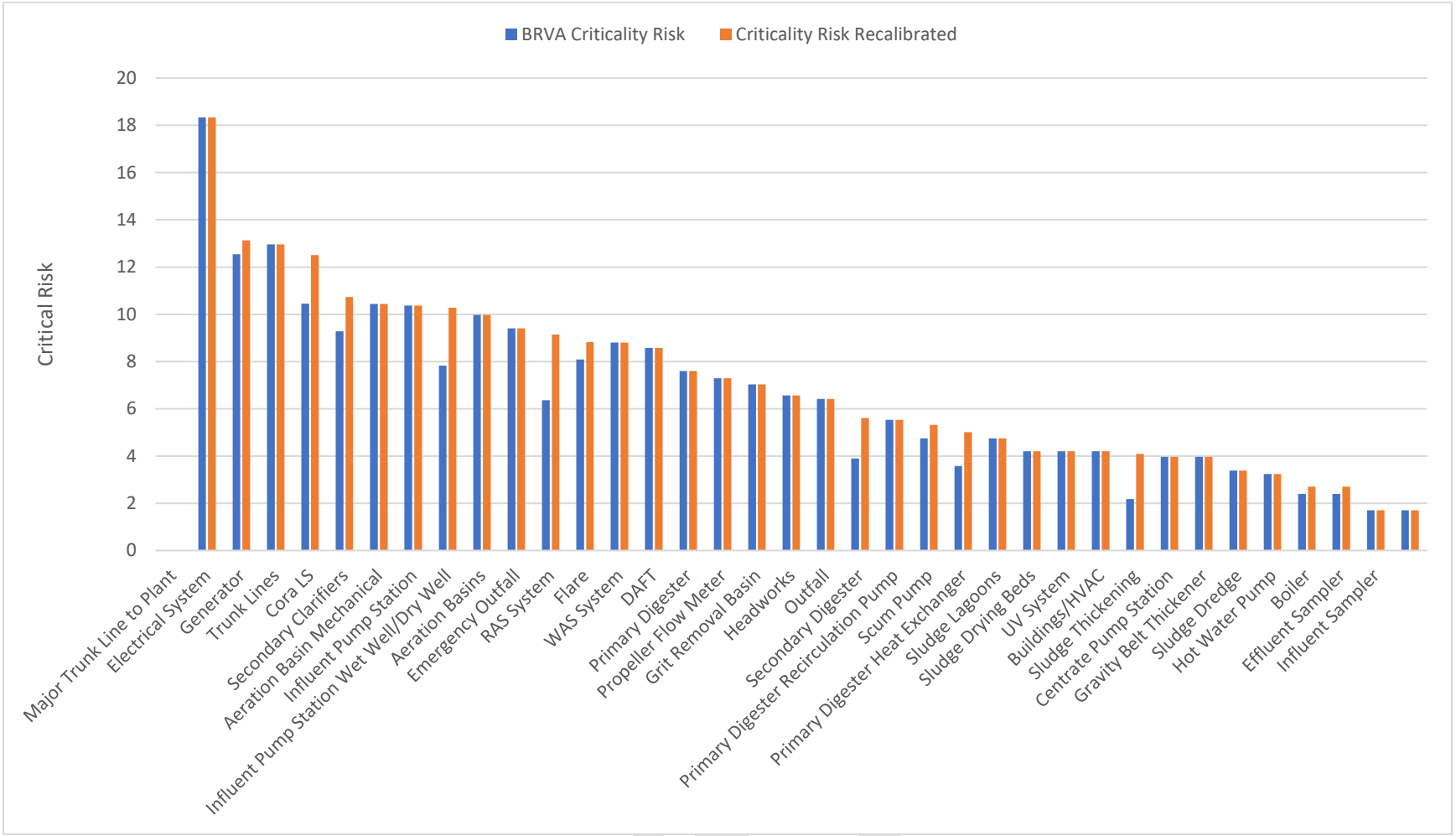
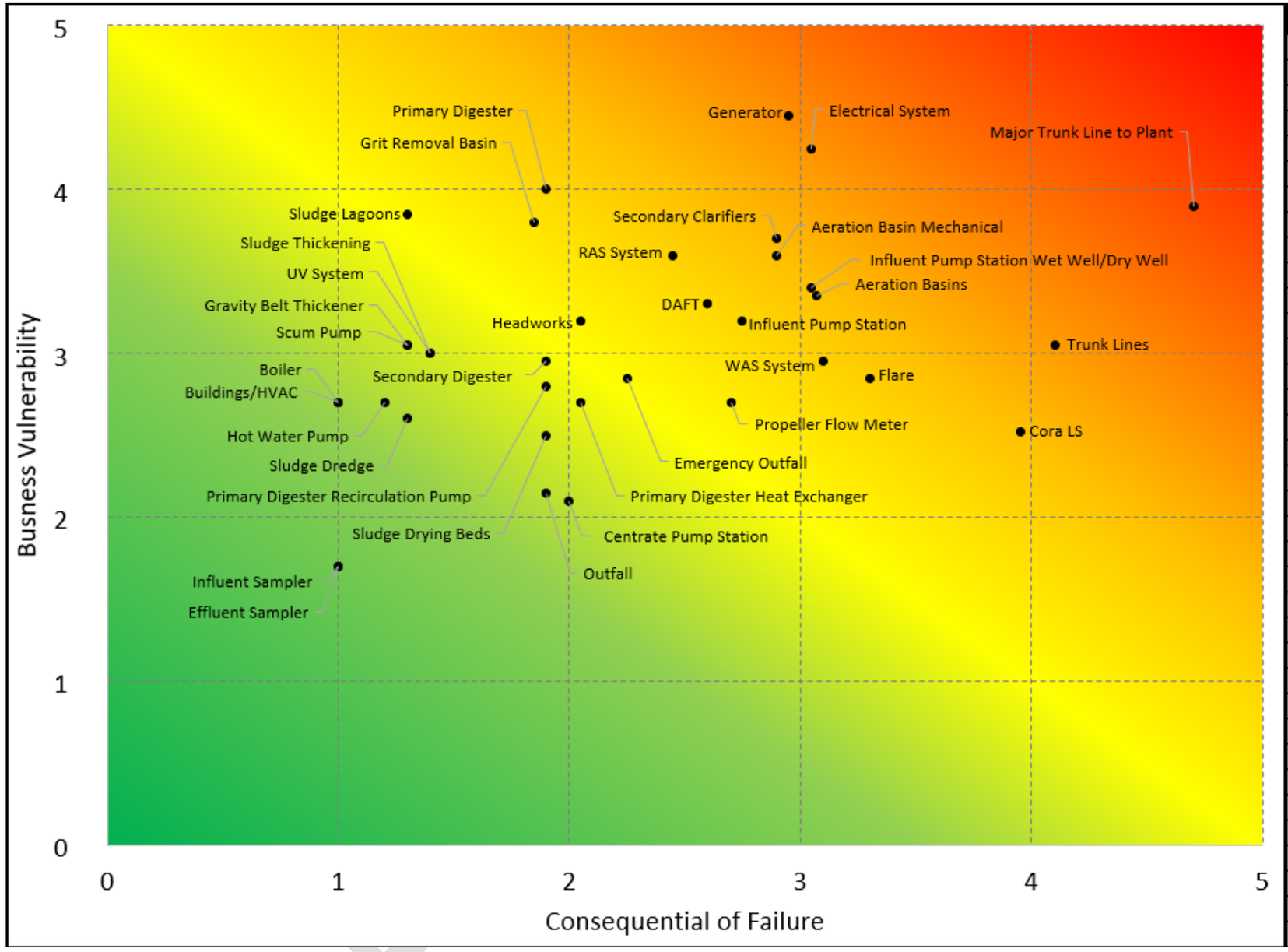


Figure 6-4: Risk Criticality Score Adjustment Comparison



Unit Process	Risk Score
Major Trunk Line to Plant	18.33
Electrical System	13.13
Generator	12.96
Trunk Lines	12.51
Cora LS	10.73
Secondary Clarifiers	10.44
Aeration Basin Mechanical	10.37
Influent Pump Station	10.28
Influent Pump Station Wet Well/Dry Well	9.97
Aeration Basins	9.41
Emergency Outfall	9.15
RAS System	8.82
Flare	8.80
WAS System	8.58
DAFT	7.60
Primary Digester	7.29
Propeller Flow Meter	7.03
Grit Removal Basin	6.56
Headworks	6.41
Outfall	5.61
Secondary Digester	5.54
Primary Digester Recirculation Pump	5.32
Scum Pump	5.01
Primary Digester Heat Exchanger	4.75
Sludge Lagoons	4.20
Sludge Drying Beds	4.20
UV System	4.20
Buildings/HVAC	4.09
Sludge Thickening	3.97
Centrate Pump Station	3.97
Gravity Belt Thickener	3.38
Sludge Dredge	3.24
Hot Water Pump	2.70
Boiler	2.70
Effluent Sampler	1.70
Influent Sampler	1.70

Figure 6-5: Asset Criticality Heat Map - Adjustment

6.2.3 Likelihood of Failure

The estimated likelihood of failure is directly related to the condition evaluation. These estimates are a useful indicator of expected functional performance that may initiate root cause analyses, a tool to assist with proactive maintenance strategies, and in some cases life expectancies of fixed asset classes. The estimated probability of failure provides a convenient way to view the information from an alternative perspective. Although the probability of failure is a variable that is typically included with a risk analysis, we did not apply this variable to develop the initial risk score during the BRVA because we focused our analyses at a system level and not at the asset or component level. Probability of failure was implemented after the condition assessments, WWTF analysis, and collection system hydraulic modeling. Results can be viewed in Section 11.

DRAFT

Section 7: Wastewater Collection System Analysis

7.1 Overview

A key element of understanding the capacity of the City's collection system under existing and future sewer flows involved the development of the collection system hydraulic model. AquaTwin Sewer Modeling software was used to develop the hydraulic model. The development of the hydraulic model involved several steps including importing the City's existing GIS sewer geodatabase, reviewing model connectivity, calculating and assigning existing and future flows to the model, and calibrating the model using WWTF DMR influent data. This section provides an overview of hydraulic model development, model calibration process, comprehensive capacity analysis, and modeling results.

7.2 Hydraulic Model Development

The City's hydraulic modeling needs were assessed to help define the software and approach needed in the development of the hydraulic model. The wastewater collection system model was developed in AquaTwin Sewer Version 15.0. The hydraulic model horizontal datum is based on the Washington State Plane Coordinate System, North American Datum of 1983 (NAD 83).

The preferred approach was to develop a trunk model that includes all pipes with diameters greater than or equal to 18-inches within the existing collection system having a total of 5 miles of sanitary sewer added to the model. A trunk model is a skeletal model which is less detailed than a full pipe model. These types of hydraulic models are used for high level decision-making and system planning. This approach was selected based on the level of detail and analysis required for this GSP.

The model uses Manning's equation to calculate friction losses throughout the system with a Manning's roughness coefficient of 0.013. Portions of the 8-inch pipes were added to the model to assure proper connectivity and stability for running the model.

7.2.1 Model Approach, Assumptions and Update

During model development, the physical network of sewers and manholes was established based on the City's GIS database, specifically the physical information contained therein for the existing collection system. A review of the existing collection system, parcel, and land use information in the GIS database was completed prior to model development which provides quality enhancements to the sanitary GIS data. The data review was undertaken in GIS in both ESRI ArcMap and hydraulic modeling software utilizing built-in AquaTwin Sewer analysis tools.

A review was conducted of the hydraulic continuity and suitability of physical sewer data in terms of profile connectivity. The following approach was taken where information, such as diameters and inverts, were not available for conduits:

DRAFT

- When inverts were missing in intermediate gravity sections where upstream and downstream information was known, the invert elevations were interpolated using the known inverts as well as the length of the conduit with missing invert information.
- For manholes for which information was unknown, a rim elevation was taken from Google Earth and verified using the latest topographic data available from United States Geological Survey (USGS).

Figure 7-1 shows the collection system hydraulic model elements. Table 7-1 presents an inventory of collection system hydraulic model.

Table 7-1: Collection System Hydraulic Model Inventory

Diameter	Length (ft) by Material							
	Asbestos Concrete	Concrete	Ductile Iron	PVC	Unknown	Vitrified Clay	Total (ft)	Total (Miles)
8"	1,675						1,675	0.32
10"	659						659	0.12
12"	1,785						1,785	0.34
18"		1,405		2,768	665	1,932	6,770	1.28
21"		57					57	0.01
24"			148			5,465	5,613	1.06
36"		7,842					7,842	1.49
42"		451					451	0.09
Total	**4,119**	**9,755**	**148**	**2,768**	**665**	**7,397**	**24,852**	**4.71**

DRAFT

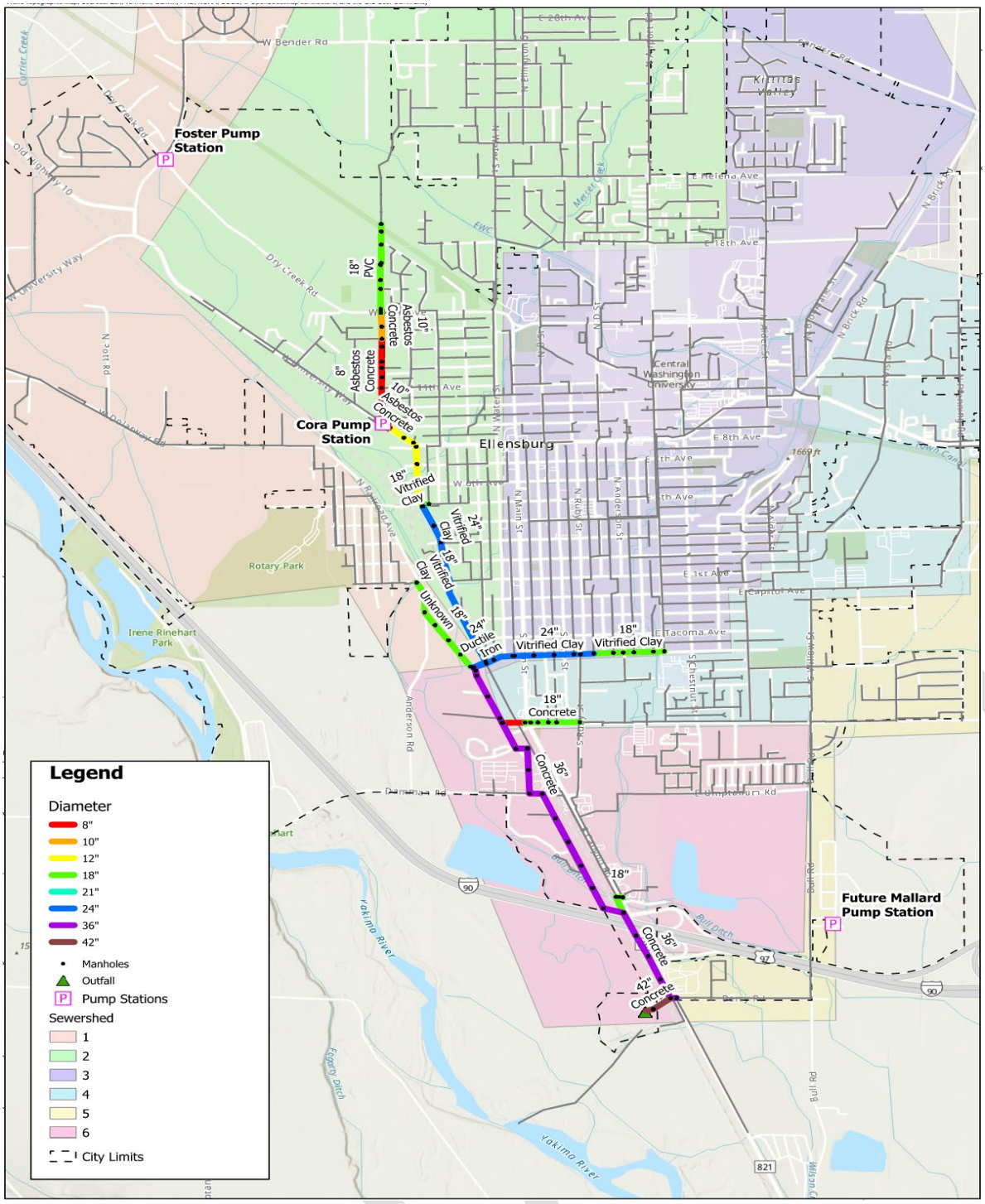


Figure 7-1: Hydraulic Model Overview

7.2.2 Sewer Inflow Allocation

This section summarizes the methods used to allocate both the average existing and future sewer flows to the hydraulic model.

7.2.2.1 Existing Sewer Average Daily Flows Calculation from Water Billing Data

Sewer flows are not directly metered at each individual customer and must be estimated based on the customer's corresponding water demand. The billed water demand was calculated based on two years of complete water billing data from 2023 to 2024. Systemwide annual water demand between 2023-2024 was 3.50 MGD; winter average water demand between 2023-2024 was 2.01 MGD, as shown in Figure 7-2.

The wastewater equivalent residential units (ERU) value is calculated based on residential winter water use since irrigation does not occur in the winter and the majority of the water consumed during the winter will enter the sewer and will ultimately end up at the treatment plant. During drier months, a large fraction of the water consumed will be for irrigation purposes and will not enter the wastewater collection system.

DRAFT

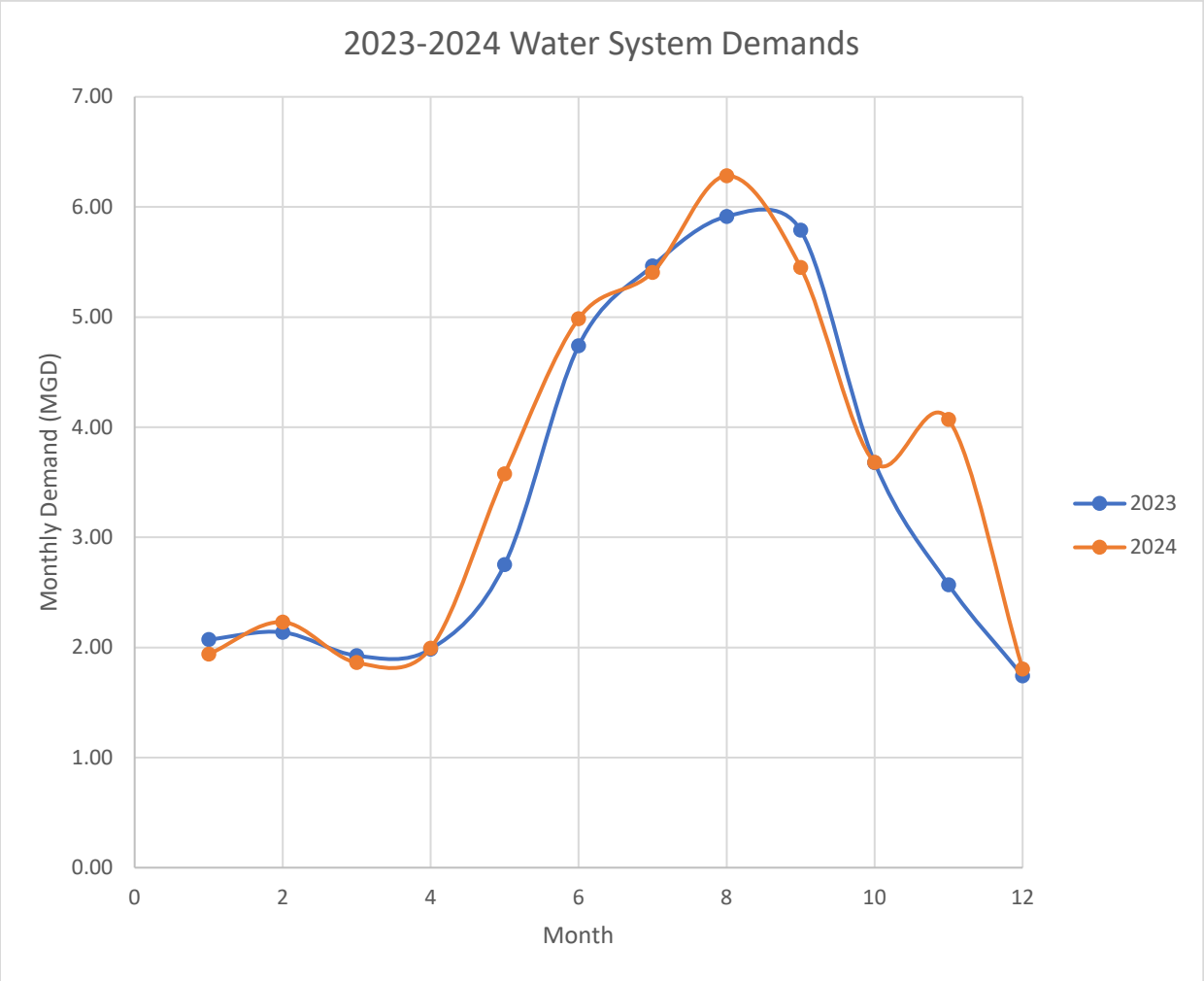


Figure 7-2: 2023-2024 Water System Demands

As referenced in the previous paragraph, wastewater flows are estimated using ERUs, which allow us to represent non-residential customers like CWU, commercial, and municipal users as a number of ERUs. For residential customers, 90% of winter water use is assumed to enter the wastewater system, since irrigation is minimal during that time. For non-residential customers, we assume a 100% equivalence between water use and wastewater discharge.

Regarding water demand, approximately 45% is comprised of residential customers, 18% multifamily residential, and 13% commercial. The remaining demand is attributed to other usage types including municipal and CWU customers.

Sewer annual and winter average flows were calculated for each water customer usage type. The calculation was accomplished by dividing the total flow between meter readings by the number of days between meter readings for customers within sewer service area. Sewer return flow ratios were then developed for each water customer usage type to calculate average sewer demand for each customer. The sewer return flow ratio represents what portion of the water

demand being consumed by a water customer is then returned to the collection system as waste.

Using winter water billing data from October to April, we calculated a systemwide average winter demand of 2.01 MGD, with a sewer base flow of approximately 1.90 MGD. The annual average water demand across 2023–2024 was 3.50 MGD. To reconcile this with the observed influent flow at the WWTF, a 19% augmentation adjustment was applied. This brought the total average sewer flow to 2.11 MGD, or 1,466 gpm, in alignment with the measured WWTF influent data as outlined previously in Table 7-1, which is considered the more consistent data source, spanning several years. Table 7-2 presents a representative breakdown of sewer contributions by land use type based on water billing data, along with the estimated flows following the 19% adjustment.

Table 7-2: Sewer Base Flow per Land Use

Land Use Type	Sewer Base Flow (gpm)	Adjusted Base Flow (gpm)	Sewer Return Flow Ratio
APARTMENT	28	31	90%
CITY/GOVERNMENT	66	73	100%
COMMERCIAL	512	569	100%
SINGLE-FAMILY RESIDENTIAL	460	510	90%
UNIVERSITY	254	282	100%
Total (gpm)	1321	1466	-
Total (MGD)	1.90	2.11	-

7.2.2.2 Existing Sewer Inflow Allocation

Sewer inflow allocation consists of assigning sewer flow to the appropriate manholes (nodes) in the model. The goal is to distribute the flow throughout the model to best represent actual system response.

The base flow component is comprised of sanitary flow (i.e., residential, non-residential customers such as the commercial, municipal and CWU customers) during dry periods. This component was developed based on the methodology described in the previous section, using 2023- 2024 water billing records. Using AquaTwin's Inflow Allocation tool and a Thiessen polygon approach, we distributed the calculated sewer flows to the nearest manhole within the gravity sewer system. This ensures that modeled inflow reflects actual customer usage patterns, providing a realistic and spatially accurate representation of how wastewater enters the collection system. The green lines in Figure 7-3 represent the allocation paths used by the tool to assign sewer demands from the billing data to the nearest upstream manholes. The red lines indicate the gravity mains in the model network.

DRAFT

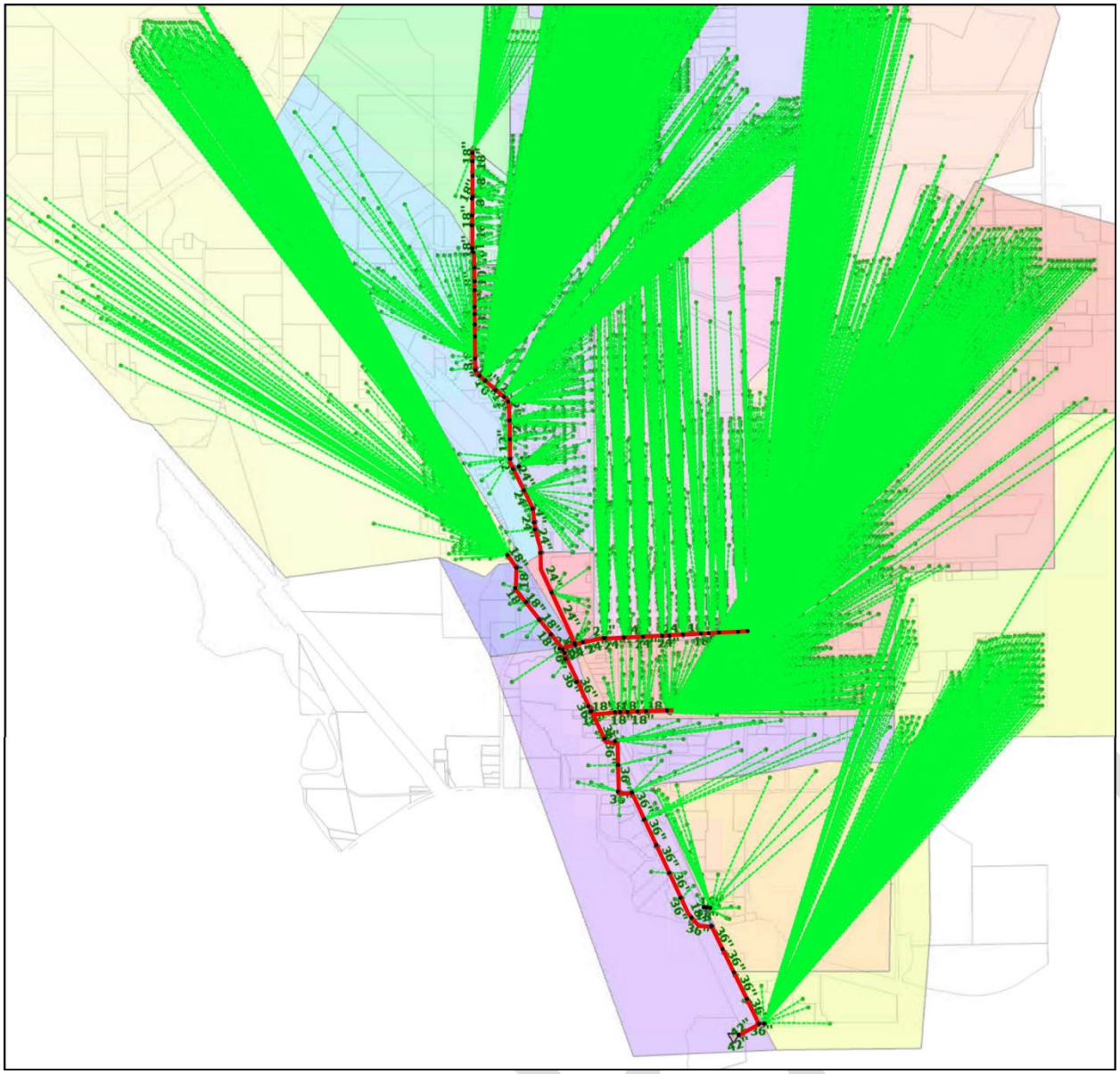


Figure 7-3: Existing Sewer Inflow Allocation

7.2.3 Model Calibration Methodology

In this calibration effort, due to the lack of flow meters, water billing data and historical influent data from WWTF was considered. Based on the 2023-2024 billing data, an average daily wastewater flow generated from water billing was imported into the model as a basis of our ADWF calibration.

Following the data import, the 2023–2024 water billing records were adjusted to align with the WWTF influent dataset, which, as previously discussed, spans the period from 2016 to 2024. Analysis showed that the average influent flow for the 2016–2021 period was higher than the

average over the full 2016–2024 range. To maintain a more conservative calibration basis, the 2016–2021 average was selected.

7.2.3.1 Existing Average Dry Weather Flow Calibration

For existing ADWF a global adjustment factor of 19% was subsequently applied to the sewer generation estimates based on the 2023–2024 water billing data to match the total average sewer flow to 2.11 MGD, or 1,466 gpm, in alignment with the measured WWTF influent data as explained previously. This adjustment was implemented to ensure consistency with historical trends and support a conservative modeling approach.

7.2.3.2 Existing Peak Wet Weather Flow Calibration

Due to the limited availability of detailed flow monitoring data, flow peaking factors were estimated using historical influent flow records at the WWTF, as outlined in Table 7-1. Peaking factors for each year were calculated based on the ratio of key flow conditions, specifically the Maximum Daily Flow (MDF) to the Average Annual Dry Weather Flow (AADWF). For the 2016–2021 period, the average Maximum Daily Flow was 7.05 MGD and the average Dry Weather Flow was 2.11 MGD, resulting in a peaking factor of 3.35. When calculated over the 2016–2024 period, the average peaking factor was slightly lower at 3.20. To maintain a more conservative approach, the 3.35 value was selected and uniformly applied to all junctions located upstream of the treatment plant. This ensures a more robust assessment of system performance under peak flow conditions.

While this approach provided useful insight into potential peak flow areas, it is important to note that steady-state simulations do not fully represent the dynamic behavior of the sewer collection system. To improve model accuracy and calibration in future efforts, it is recommended that temporary flow monitoring meters be installed at key locations throughout the system, as illustrated in Figure 7-4, this will help in developing location-specific peaking factors, which gives more granularity in system peaking. Additionally, the hydraulic model should be updated to include all pipes 10 inches in diameter and larger, this will allow for a more detailed understanding of flow patterns, which will improve the calibration process and enhance the overall accuracy of the model.

DRAFT

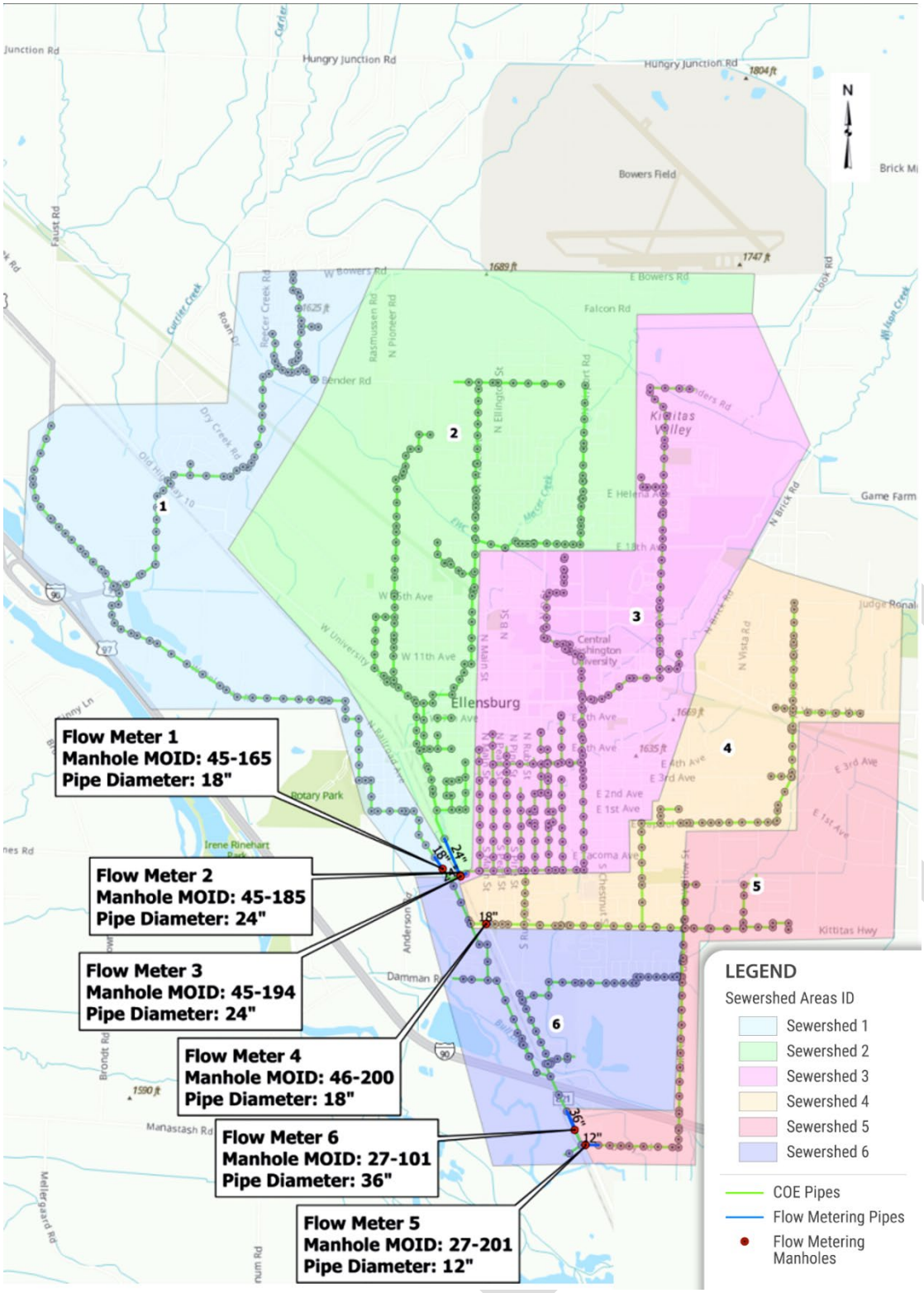


Figure 7-4: Flow Metering Plan

7.2.3.3 Future Average Dry Weather Flow Calibration

As explained in section 4.3, the City's 2021 Comprehensive Plan projects steady growth at about 2% annually through 2037, with commercial and residential growth continuing at similar rates while industrial growth remains minimal.

To forecast future wastewater flows, we relied on the same growth rate and the WWTF Projected Influent Wastewater Flows listed in Table 4-9 for our planning horizon through 2044. Based on these assumptions, the future average dry weather flow at the WWTF is 3.45 MGD. We applied a 61% global adjustment to the existing base flow and applied it to all junctions in model A. This increase reflects anticipated growth in sewer service population and maintains consistent flow ratios between residential and commercial users.

7.2.3.4 Future Peak Wet Weather Flow Calibration

For the future peak wet weather flow, we used the same methodology mentioned earlier to calculate the peaking factor by calculating the ratio of the Maximum Daily Flow (MDF) of 11.5 to the Average Annual Dry Weather Flow (AADWF) of 3.45, resulting in a 3.38 future peaking factor. This peaking factor was applied to all the upstream nodes in the model under the future scenario.

7.2.4 Hydraulic Model Capacity Evaluation

This section describes the capacity analyses performed using the calibrated sewer system model as well as the hydraulic model findings.

7.2.4.1 Existing Flow Conditions

7.2.4.1.1 Dry Weather d/D Capacity Analysis

The model simulates a total system flow of approximately 1,464 gpm, or 2.11 MGD, under existing dry weather conditions. The modeled flow at the Cora Street PS is approximately 62 gpm. Based on operator data from the City, it was found that the overall average from March to June of 2025 was 53 gpm, which is similar to the model representation.

In the scenario analysis, pipes were categorized into five groups based on their flow depth-to-diameter (d/D) ratio: less than 20%, 20%–40%, 40%–60%, 60%–80%, and greater than 80% full. For dry weather flow, a d/D ratio of 60% is the established design criterion, meaning pipes exceeding this threshold are considered to have limited remaining capacity. Figure 7-5 illustrates the results of the existing DWF d/D capacity analysis. The evaluation confirms that no pipes currently exceed the 60% d/D criterion, indicating the system performs within acceptable limits under dry weather conditions.

DRAFT

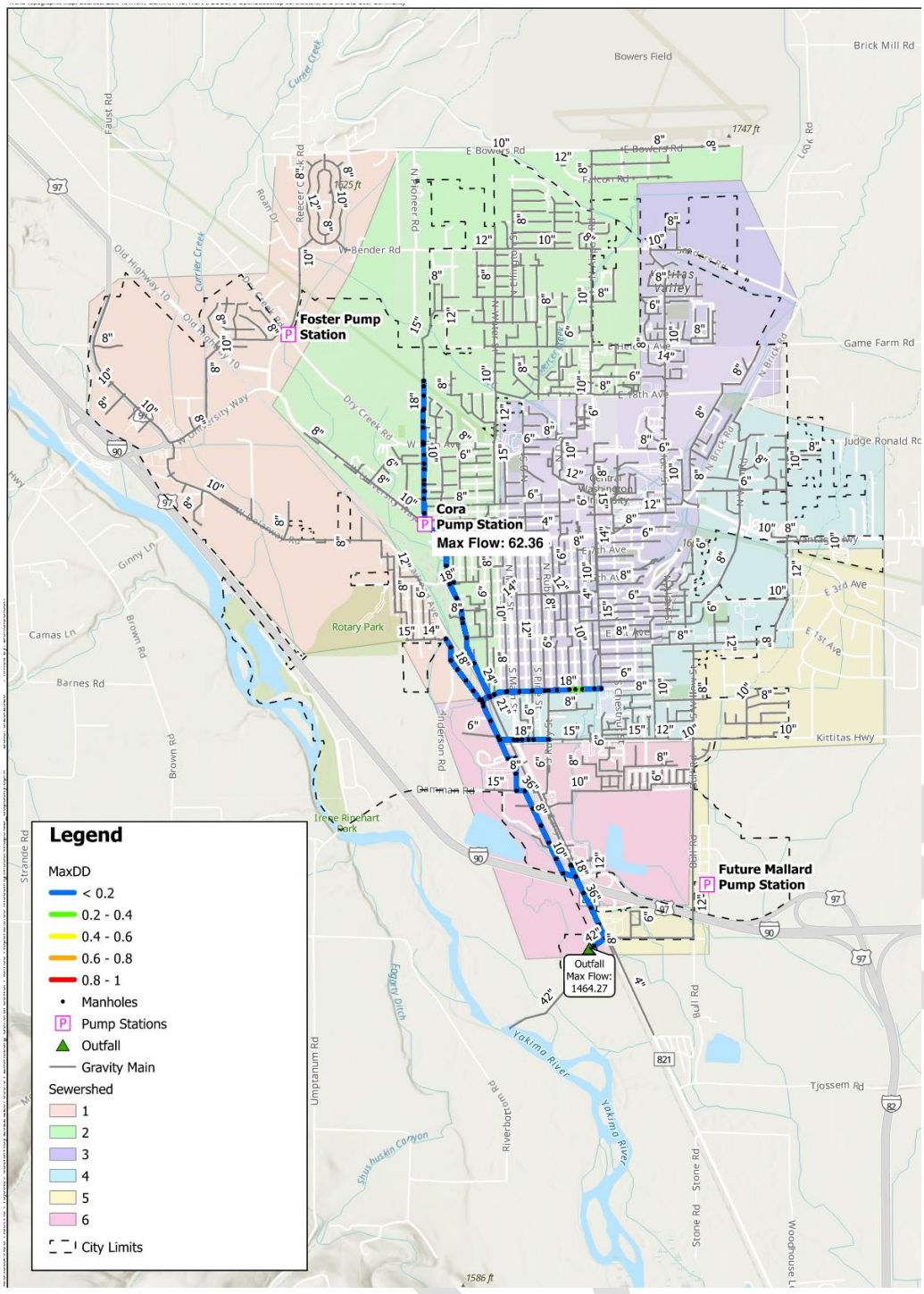


Figure 7-5: Dry Weather d/D and Pump Station Flow Rates

*7.2.4.1.2 **Wet Weather d/D Capacity Analysis***

The model simulates a total system flow of approximately 4,891 gpm, or 7.04 MGD, under existing dry weather conditions. The modeled flow at the Cora Street PS is approximately 208 gpm. This dataset reflects a conservative peaking factor of 3.35 as explained earlier.

In the scenario analysis, pipes were categorized into five groups based on their d/D ratio: less than 20%, 20%–40%, 40%–60%, 60%–80%, and greater than 80% full. For wet weather flow (WWF), a d/D ratio of 80% is the established design criterion, meaning pipes exceeding this threshold are considered to have limited remaining capacity. As shown in the model output (Figure 7-6), all modeled pipes remain below the 80% d/D threshold under wet weather flow conditions. Most of the system is represented by green and yellow pipe segments, corresponding to d/D values between 20% and 60%, with a few isolated blue segments (less than 20%) and some orange (60–80%) along the southern trunk main. No red segments (d/D > 0.8) are present, indicating that the system is performing within acceptable capacity limits during wet weather events.

DRAFT

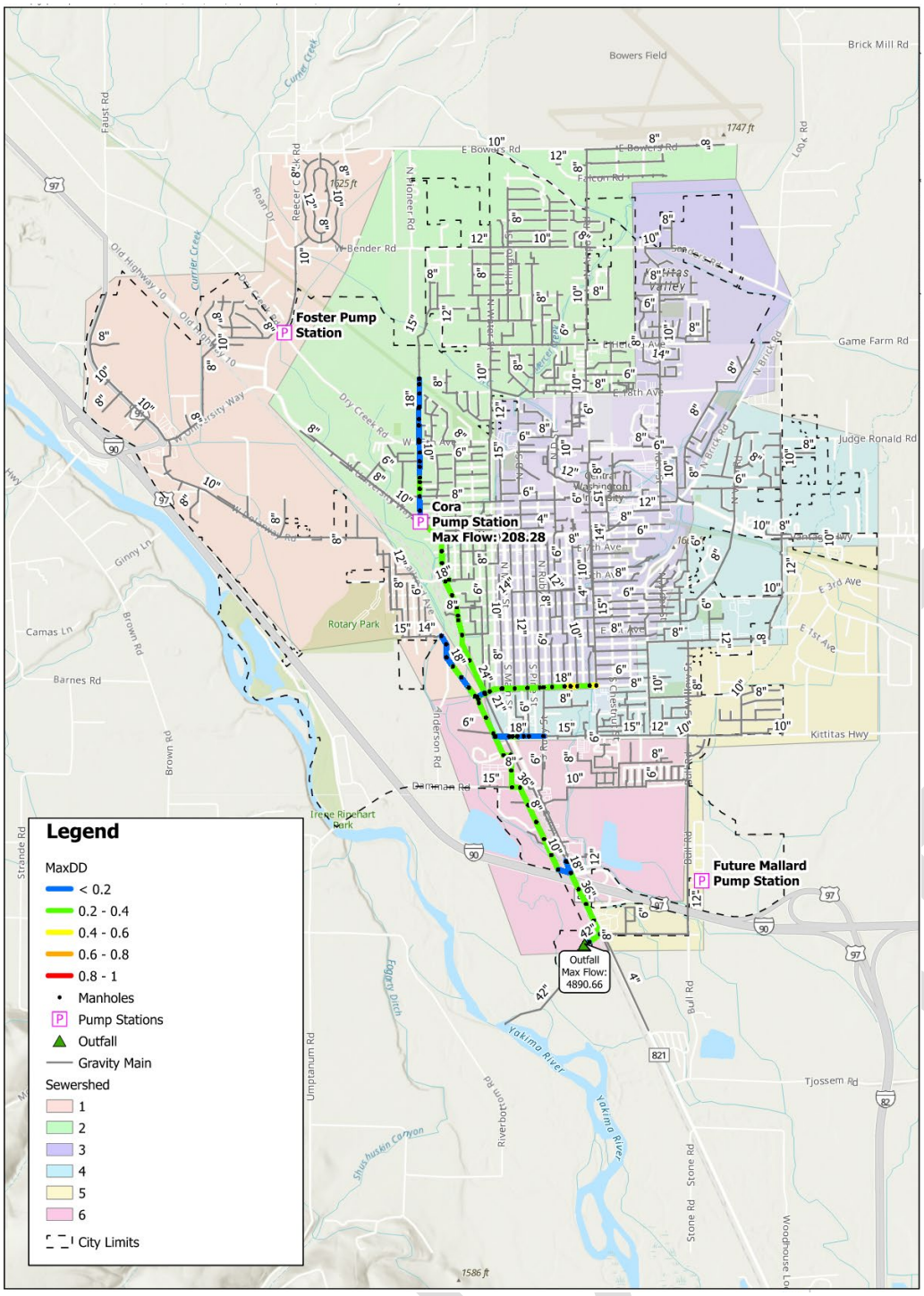


Figure 7-6: Wet Weather d/D and Pump Station Flow Rates

*7.2.4.1.3 **Pipe Velocity Analysis***

In accordance with the Washington State Department of Ecology's Criteria for Sewage Works Design, a minimum velocity of 2 fps is recommended for gravity sewer mains to support self-cleaning conditions. The model output categorizes pipe velocities into five groups: less than 2 fps, 2–4 fps, 4–6 fps, 6–8 fps, and 8–10 fps. As shown in Figure 7-7, multiple upstream pipe segments—particularly within the northern portion of the system and along N Wenas Street—are modeled with velocities below the 2-fps threshold (highlighted in red). These areas may require enhanced cleaning and maintenance practices due to the potential for solids deposition. The remaining segments of the system generally fall within the 2–6 fps range (yellow and green), indicating adequate velocity for typical dry weather conditions.

DRAFT

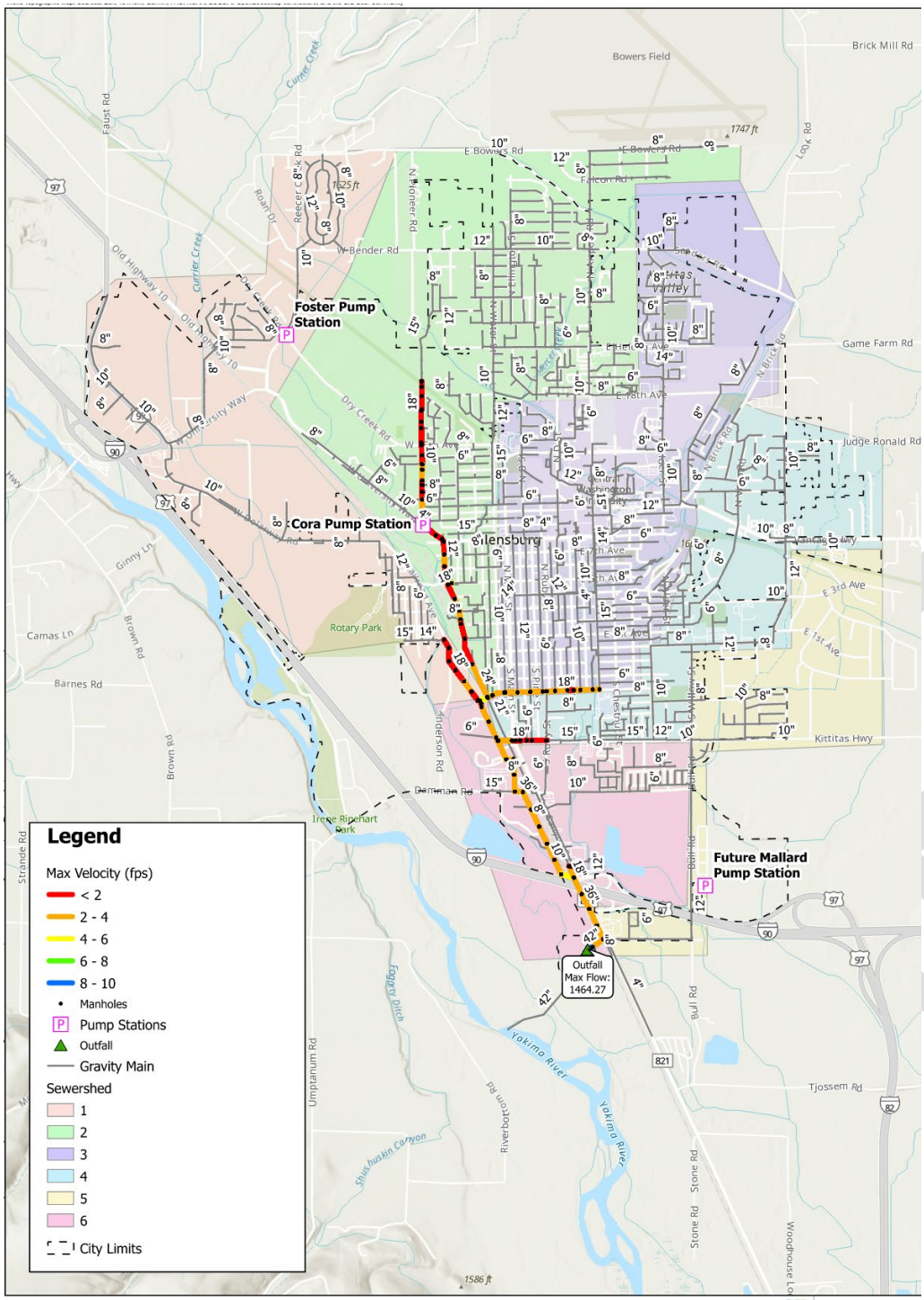


Figure 7-7: Existing Pipe Velocity Analysis

7.2.4.2 Future Flow Conditions

7.2.4.2.1 Dry Weather d/D Capacity Analysis

The model simulates a total system flow projected future dry weather flow of approximately 2,358 gpm or 3.4 MGD. The modeled flow at the Cora Street PS is approximately 100 gpm.

As shown in Figure 7-8, the model output categorizes pipes into five groups based on their flow depth-to-diameter (d/D) ratio: less than 20%, 20%–40%, 40%–60%, 60%–80%, and greater than 80% full. For dry weather conditions, a d/D threshold of 60% is maintained as the design criterion. All gravity mains remain below this threshold under projected future base flow conditions. The majority of the system is modeled with d/D ratios in the 0.2–0.4 and 0.4–0.6 range (green and yellow), with limited segments below 20% (blue). No orange or red segments are present, confirming that the system is expected to perform within acceptable hydraulic capacity under future dry weather flows.

DRAFT

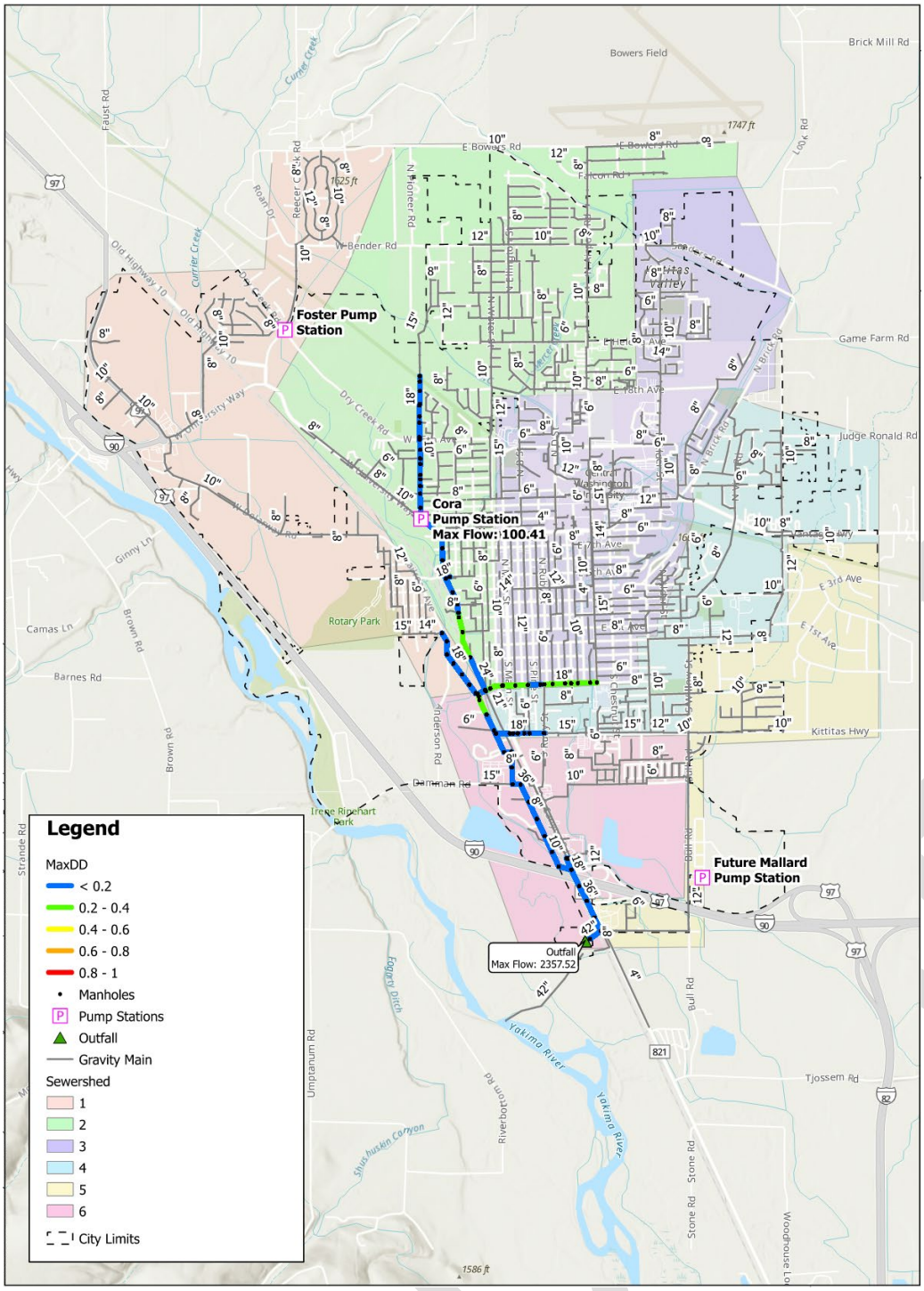


Figure 7-8: Future d/D Dry Weather Flow

*7.2.4.2.2 **Wet Weather d/D Capacity Analysis***

Projected future peak wet weather flow is approximately 7,968 gpm (11.5 MGD), based on historical base flows and the application of 3.38 peaking factors as explained earlier. The modeled flow at the Cora Street PS is approximately 339 gpm. This approach reflects a conservative planning estimate under anticipated growth and loading scenarios.

As shown in Figure 7-9, the model output categorizes gravity mains into five d/D ranges: less than 20%, 20%–40%, 40%–60%, 60%–80%, and greater than 80% full. A d/D threshold of 80% was applied as the design planning criterion for peak wet weather flow conditions. Model results indicate that gravity mains are projected to operate below this threshold under future peak flow conditions. Most modeled segments fall within the 0.4–0.6 and 0.6–0.8 d/D range (yellow and green), reflecting available capacity across the system. One segment of 18-inch pipe along East Manitoba Avenue approaches the upper threshold, indicating a moderate level of risk and potential need for further evaluation during detailed design or future planning.

DRAFT

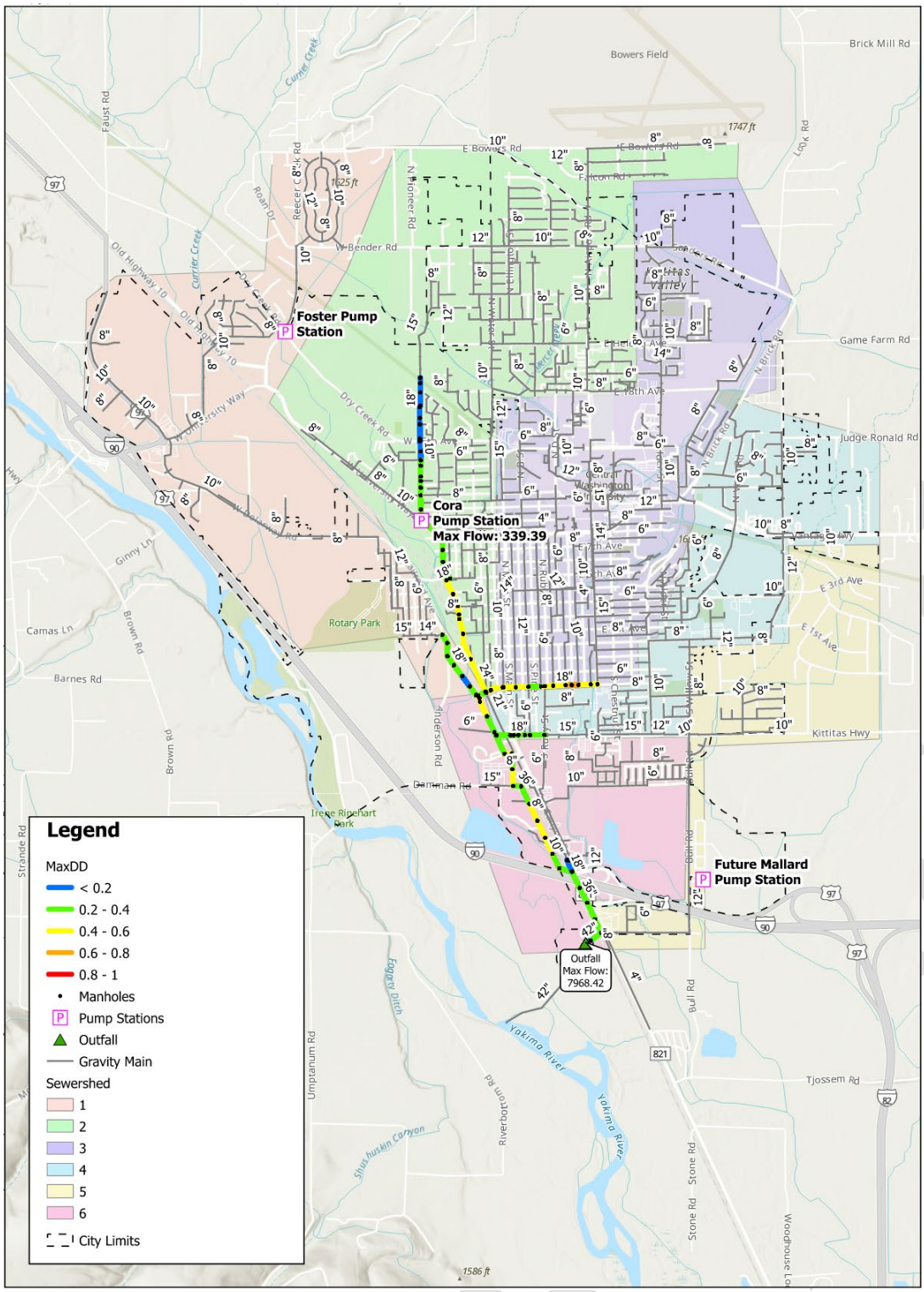


Figure 7-9: Future d/D Wet Weather Flow

*7.2.4.2.3 **Pipe Velocity Analysis***

In accordance with the Washington State Department of Ecology's Criteria for Sewage Works Design, a minimum velocity of 2 fps is recommended for gravity sewer mains to support the transport of solids and minimize the need for frequent maintenance. As shown in Figure 7-10, modeled velocities across the system meet or exceed this minimum threshold. Most pipe segments fall within the 2–4 fps and 4–6 fps ranges (yellow and green), with a few segments operating between 6–8 fps (blue). No red segments are present in the model output, indicating that future dry weather flows are expected to maintain sufficient velocities throughout the gravity system.

DRAFT

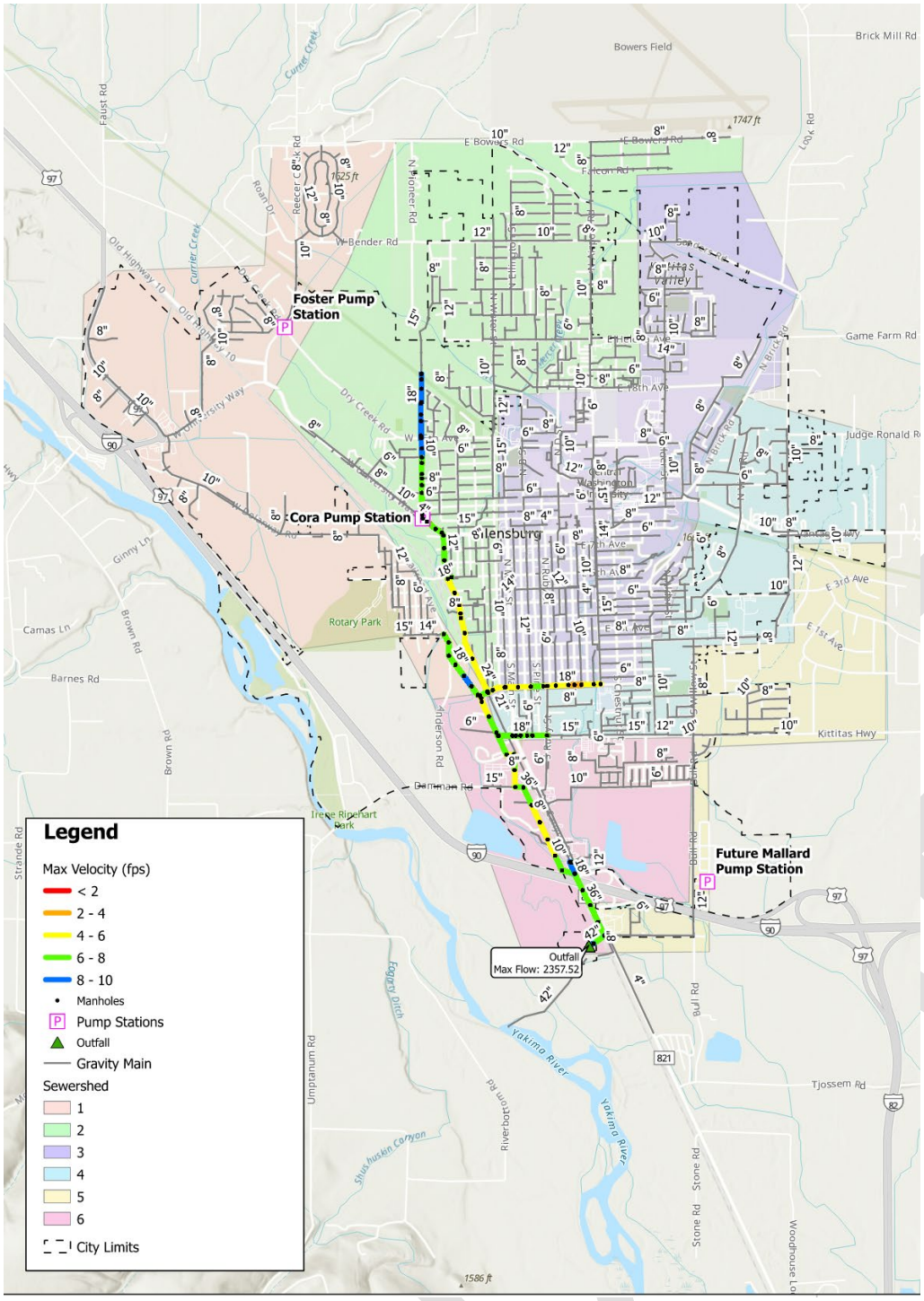


Figure 7-10: Future Pipe Velocity Analysis

7.2.5 Inflow & Infiltration Analysis

I&I refers to the entry of stormwater (inflow) and groundwater (infiltration) into a sanitary sewer system. When flow entering the system exceeds what it was designed to convey, I&I can result in surcharging of pipelines and increased demand on downstream pump stations and wastewater treatment facilities. This additional flow not only stresses hydraulic capacity but also increases operational costs, as the entire volume—including stormwater and groundwater—must be treated.

Infiltration is typically caused by groundwater entering the system through structural defects such as cracked pipes, faulty joints, or manhole walls. It tends to occur more consistently throughout the year but is often elevated during periods of high groundwater. Inflow occurs during and immediately following rainfall or snowmelt and enters the system through cross-connections, open manholes, or improper connections such as roof drains or sump pumps.

The U.S. Environmental Protection Agency (EPA) provides quantitative criteria to assess excessive I&I in collection systems:

- Excessive infiltration is defined as per capita flows exceeding 120 gallons per capita per day (gpcd) over a 7–14 day period of dry weather during high groundwater conditions.
- Excessive inflow is defined as per capita flows exceeding 275 gpcd during wet weather periods, excluding major industrial discharges.

7.2.5.1 Infiltration Analysis

According to the previous master plan, shallow groundwater levels in the Kittitas Valley are strongly influenced by seasonal irrigation practices. Water levels typically rise during early spring and fluctuate through the summer due to irrigation activities. The Valley's permeable granular soils overlie confining layers that separate near-surface groundwater from deeper aquifers, which provide most of the local drinking water. Within certain areas of the City of Ellensburg, groundwater can rise to within one to two feet of the ground surface. Groundwater levels fluctuate seasonally and can increase the potential for infiltration, particularly in areas with shallow water tables or aging infrastructure.

To evaluate infiltration, dry weather flow data from August 2016 through July 2024 was compared with precipitation records. A representative 14-day dry weather period was identified for each year. During these periods, maximum daily flow and population data were used to calculate per capita flow. Figure 7-11 illustrates the influent flow time series and 30-day running average used to identify stable dry weather periods for this analysis.

DRAFT

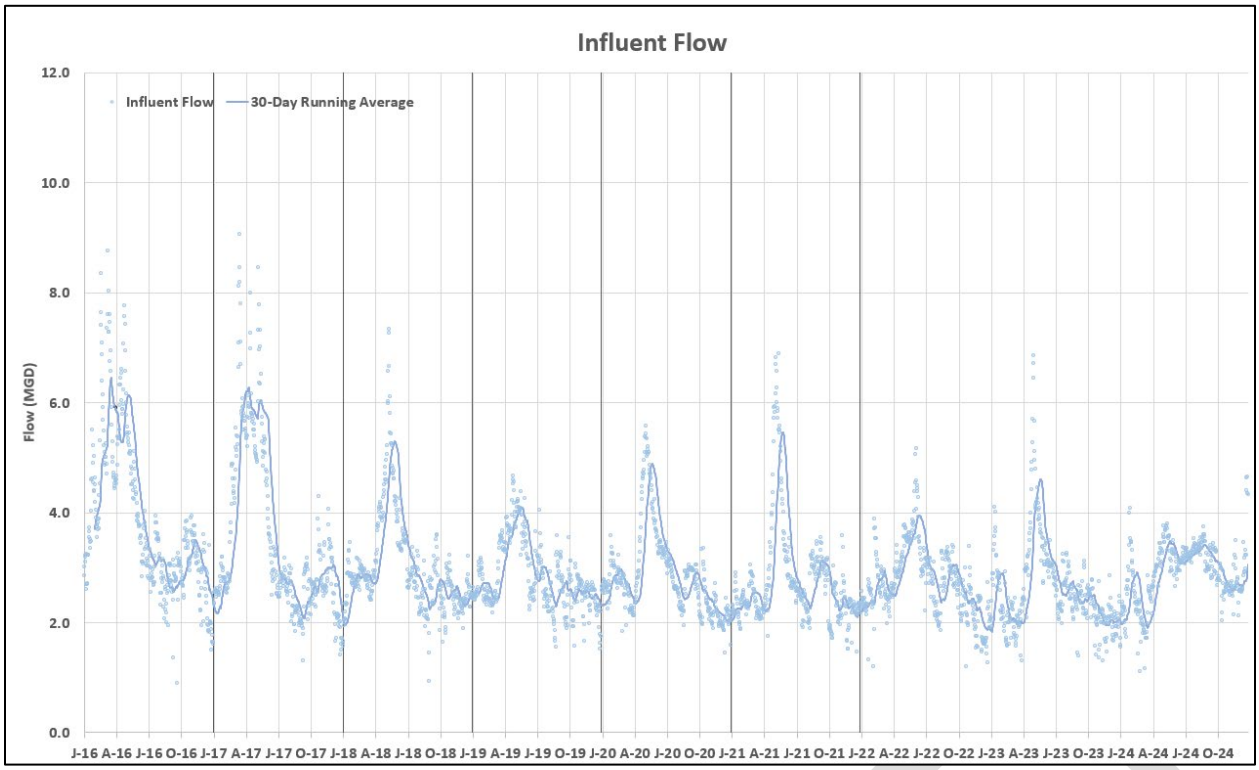


Figure 7-11: Influent Flow and 30-day Running Average (2016-2024)

As shown in Table 7-3, calculated per capita flow ranged from 148 to 175 gpcd, exceeding the 120 gpcd threshold each year. The highest observed value was 175 gpcd in August 2016, and the lowest was 148 gpcd in August 2023.

These findings indicate that excessive infiltration has occurred consistently throughout the monitoring period based on EPA criteria. While groundwater levels were not specifically evaluated as part of this analysis, historical data suggest that elevated groundwater conditions may be a contributing factor to the observed infiltration in the system.

DRAFT

Table 7-3: Summary of Infiltration Analysis during Dry Weather Periods (2016-2024)

Year	Population	Sewer Service Population	Maximum Daily flow (MGD)	Maximum Daily flow (gpd)	Per Capita Flow (gpcd)	Month
2016	19,310	20,115	3.53	3,530,000	175	August
2017	19,550	20,355	3.33	3,330,000	164	June
2018	19,660	20,465	3.52	3,520,000	172	July
2019	19,960	20,765	3.15	3,150,000	152	June
2020	20,797	21,602	3.21	3,210,000	149	July
2021	19,530	20,335	3.52	3,520,000	173	July
2022	20,940	21,761	3.36	3,360,000	154	August
2023*	21,359	22,100	3.26	3,260,000	148	August
2024*	21,786	22,138	3.53	3,530,000	159	July

*Based on Census population

7.2.5.2 Inflow Analysis

To evaluate inflow, winter wet weather events were reviewed. November 2024, which recorded the highest precipitation recorded from 2016-2024, of 1.45 inches, was used as a representative month. The maximum daily influent flow during this period was 3.06 MGD, with a service population of 22,138, resulting in a calculated inflow of 158 gpcd. This value is well below the EPA threshold of 275 gpcd, and similar results were observed in prior years. Therefore, inflow is not considered excessive per EPA standards.

7.3 Cora Street Pump Station Analysis

The Cora Street PS is at the intersection of Cora Street and University Way. The PS was built in the early 1980s and has had one pump replacement but no other significant upgrades. The PS serves a small area in the northwest section of the City. The PS consists of two submersible centrifugal pumps. The pumps and float switches are accessed at a platform 10-feet below grade via a manhole and ladder from grade level to the platform.

The PS has a capacity of 650 gpm or 0.96 MGD. Criteria for Sewage Works (Ecology, 2008) requires pump stations to pump peak hour flow (PIF) with the largest pump out of service. The projected peak hour flow in this drainage basin is unknown.

During this analysis, notable deficiencies were identified and are described below:

- **Standby Power:** The PS does not have a standby generator. According to *Ecology's 2008 Criteria for Sewage Works*, wastewater pumping stations should be designed with emergency power in case the primary electrical feed is lost. For small PS's, a portable generator that can be plugged into an electrical power supply pigtail at the PS is commonly used and large stations should have permanently mounted generators. Given the small size of the Cora Street PS and the small area in which it serves, this bypass is acceptable for emergency service.

DRAFT

- **Confined Space:** In order to service the pumps or the float switches at the PS, maintenance personnel must enter the PS, which is a confined space requiring confined space safety practices. There is no exhaust fan in the pump station; it is recommended that a fan be installed.

- **Alarms:** The PS telemetry is limited to a blinking alarm light at the top of the control panel. The PS is not linked to SCADA and City personnel are typically notified of the blinking alarm by civilians.

- **Site Security:** The main power disconnect is mounted on a local power pole and it is not locked or protected. The PS control panel is mounted above grade adjacent to the wet well. The original control panel was replaced with a spare that the City moved from another PS.

- **Utility Water:** The pump station does not have a source of water supply, as recommended by *Ecology's 2008 Criteria for Sewage Works*.

7.4 Maintenance and Testing

7.4.1 Gravity Sewer Inspection, Rehabilitation & Repair

The City's collection system began in the late 1890s mostly consisting of VCP, followed by AC pipe from the 1960s to 1980s. After the 1980s, the City has installed mostly PVC pipe. While the City has steadily separated sanitary and stormwater sewers, approximately 12 blocks in the downtown area remain reliant on the combined system.

Through a programmatic approach, City Staff regularly perform inspections of pipes within the collection system to identify deficiencies and develop rehabilitation actions. This program helps to ensure that facilities requiring major rehabilitation or replacement are identified and addressed before a failure occurs. The program also helps to manage infiltration into the system and maintain available capacity to support future growth. The program centers around the National Association of Sewer Service Companies (NASSCO) Pipe Assessment Certification Program (PACP) scoring paradigms. Approximately one third of the City's collection system is old concrete or VCP. The VCP and concrete pipes were installed from 1930 to 1980, which means they are 40 to 90 years old. VCP and concrete pipes have an expected structural life expectancy of 75 to 100 years depending on the amount of hydrogen sulfide corrosion in the sewer system. Clay and concrete pipes have a serviceability life expectancy of 50 to 75 years. Serviceability life expectancy is based on service issues such as amount of I/I, root intrusion and other maintenance issues. Based on the significant amount of I/I in the system, most of the concrete pipe and VCP have exceeded its service life.

7.4.2 Force Main Inspection and Testing

The City owns and operates one pump station that convey flow from low points in the collection system to higher points in the collection system to move flow to the WWTF and a future pump station. Only one PS is actively used. Force main condition can be identified initially via PS performance. Low pipeline flow, blockages, or increased power requirements can be indicative of a deteriorating force main pipe. Video inspection is possible but typically force mains are a

smaller diameter than the gravity pipes, which require either a specialized camera or equipment. Equipment options include camera pigs and smart tools that can sense pitting, metal loss, and/or circumferential cracking.

The force main inspection program will prioritize inspections based upon pipe age and material. Subsequent investigation will include review of PS data to determine any changes in pumping capacity and/or pump speed that may be attributed to a deteriorating pipe. Further investigation may include pigging the line and/or use of a camera pipe or smart tools to determine pipe condition and resultant expected remaining useful life. The product of the investigation is a prioritized list of force mains that require rehabilitation or replacement.

7.4.3 I/I Reduction Program

Infiltration and inflow (I/I) are the primary sources of fugitive flow into the collection system. Inflow includes stormwater that enters the collection system through direct connection such as roof drains, yard drains, sump pumps, open manholes, indirect connections to stormwater systems, etc. Infiltration includes groundwater that enters the collection system through broken or compromised manholes or pipelines. One of the largest challenges associated with I/I detection is that is requires identification during high groundwater and/or storm periods to detect the exact source. The City uses CIPP technology to reline pipes having known I/I issues. These pipes are typically relined in segments of 300 to 600 linear feet and regular rooting and flushing is performed by City staff.

7.4.4 PS Inspection and Maintenance

The BRVA process conducted at the beginning of the GSP development identified the Cora Street PS as being high risk due to aging and corroded infrastructure and maintenance limitations.

In conjunction with its gravity and force main inspection programs, the City will prioritize inspections of the PS based upon risk level. Inspections will be used to identify equipment requiring further attention to include maintenance, rehabilitation, and/or replacement.

7.5 Collection System Analysis Summary

The following notes summarize the results of the Hydraulic Modeling Analysis:

- Wastewater trunk lines with diameters of 18 inches or greater generally provide adequate capacity under existing and future flow conditions. A single 18-inch pipe segment along East Manitoba Avenue, however, approaches the upper capacity threshold, indicating a moderate level of risk and potential need for further evaluation during detailed design or future planning.

- Under existing dry weather flow, multiple upstream pipe segments—particularly within the northern portion of the system and along N Wenas Street—are modeled with velocities below the 2-fps threshold (highlighted in red). These areas may require enhanced cleaning and maintenance practices due to the potential for solids deposition.

- Under future flows, no pipe segments are modeled with velocities below the 2 fps threshold, indicating that future dry and wet weather flows are expected to maintain sufficient velocities throughout the gravity system.

- Install flow meters to effectively inventory the system and generate a productive system model for further analysis. Installation at strategic locations could be used to establish a preliminary model to estimate flow patterns, while working towards collecting remaining data points from field checks.

The following notes summarize the results of the I/I Analysis:

- The City has excessive infiltration that is largely due to the age of the collection system piping. The City needs to prioritize repair and replacement of this piping by performing an I/I investigation, which would include video inspection and smoke testing of the collection system.

The following notes summarize the results of the Cora Street PS Analysis:

- If retained, the City would have to consider replacement as part of the 20-year capital improvement plan, however they are currently moving forward with efforts to install a previously proposed gravity sewer that would reroute the sewer and eliminate the need for pumping. This evaluation and recommendation were included as part of the capital improvement plan in the City's Wastewater-Storm Sewer Study (HDR Engineering, February 2001). Updated hydraulic modeling of the PS was not completed because of this anticipated decommissioning.

The following notes summarize the results of the maintenance, testing, and rehabilitation assessment:

- The City should conduct extensive CCTV inspections of all sewer pipe to monitor and target vulnerable areas within the system for potential Repair and Replacement (R&R) needs. This will enable the City to minimize I/I and other maintenance issues. As a conservative approach.

DRAFT

- The full condition of aging pipes within the collection system, especially VCP and concrete pipes that were installed starting in the 1930s, is not fully known. While some pipe segments can be repaired, it may be necessary for the City to replace much of these lines as they reach the end of their service lives to minimize I/I and other maintenance issues. To address this aging infrastructure, approximately 10,000 feet of sewer pipe per year may need to be replaced. The City has approximately 75,000 LF of VCP and approximately 160,000 LF of concrete and AC pipe combined. If all this aged pipe needs to be replaced, the effort would take over 20 years to complete, not including other types of pipe within the system that will also need servicing. The typical service life of VCP, concrete, and AC pipe varies between 50 to 100 years, however some systems can remain in good condition for longer with good maintenance. It is vital that the City continues to invest in regular inspection and upkeep of these, and all their pipes, to ensure the system remain in good operational condition. Instituting an R&R funding program would facilitate this effort, as well as mitigate other I/I or potential capacity constraints.

DRAFT

Section 8: Wastewater Treatment Facility Analysis

8.1 Overview

Section 7 evaluates the WWTF's current capacity and performance, highlighting areas with capacity shortages to handle the design flows and load. The assessment was carried out using the following three methods:

- Plant Hydraulic Analysis: A hydraulic model was developed to evaluate the plant's hydraulic profile and overall capacity.
- Process Modeling Analysis: A process model was created to simulate the performance of the secondary biological process. Desktop calculations were used to validate the model results and assess the capacity of other processes and major equipment directly connected to the secondary process.
- Desktop Calculations: The remaining unit processes and major equipment were evaluated using desktop calculations, and their performance was compared with design criteria from literature or regulatory recommendations.

Each of these methods and evaluations is discussed in detail in the following sections.

8.2 Plant Hydraulic Capacity

A hydraulic model was developed using Visual Hydraulics Version 5.1 software by Innovative Hydraulics to assess the plant's overall hydraulic capacity. This evaluation aimed to confirm that the existing facilities can pass the design flows without overtopping the structures' walls and to ensure the flow split structure operates as intended. The hydraulic profile was established from the headworks to the Yakima River. Plant operators collected field measurement data on three different dates, which were used to calibrate the model. This calibrated model was then applied to assess the hydraulic flow under design flow conditions.

The existing WWTF's hydraulic model was constructed based on record drawings provided by the City. The results of this model were compared against in-field measurements. Water elevation estimates, based on the freeboard height from these measurements, were matched with the model-predicted water elevations. The modeled water level closely aligned with the field-measured level, except in two areas:

1. At the AB splitter outlet box, the water level was measured to be 4 to 6 inches higher than what the model predicted. This difference became more noticeable as the flow rate increased. It's likely that there's extra resistance to flow, or 'headloss', in the pipe leading from the splitter box to the aeration basin. The model was adjusted to account for this extra headloss.

At the AB outlet box, the water level was also higher than the model predicted, varying between 2 to 8 inches. However, this difference didn't seem to change consistently with the flow rate. Due to this inconsistency, no adjustments were made to the model for this finding.

DRAFT

The calibrated model was used for hydraulic analysis for the 2044 PIF, MDF, MMF, and current PIF. The analysis summary includes:

- No overflow conditions were detected for the design flows tested.
- The UV disinfection system could trigger a HWL alarm at the 2044 PIF.
- The V-notch weir in the Secondary Clarifiers is estimated to be submerged at the 2044 PIF as the water level in the clarifier discharge box exceeds the weir elevation.
- The weir on the AB splitter box appears to be submerged in all flow conditions, potentially resulting in uneven flow distribution between the aeration basins.
- The freeboard in the AB splitter box may reduce to less than one foot at the 2044 PIF.

Accordingly, there are no major concerns with the plant's hydraulic profile for the foreseeable future. However, it would be beneficial to inspect the aeration basin inlet pipe to determine the cause of the increased headloss. Resolving this issue will ensure that the AB splitter box can distribute the flow evenly between the two aeration basins. The submerged state of the V-notch in the secondary clarifier can be resolved by expanding the outlet pipe or adding a new secondary clarifier.

8.3 Secondary Process Performance and Capacity

Process modeling is a critical step in the plant capacity assessment. The values validated through this modeling are used as inputs for the desktop calculations applied to many other processes. Biological process simulation was conducted to evaluate the performance of the secondary process at the plant, accompanied by desktop calculations. A plant process model was developed using BioWin Simulator Version 6.2, provided by Envirosim. The BioWin model utilizes complex biological interactions to predict material transformations and pollutant removals across various processes within a WWTF, providing detailed insights into wastewater characteristics throughout the treatment stages.

8.3.1 Process Model Setup

The process model was set up to represent the existing WWTF processes as presented on Figure 8-1. The plant daily monitoring data from January 2016 through June 2022, along with additional sampling data collected in June 2022 and provided by the City, were used to develop the detailed influent wastewater characteristics for the modeling.

DRAFT

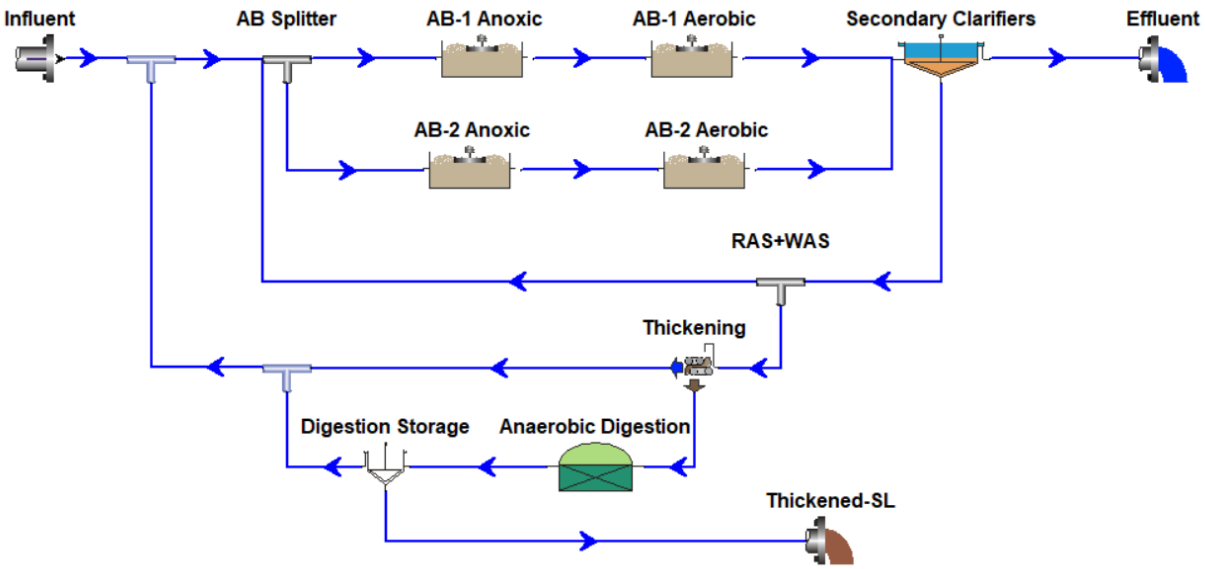


Figure 8-1: BioWin Simulator Layout for Ellensburg WWTF

To reduce the predictive error between the model outputs and actual data, the model was calibrated and validated using historical operation and performance data. The detailed influent characterization and the results of the calibration and validation process, including the 14-day sampling, are documented in Appendix F. Subsequently, the calibrated model was used for the secondary capacity assessment in the following section.

8.3.2 Simulation Conditions

The primary role of the secondary process is to remove BOD_5, TSS and nutrients Table 8-1 summarizes the Ellensburg WWTF secondary effluent quality goals, which were established to meet the NPDES permit limitations on these parameters.

Table 8-1: Secondary Effluent Quality Goal

Design Criteria	Units	Secondary Effluent Quality Goal	NPDES Permit Requirements
BOD_5 Average Monthly	mg/L	25	30
TSS Average Monthly	mg/L	25	30
Ammonia (as NH_3-N) Maximum Daily	mg/L	2, 1(1)	8.2
pH Average Monthly		6.5 to 7.5	6.0 to 9.0

Notes:
(1) Maximum daily and average monthly goal are set to be 2 and 1 mg/L, respectively.

DRAFT

The targeted ammonia is assumed to achieve nearly full nitrification. While effluent ammonia from the plant could vary under the permitted maximum daily concentration of 8.2 mg/L, maintaining stable operational conditions to facilitate partial nitrification and keep the ammonia concentration in this low range for an extended period is impractical. Therefore, it is recommended that the plant operates in a manner that ensures either nearly full nitrification or no nitrification at all depending on the permit limit.

The treatment capacity of the secondary process was assessed based on the design SRT required to meet the effluent BOD_5 and ammonia goals. Additionally, the typical secondary clarifier operation parameters were considered to meet the TSS goal. Table 8-2 summarizes the key operations criteria used for the assessment.

DRAFT

Table 8-2: Operation Criteria for Secondary Process Capacity Assessment

Design Criteria	Unit	Value
Aeration Basins		
Total SRT	days	11.5 at 9°C(1) 9.0 days at 14°C(1)
Targeted DO Concentration in Aerobic Cycle	mg/L	2
Anoxic Cycle, as % of Total Cycle		25%(2)
Secondary Effluent Alkalinity as $CaCO_3$	mg/L	>80(3)
Process MLSS	mg/L	1,500 to 4,000(4)
Current RAS Pumping Capacity	MGD	1.8 to 3.0(5)
Secondary Clarifier		
Side Water Depth of Current Clarifiers	ft	12
Solids Loading Rate- Average	lbs/sf/day	19.2 to 28.8(6)
Solids Loading Rate- Peak	lbs/sf/day	48(6)
Surface Overflow Rate - Average	gal/sf/d	400 to 600(6)
Surface Overflow Rate – Peak	gal/sf/d	1000 to 1200(6)

Notes:

(1) Design Total SRT estimated assuming the following condition: effluent ammonia = 1 mg/L, DO of aerobic zones = 2 mg/L 25% safety factor added to the theoretical aerobic SRT calculated. 25% of the total SRT is assumed to be anoxic SRT.

(2) In the current operation, surface aerators are cycled on and off to facilitate an anoxic condition. The operators have reported they started it and that has increased the sludge settleability. The operation is assumed to be continued.

(3) Alkalinity impacts the effluent pH and the performance of nitrification bacteria. A minimum alkalinity is assumed for the secondary effluent to meet the targeted effluent pH and maintain sufficient alkalinity that doesn't inhibit the nitrifiers' performance.

(4) Typical MLSS range for conventional activated sludge. The current aeration basins, using surface aerators for mixing and aeration, have been run up to about 1700 mg/L of MLSS. To run the aeration basins at higher MLSS levels and thereby increase treatment capacity, improvements in the mixing and aeration methods are necessary to ensure complete mixing across the typical MLSS range.

(5) Historical RAS pumping rate reported in DMR from July 2017 through June 2022.

(6) Typical design range for the activated sludge process excluding extended aeration.

SRT = solids retention time
DO = dissolved oxygen
$CaCO_3$ = calcium carbonate
MLSS = mixed liquor suspended solids
MLSS = mixed liquor suspended solids
SLR = sludge loading rate
lbs/sf/day = pounds per square feet per day
SOR = surface overflow rate
gal/sf/d = gallons per square feet per day
% = percent

Table 8-3 summarizes the operating scenarios evaluated through process modeling, along with additional scenarios used in desktop calculations to assess aeration and clarification capacity. One construction scenario was analyzed for the aeration basins and secondary clarifiers to determine whether taking one tank offline during the construction period would enable the implementation of the required process improvements in these scenarios.

DRAFT

Table 8-3: Operating Scenarios for Modeling and Desktop Calculations

Scenario	Summary of Operating Conditions	Purpose of Scenario
Scenarios to Assess Existing Aeration Basin Capacity		
S1	Design MML – Most Conservative Monthly Average • Two aeration basins and two secondary clarifiers in service • Lowest monthly average temperature=9.0°C • Aeration basin max MLSS at 4,000 mg/L	Determine the maximum treatment capacity of the existing aeration basin under the most conservative monthly average conditions.
S2	Design AAL – Maintenance • One aeration basin offline • Annual average temperature=14°C • Aeration basin max MLSS at 4,000 mg/L	Assess if one aeration basin can be taken offline during maintenance to inspect the submerged tank's condition.
S3	Design AAL – Typical Condition • All aeration tanks in service • Annual average temperature=14°C • Aeration basin MLSS at 3,000 mg/L	Investigate whether the average annual wastewater load can be treated using a lower MLSS range.
S4	Construction Scenario for Improvements - 2026 AAL • One aeration basin offline • Annual average temperature=14°C • Aeration basin max MLSS at 4,000 mg/L	Assess whether one aeration basin can handle the near-term load while the other basin undergoes improvements.
Scenarios for Assessment of Aeration Capacity (Desktop calculations only)		
S5	Design MML • Aerobic tank DO at 2.0 mg/L • Maximum average monthly temperature=19°C	Estimate aeration demand under maximum month load condition.

S6	Design PDL
	• Swing as anoxic, IR = 4.5 MGD
	• Aerobic tank DO
	  ○ 0.65 mg/L at 19°C (S6a)
	  ○ 1.3 mg/L at 9°C (S6b)
		Estimate aeration demand under peak day load condition.

Scenarios for Assessment of Secondary Clarifier Capacity (Desktop calculations and state point analysis)		
S7	Design PIF • All secondary clarifiers online • RAS TSS = 10,000 mg/L • RAS Flow = 6 MGD	Verify that the clarifiers operate within the maximum design ranges during peak hydraulic and solids loading.
S8	Design MMF • All secondary clarifiers online • RAS TSS = 10,000 mg/L • RAS Flow = 6 MGD	Confirm that the clarifiers operate within typical design ranges during the month with the highest hydraulic and solids loading.
S8	Construction Scenario for Improvements at AAF • RAS TSS = 10,000 mg/L • RAS Flow = 2 MGD	Evaluate the maximum flow that a single secondary clarifier can handle while the other clarifier is being upgraded during dry weather conditions.

The following section summarizes the results of the secondary capacity assessment based on these scenarios.

DRAFT

8.3.3 Aeration Basin Capacity Assessment

Table 8-4 summarizes the results of the aeration tank capacity assessment. The detailed modeling results are provided in Appendix F.

Table 8-4: Summary of Aeration Tank Capacity Assessment

Parameter	Unit	S1 Design MML	S2 Design AAL	S3 Maintenance	S4 2026 AAL
Aeration Tank Volume, in Service	Million gallons	2.50	2.50	1.25	1.25
Total SRT	days	11.5	9.0	9.0	9.0
Aerobic SRT	days	8.4	6.4	6.4	6.4
Estimated Observed Yield	lbs MLSS /lbs BOD_5	0.72	0.80	0.80	0.80
Max MLSS Concentration	mg/L	4,000	4,000	4,000	4,000
Influent BOD_5 Load Capacity at Max MLSS	lbs BOD_5/day	10,000	11,600	5,800	5,800
Influent BOD_5 Load	lbs BOD_5/day	10,000	7,600	7,600	5,200
If Load Capacity at Design Load or Larger?		YES	YES	NO	YES
Secondary Process HRT	hours	6	12	6	8
Key Outputs from Process Model[a]					
MLSS Concentration	mg/L	4000	2600	4700	3500
Total SOTR	lbs O_2/hr	950[b]	760[c]	730[b]	520[b]
Secondary Effluent CBOD	mg/L	12	11	17	13
Secondary Effluent TSS	mg/L	21	18	32	23
Secondary Effluent NH_3-N	mg/L	1.7	1.0	1.1	1.0
Secondary Effluent pH	mg/L	7.2	7.0	7.0	7.0

Notes:

(1) Simulated for the targeted SRT.

(2) Exceed the current 4 aerator's capacity of 400 lbs O_2/hr in each basin, supplied by the 4 aerators.

(3) Air demand can be met if all 8 aerators across both basins are operated continuously, foregoing the anoxic cycle.

The existing two aeration basins will be capable of handling the design AAL if the MLSS in the basins can be increased to 2700 mg/L, as summarized in the results for scenario 2 and validated through process modeling. However, to treat the design MML of 10,000 lbs BOD_5 per day during winter, as estimated for scenario 1, the MLSS must be further increased to 4,000 mg/L. This increase is necessary under the most conservative monthly average conditions, a requirement also validated in the process modeling. Additionally, once the AAL exceeds one basin's treatment capacity of 5,800 lbs/day (as indicated in the results for scenario 3), it will not be possible to take one of the two aeration basins offline for maintenance.

Currently, the MLSS in the aeration basins is limited to approximately 1,700 mg/L at the plant, primarily due to mixing efficiency constraints and the limited capacity of the existing two secondary clarifiers, given the current sludge settleability. To facilitate the increase in MLSS in the aeration basins, significant improvements will be required. These may include, but are not

DRAFT

limited to, converting to a more efficient mixing and aeration method, adding a dedicated anoxic selector to improve sludge settleability, and installing additional secondary clarifiers to handle the increased solids inventory in the system. The timeframe for such improvements is limited to only a couple of years, as the influent BOD_5 load is anticipated to reach the treatment capacity of one basin within that period (refer to the results for Scenario 4 in Table 8-4).

8.3.4 Aeration Capacity Assessment

To assess the required upgrades for the aeration system, the maximum aeration demands in the existing basins were calculated for both the design MML and PDL conditions. Aeration demand escalates with increasing water temperature, as the dissolved oxygen (DO) saturation concentration diminishes with rising temperatures. Additionally, the demand varies depending on the minimum DO concentration maintained in the aeration basins, which is dictated by the targeted SRT and water temperature. Table 8-5 summarizes the estimated aeration demand for the three selected scenarios summarized in Table 8-3, taking these factors into account.

Table 8-5: Summary of Aeration Demand Assessment

Parameter	Unit	S5 Design MML	S6a Design PDL	S6b Design PDL
DO in Aeration Basins	mg/L	2.00	0.65	1.30
Air Demand as SOTR for Aeration Basins	lbs O_2/day	1,100	1,150	1,170
Aeration Capacity of Current 8 Aerators	lbs O_2/day		800 (600[(a)])	
Is Existing Aeration Capacity Sufficient?		NO	NO	NO

Notes:

(1) Aeration capacity is assumed for the current cyclical operation of the aerators, where the aerators are operational 75% of the time and off 25% of the time.

As summarized in the assessment results, the aeration demand estimated in all three scenarios appears to exceed the existing capacity of the 8 aerators, even if all aerators are assumed to operate continuously. At least two aerators need to be added to each bay in order to meet the peak air demand. To meet the maximum aeration demand in the design year while maintaining the current cyclical operation, which facilitates anoxic conditions to improve sludge quality, the aeration capacity needs to be nearly doubled.

8.3.5 Secondary Clarifier Capacity Assessment

The capacity of the secondary clarifiers was assessed for a typical operation scenario and a peak flow scenario. An additional scenario was also estimated to determine if one secondary clarifier can handle the conditions over the next few years, thereby allowing the other secondary clarifier to be taken offline for improvements. The assessed results are summarized in Table 8-6.

DRAFT

Table 8-6: Summary of Secondary Clarifier Capacity Assessment

Parameter	Unit	S7 Design PIF	S8 Design MMF	S9 Max AAF
Secondary Clarifiers, in Service	each	2	2	1
Total Surface Area	sf	11,349	11,349	5,675
Influent Flow	MGD	16.1	10.1	3.5
RAS Flow	MGD	3.2 (6.5[(a)])	3.2 (6.5[(a)])	2.0
RAS TSS Concentration	Mg/L	10,000	10,000	6,000
MLSS in Mixed Liquor	mg/L	1,700 (2,900[(a)])	2,400 (3,900[(a)])	3,700
SOR	gal/d/sf	1,400	900	600
SLR	lbs/d/sf	23.5 (47.8[(a)])	23.5 (47.8[(a)])	17.6
Is SOR within typical?		No	No	Yes
Is SLR within typical?		Yes (No[(a)])	Yes (No[(a)])	Yes

Notes:
(1) Assessment assuming increased RAS pumping capacity.

As shown in the results for scenarios 7 and 8, the existing two secondary clarifiers cannot handle the design MMF or PIF as the SOR exceeds the typical design range recommended for the clarifiers. Additionally, the current RAS pumping capacity, with a historical maximum RAS rate of about 3.2 MGD with both pumps in service, limit the rise in MLSS concentration in the aeration basins, preventing it from reaching the desired level to maximize treatment capacity. Increasing the RAS pumping capacity will result in the two clarifiers being unable to handle the increased solids inventory. Therefore, a third secondary clarifier will be required to meet capacity demands.

If one of the secondary clarifiers needs to be taken offline for improvements, the remaining clarifier will only be able to handle the solids inventory under the projected AAF conditions for a couple of years, and only during the summer months If the service time for the improvements exceeds 3 to 4 months, a feasible approach might be to upgrade one secondary clarifier in one year and the other in the subsequent year. However, this approach would involve a waiting period between the two improvements. This potential extension of the construction period should be factored into any improvements planned for the secondary clarifiers.

8.4 Other Process Capacity Assessment

The following sections present a summary of the individual process capacity assessment results. The forecasted values, derived from desktop analysis, are compared with standard design values and ranges sourced from “Wastewater Engineering: Treatment and Resource Recovery” (5th Edition, 2014, by Metcalf & Eddy) and Criteria for Sewage Works Design (Ecology, 2008, commonly referred to as the Orange Book). The cells highlighted indicate processes that surpass the existing design capacity or fall short of the typical design standards as outlined in Metcalf & Eddy or Orange Book.

8.4.1 Influent Pump Station

The Orange Book requires pump stations to provide firm capacity to handle PIF. However, the IPS will not be able to accommodate the design PIF of 16.1 MGD by 2044, which exceeds the

DRAFT

system's estimated capacity of 15.2 MGD, as shown in Table 8-7. Additionally, the collection line near the WWTF frequently experiences surcharge issues due to the inadequate volume of the existing wet well during peak flow conditions. Expanding the wet well is challenging since the IPS operates continuously. As a short-term solution, the IPS capacity can be increased by replacing or adding an influent flow line to the headworks, which would reduce the TDH and increase pumping capacity. For long-term improvements, constructing a new IPS in parallel with the new secondary biological process is recommended.

Table 8-7: IPS Capacity Assessment Results

IPS Criteria	Capacity		
Type	Vertical non-clog centrifugal		
Number, each	2 large + 1 small		
Capacity each large pump, MGD	10.30		
Capacity small pump, MGD	6.55		
Total firm capacity(1), MGD	15.2(2)		
Flow Assessed	Design PIF	Permit PIF	Historical PIF
Flow, MGD	16.1	15.0	12.9(3)

Notes:

(1) The firm capacity refers to the total capacity available when the largest unit or piece of equipment is out of service.

(2) A 10% reduction in total capacity is assumed due to increased head loss in the common discharge line, which shifts the pump operation point to a higher Total Dynamic Head (TDH), reducing the flow from each pump.

(3) Peak hour flow rate reported in the 2018 WWTF Aeration Basin Study (2018 Aeration Basin Study) by Gray & Osborne, Inc. No peak hour flow rate was recorded after 2017.

8.4.2 Grit Removal

Table 8-8: Grit Removal Capacity Assessment Results

Grit Removal Criteria	Capacity		
Type	Detritus		
Number, each	1		
Diameter, ft			
Surface area, sq.ft			
Total firm capacity, MGD	15.0		
Surface overflow, gpd/sf	Design	Permit	Historical
@ AAF	16,400	-	10,500
@ MMF	32,300	25,500	21,000
@ PIF	51,200	47,700	40,100
Typical in Metcalf & Eddy		46,300	
Detention time, seconds	Design	Permit	Historical
@ AAF	59	-	92
@ MMF	30	38	46
@ PIF	19	20	24
Typical in Orange Book		45 to 90	

DRAFT

8.4.3 Screening

The existing screening system includes a manual bar screen, allowing excess flow to be handled by the backup screen if the influent flow exceeds the capacity of the mechanical screens. This backup screen meets the design requirements outlined in the Orange Book. Since the design flow surpasses the combined capacity of both screens, increasing the screening capacity is recommended. Additionally, the screening area has limited space for maintenance access, so it is recommended to modify the channel structure when increasing the screening capacity to allow for more maintenance space between the channels.

DRAFT

Table 8-9: Screening Capacity Assessment Results

Screening Criteria	Capacity		
Mechanical screen	Perforated plate		
Number, each	2		
Opening size, in	0.25		
Capacity, each, MGD	7.5		
Capacity, total, MGD	15		
Manual screen	Bar screen		
Number, each	1		
Opening size, in	1.25		
Total firm capacity, MGD	15.0		
Flow Assessed	Design PIF	Permit PIF	Historical PIF
Flow, MGD	16.1	15.0	12.9

8.4.4 UV Disinfection

In 2015 WWTF Engineering Report, the manufacturer, Trojan Technologies, Inc., confirmed the existing UV system could treat up to 18 MGD at a dose of 35,000 uW-sec/cm^2 and UV transmittance of 65 percent. As the effluent UV transmittance is typically above 70 percent, no additional capacity is required for the UV disinfection. If the City does not wish to modify the UV dosing, then additional capacity would be required to meet deign PIF.

Table 8-10: UV Disinfection Capacity Assessment Results

UV Disinfection Criteria	Capacity		
Type	Low pressure, low intensity UV		
Flow capacity, MGD			
UV dose @ 43,000 uW-sec/cm^2	15		
UV dose @ 35,000 uW-sec/cm^2	18		
Flow Assessed	Design PIF	Permit PIF	Historical PIF
Flow, MGD	16.1	15.0	12.9

8.4.5 Return Activated Sludge (RAS) Pumps

Currently, both RAS pumps are frequently operated at 100% capacity with no redundancy, returning approximately 3 MGD of RAS flow to the aeration basins. This is significantly below the typical range recommended for RAS pumping capacity, as summarized in Table 8-11. As mentioned earlier in Section 7.2.5, the RAS flow capacity needs to be increased to maintain the desired biomass concentration in the aeration basins and effectively treat the projected loads.

DRAFT

Table 8-11: RAS Pump Capacity Assessment Results

RAS Criteria	Capacity	
Type	Vertical non-clog centrifugal	
Number, each	2	
Capacity, each, gpm	1,400	
Capacity, each, MGD	2.0	
Total max capacity, MGD	3.0	
Typical RAS flow recommended, MGD	Design	Historical
Minimum @ 70% of average flow	3.6	2.9
Maximum @ 125% of average flow	6.4	5.2

8.4.6 Waste Activated Sludge (WAS) Pumps

The existing capacity of the WAS pump is adequate to handle the estimated WAS production under all conditions, with the sludge feed pump serving as a backup system for wasting. Therefore, no capacity limitations have been identified for the WAS pumps at this time.

Table 8-12: WAS Pump Capacity Assessment Results

WAS Criteria	Capacity		
WAS Pump			
Type	Vertical non-clog centrifugal		
Number, each	1		
Capacity, each, gpm	300		
Capacity, each, gpd	432,000		
Sludge Feed Pump			
Type	Progressive Cavity		
Number, each	1		
Capacity, each, gpm	470		
WAS TSS estimated, lbs/day	2044	Permit	Historical
@ average	5,800	6,100	3,500
@ max month	6,900	7,300	4,500
WAS flow estimated, gpd	2044	Permit	Historical
@ average & 1% TSS	69,500	73,100	42,000
@ max month & 1% TSS	82,700	87,500	54,000

8.4.7 Thickening Process

The existing thickening process, which includes the GBT, DAFT, and the thickened WAS pump, appears capable of handling the solids produced under both Permit and 2044 conditions, as summarized in Table 8-12. Therefore, no capacity limitations are identified at this time.

Table 8-13: Thickening Process Capacity Assessment Results

Thickening Process Criteria		Capacity	
Gravity Belt Thickener			
Number, each		1	
Solids capacity, lbs/hr		1,000	
Hours/week of operation estimated	2044	Permit	Historical
@ design max month	48	50	32
Dissolved Air Floatation			
Number		1	
Surface area, sq.ft.		200	
Capacity, lbs dry solids/d/sf		48	
Sludge loading rate estimated, lbs dry solids/d/sf	2044	Permit	Historical
@ max month & 1% TSS	35	36	23
Thickened WAS (TWAS) Pump			
Type		Progressive Cavity	
Number, each		1	
Capacity, each, gpm		300	
Capacity, each, gpd		432,000	
TWAS TS estimated, lbs/day	2044	Permit	Historical
TSS capture rate assumed	95%	95%	95%
@ average	5,510	5,795	3,610
@ max month	6,555	6,840	4,275
TWAS flow estimated, gpd	2044	Permit	Historical
TWAS concentration assumed(1)	4.2%	4.2%	4.2%
@ average	15,700	16,500	10,300
@ max month	18,700	19,500	12,200

Notes:
(1) Average TWAS TS concentration from the historical plant daily monitoring data.

8.4.8 Digesters

If both the primary and secondary digesters are used for digestion, the required retention time to produce Class B solids can be achieved as estimated in Table 8-14**.** However, modifications to the secondary digester will be necessary to meet this goal along with the accessory system such as boiler, mixer, recirculation pump and heat exchanger.

DRAFT

Table 8-14: Digesters Capacity Assessment Results

Digestion Criteria		Capacity	
Primary Digester			
Number, each		1	
Volume, total, gallons		309,000	
Secondary Digester			
Number, each		1.00	
Volume, total, gallons		301,300	
Retention time estimated, days	2044	Permit	Historical
@ average	20	19	30
@ max month	17	16	25
Typical retention time in Orange Book, days		15 (10 to 20)	
Volatile solids (VS) loading estimated, lbs/cf/day	2044	Permit	Historical
@ average	0.06	0.06	0.04
@ max month	0.06	0.07	0.04
Typical VS loading in Metcalf & Eddy, lbs/cf/day		0.12 at 15 days	
VS destruction assumed		45% (45% to 50% from Metcalf and Eddy)	
VS destruction estimated, lbs/day	2044	Permit	Historical
@ average	2,000	2,100	1,300
@ max month	2,400	2,500	1,600
Total solids (TS) from digester estimated, dry lbs/day			
@ average	3,500	3,700	2,300
@ max month	4,200	4,300	2,700
VS from digester estimated, dry lbs/day			
@ average	2,500	2,600	1,600
@ max month	2,900	3,100	1,900

8.4.9 Digested Sludge Storage Process

The solids loading rate to the sludge lagoon is expected to exceed the typically recommended rate. In this case, the sludge drying beds, with their additional capacity, can be used to store the excess sludge. Therefore, there is no concern regarding sludge storage capacity within the planning horizon.

DRAFT

Table 8-15: Digested Sludge Storage Assessment Results

Sludge Lagoon		Capacity	
Number, each		2	
Area, each, sq.ft.		28,280	
Solids loading rate estimated, dry lbs VS/1000 sq.ft/day	2044	Permit	Historical
@ average	44	46	27
@ max month	51	55	34
Typical loading rate from Metcalf & Eddy		20 to 50	
Sludge Drying Beds		**Capacity**	
Large bed, each		10	
Small bed, each		2	
Total area, sq.ft.		127,000	
Solids loading rate estimated, dry lbs TS/sq.ft/yr	2044	Permit	Historical
@ average	10	11	7
@ max month	12	12	8
Typical loading rate from Metcalf & Eddy		12 to 20	

8.5 Aeration Basin Alternative Analysis

As the aeration basins are projected to reach their treatment capacity in the near future, with both BOD_5 and ammonia treatment limited by the current MLSS cap, a separate project was conducted to perform an alternative analysis addressing these capacity issues. Six alternatives were developed as summarized below:

1. **Addition of anoxic selector and aerators**: Improves sludge settleability and adds aeration capacity to meet increased demand.

Addition of anoxic selector and switching from surface aeration to diffused aeration: Enhances sludge settleability and provides a more efficient aeration method, fully utilizing basin volume.

Addition of primary filters, anoxic selector and aerators: Reduces load on the aeration basin, provides food source for anaerobic digestion, improves sludge settleability, and adds aeration capacity to meet increased demand.

Splitting two aeration basins into four basin, addition of anoxic zone and switching from surface aeration to diffused aeration: Eliminates the need for additional volume during maintenance by reducing inactivated volume. Improves sludge settleability and provides a more efficient aeration method for full utilization of basin volume.

Construction of new three aeration basins with diffused aeration configured as modified Ludzack Ettinger (MLE) process: Builds a new MLE process to meet treatment capacity while producing good sludge settleability.

Construction of new three aeration basins with diffused aeration configured as MLE and primary filters for primary removal: Creates a new MLE process for reduced load conditions with primary filtration, while also providing an additional food source for anaerobic digestion.

These six alternatives were evaluated in detail to identify the most suitable option. The evaluation process included estimating capital and O&M costs for each alternative, conducting an NPV analysis to assess long-term financial feasibility, and performing a pros and cons assessment to compare the advantages and disadvantages of each option. The table below provides a summary of the alternatives and their corresponding NPV values. A presentation summarizing the alternative analysis is included in Appendix G.

8.6 WWTF Analysis Summary

The following notes summarize the results of the Hydraulic Analysis:

- No overflow condition was detected for all flow scenarios.
- The freeboard in the AB splitter box may decrease to less than one foot at 2042 PIF.
- The water level at the UV disinfection system may exceed the high water level (HWL) alarm set point at 2042 PIF.
- The weir located on the AB splitter box was estimated to be submerged in all design flow conditions checked with the addition of increased headloss. It could potentially lead to uneven flow distribution between the two aeration basins

The following notes summarize the results of the Secondary Process Analysis:

- **For Scenarios 1 to 4 to Assess Existing Aeration Basin Capacity:** There is adequate capacity for all scenarios run, except Scenario 2, which outlined the design AAL with one Aeration Basin offline for maintenance. One aeration basin's capacity is 24% less than Design AAL.
- **For Scenarios 5 and 6A/B for Assessment of Aeration Capacity (Desktop calculations only):** There is insufficient capacity for all scenarios with high oxygen demand. Aeration capacity of 8 aerators can be 32% less than maximum demand estimated. There are currently only 4 aerators per aeration basin. The current configuration only utilizes 6 of the 8 available aerators. If all 8 aerators were used, it can be expected that they could satisfy aeration demand no longer than 2028. However, using all 8 aerators without on/off cycling would eventually eliminate anoxic conditions in the aeration basins, resulting in a lack of alkalinity recovery and poorer microorganism settleability. This could, in turn, lead to an increase in sludge SVI values and accelerate the secondary clarifiers reaching the treatment capacity. Therefore, 2 more aerators need to be added to each aeration basin in the short term to maintain sufficient capacity. If growth increases beyond 2%, capacity will be reached sooner.
- **For Scenarios 7 to 9 for Assessment of Secondary Clarifier Capacity (Desktop calculations and state point analysis):** There is a capacity shortage to handle the

DRAFT

requires solids loading rate for both the design MMF and the design PIF. Secondary clarifiers' capacity can be 30% less than capacity needed for design flows.

The following notes summarize the results of the WWTF Process Capacity Assessment:

- **Influent Pump Station:** The IPS will exceed the system's estimated capacity of15.2 MGD and will not be able to accommodate the design PIF of 16.1 MGD by 2044. Additionally, the IPS wet well is undersized which causes the collection line near the WWTF to experience surcharging during peak flow conditions. As a short-term solution, the IPS capacity can be increased by replacing or adding an influent flow line to the headworks, which would reduce the TDH and increase pumping capacity. For long-term improvements it is recommended to construct a new IPS in parallel with the new secondary biological process.

- **Grit Removal:** The construction of a new grit removal system is recommended given the estimated surface overflow rate at the grit removal tank exceeds the typical recommended limit under both Design and Permit PIF conditions and the detention time is estimated to be significantly below the typical range at Design and Permit MMF and PIF conditions. Additional consideration was given to the age, worn condition, and physical cracking of the grit auger.

- **Screening:** An additional screen is recommended because the design flow surpasses the combined capacity of both screens. Additionally, the screening area has limited space for maintenance access, so it is recommended to modify the channel structure when increasing the screening capacity to allow for more maintenance space between the channels.

- **UV Disinfection:** Current UV dosing is rated for 15 MGD. Under design PIF conditions, unless dosing is modified there will be insufficient treatment and additional banks are recommended. Lamps will also reach the end of their service life by the end of the planning horizon.

- **RAS Pumps:** RAS flow capacity needs to be increased to maintain the desired biomass concentration in the aeration basins and effectively treat the projected loads.

- **WAS Pumps:** No capacity limitations have been identified for the WAS pumps at this time.

- **Thickening Process:** No capacity limitations have been identified for the WAS pumps at this time.

- **Digesters:** If both the primary and secondary digesters are both used for digestion, the required retention time to produce Class B solids can be achieved**.** However, modifications to the secondary digester will be necessary to meet this goal along with the accessory system such as boiler, mixer, recirculation pump and heat exchanger.

- **Digested Sludge Storage Process:** The sludge drying beds can be used to store excess sludge when the sludge lagoons reaches capacity.

DRAFT

The following notes summarize the results of the Aeration Basin Alternatives Analysis:

- Alternative 5 was selected as the preferred solution. This involves the construction of new MLE aeration basins. Additionally, the installation of one surface aerator was included as a near-term improvement, allowing the existing aeration basins to serve for additional years and enabling one basin to be taken offline for inspection and cleaning of potential grit accumulation.

DRAFT

Section 9: Operations and Maintenance

9.1 Introduction

This section provides an overview of the City Public Works and Utilities Department Wastewater Utility Division (WUD) organization, staffing, and O&M program. Assets under WUD management include the gravity sewer pipelines, PS's, force mains, and wastewater treatment facilities. The items addressed in this chapter include responsibility and authority, normal system operation, routine and preventative maintenance, current and projected staffing needs, new construction, safety, and emergency response. Existing practices and identification of potential improvements are reviewed.

9.2 Organizational Structures & Responsibilities

The WUD falls under the authority of the Public Works Director and provides the collection and treatment of wastewater received from residential, commercial, and industrial uses. The WUD is supported by the Engineering Services Division (ESD) which provides engineering planning, design, construction management services, inspection, and permitting of work related to public infrastructure for the Water, Wastewater, Stormwater & Solids Waste Divisions. The ESD is responsible for planning and developing City utilities in the most cost-efficient way, while protecting public safety.

The WUD is responsible for the day-to-day operations of the sewer collection system, PS, and WWTF. It is divided into two main sections: Wastewater Treatment Facility and Water/Wastewater Systems. Figure 9-1 depicts the organization structure of this division.

DRAFT

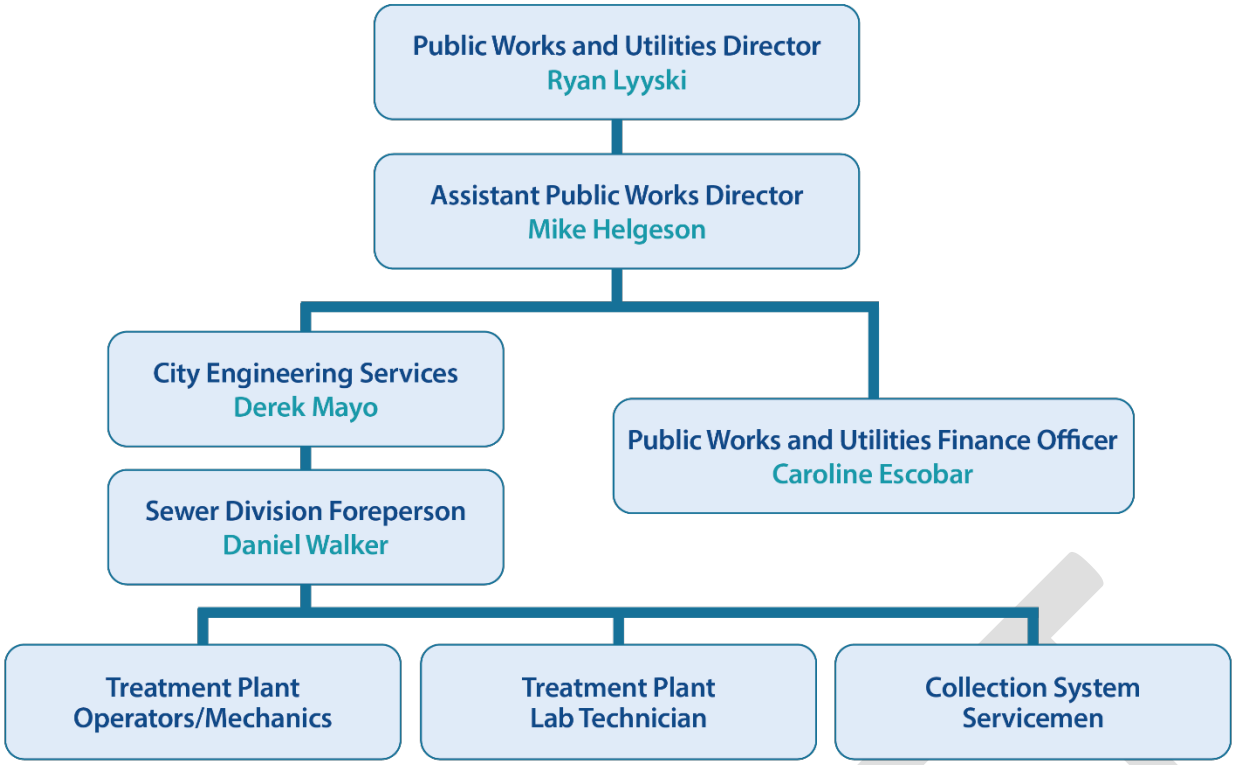


Figure 9-1: City of Ellensburg Organizational Structure

9.3 WWTF Section Responsibilities

The WWTF is staffed by ten (10) full time employees. This includes the lead operator and four level II operators. A laboratory technician and a source control specialist support them, all of whom report to the Sewer Division Foreperson. Their duties include operations and maintenance of the WWTF equipment and systems and responding to after-hour alarms or other operational needs. This facility's operation and the quality of the effluent it discharges depend on the performance of the plant staff.

It is the responsibility of the publicly elected officials and City Hall staff to provide the budgetary and staffing support necessary for the proper care and performance of these facilities.

9.4 Water/Wastewater System Responsibilities

Th staff members dedicated to the Water and Wastewater systems include maintenance workers and one lead worker, who have the duty and responsibility to operate and maintain the water distribution and wastewater collection systems. Their duties include video inspection, inspection and maintenance of manholes, pipes, and PS's as well as responding to citizen complaints and investigating problems with the collection system.

DRAFT

9.5 System Operation & Control

Operations data is collected by programmable logic control (PLC) systems that measure, calculate and execute prescribed functions for many in-plant and pump station functions. The PLC collects data from the IPS, the boiler, and the UV system. The information generated within the treatment facilities and PS's is automatically transmitted through the WWTF Supervisory Control and Data Acquisition (SCADA) system and recorded in an electronic format at the WWTF.

9.6 Staffing Assessment

The BRVA workshops noted that the City could expand staff training and has limited documented SOP, AOPs, and ERPs at the WWTF. There is also no certified electrician on staff, which limits the City's ability to perform necessary routine maintenance on electrical cabinets and panels.

9.7 O&M Assessment Summary

The following notes summarize recommendations for the O&M program:

- Allocate resources to leverage existing institutional knowledge to formally document SOPs, AOPs, and ERPs and training protocols.
- Consider bringing a certified electrician on staff.
- Harness existing CMMS system to address long lead WEM times for workorders and limited resources through the City's CMMS system, where necessary staffing levels and can be determined and justified for potential staff augmentation.

DRAFT

Section 10: Capital Improvement Plan

10.1 Introduction

This Section provides a compilation of recommended projects and improvements during the planning period. The framework for the recommended projects was derived from the collection system analysis in Section 7: and the wastewater treatment facility analysis in Section 8: along with the BRVA in Section 6. The projects identified by this process represent the Capital Improvement Program (CIP) for the wastewater collection and treatment system through 2044. The CIP is summarized in Table 10-1.

The project recommendations outlined herein guide the City in identifying and prioritizing enhancements to its wastewater collection and treatment systems. These enhancements are structured into various projects that form the prioritized CIP. The primary goal of the CIP is to expand and upgrade the City's current collection and treatment systems to accommodate anticipated future demand.

Each project is accompanied by an Association for the Advancement of Cost Engineering (AACE), Class 5, planning level accuracy of +50%/-30%, engineer's Opinion of Probable Construction Cost (OPCC). The City should review the CIP periodically to adjust for changes in the priority of each project, project cost, and project scope.

Periodic reviews of the CIP are recommended to adjust for changes in regulatory requirements, population growth, and project priority, cost, and scope.

Wastewater collection system and WWTF improvements are classified as either Repair/Replace or Capital projects. The distinction between the two classifications is intended to indicate the urgency for the project and the appropriate funding source.

- Repair and Replace (R&R): These projects are intended to replace infrastructure in kind and are typically the result of obsolete equipment that has exhausted its useful life or experiences excessively high maintenance. The R&R projects may include new equipment replacing old, or a replacement of equipment that is still functional but is no longer suitable to support the treatment processes or regulatory compliance. This type of project typically has a mid-range budgetary limitation.

- Capital: These projects are normally targeted at reducing maintenance or improving operations on a larger scale and are determined by major asset failure, capacity needs, or regulatory expansion requirements. These projects typically have a significant budgetary impact requiring long-term planning and funds.

10.2 Project Prioritization

The selection and prioritization of CIP projects were based on the following key criteria:

1. Compliance with regulatory, health, and public safety standards.

2. Providing adequate capacity for anticipated future loads.

3. Enhancing the efficiency of the collection system by reducing inflow and infiltration.

4. Improving the operability of the WWTF.

The projects within the CIP are divided into two categories: near term improvements recommended for the collection system and the WWTF to be implemented within the next 10 years, and mid- and long-term improvements suggested for lower-risk and less urgent needs, that can be implemented between 10 to 20 years. The formulation of each table is elaborated upon in the subsequent discussion.

After completing the system evaluations, risk scores were adjusted, and likelihood of failure (LoF) was introduced into the equation to yield the final risk ranking. The LoF was also projected to a 20-year timeline to compare future risks. It is important to note that digester improvements were not included in these evaluations as they are being addressed outside the scope of this project. Projects were selected for capital improvement and R&R based on two factors: (1) where they fell along the risk rank and (2) their LoF within the 20-year time horizon. The risk rank pulls together information gathered during the BRVA, condition assessments, process performance assessments and hydraulic capacity assessments. The LoF score relies on ability to maintain regulatory requirements, aging infrastructure ending useful life or reaching obsolescence, and data associated with O&M knowledge and records. Figure 10-1 shows this ranking and highlights the associated CIPs described in Section 10.3.

DRAFT

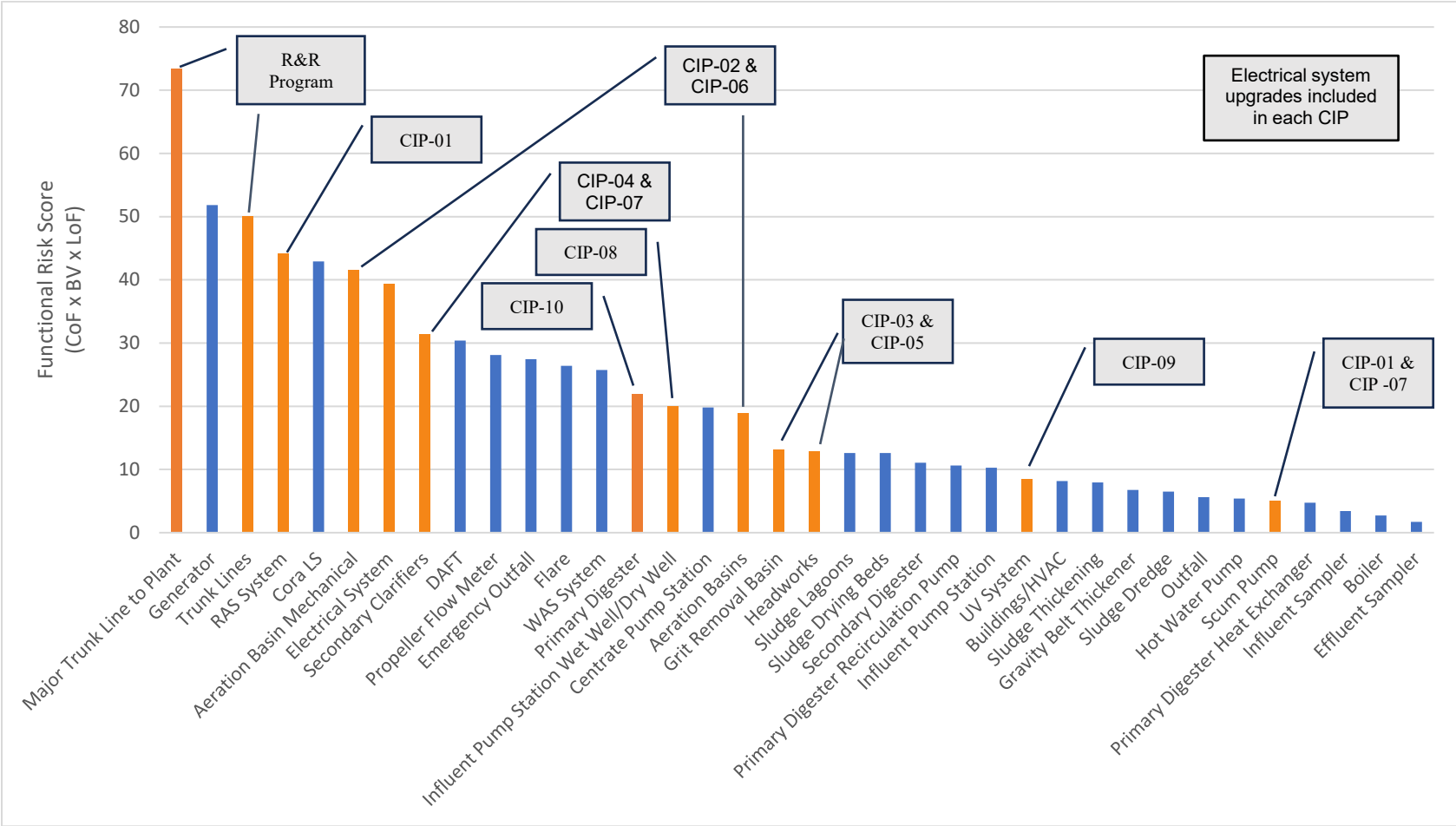


Figure 10-1: City of Ellensburg System Risk Evaluation & Associated CIPs

10.3 20-Year CIP

Nine projects were identified for the CIP. Appendix H shows anticipated site layouts for proposed CIPS. They are outlined as follows:

CIP-01 RAS Building Improvements

This project includes replacement of two RAS pumps and one scum pump with new pumps, which are near end of service life. Project will also include integration of SCADA. This is selected as improvement one to ensure adequate biomass concentration is being delivered to the aeration basins, in addition to accounting for a high likelihood of failure with both pumps running 100% of the time, limiting the ability to perform routine maintenance.

CIP-02 Aeration Improvements

This project adds two surface aerators to the existing aeration basins to provide sufficient aeration for CBOD and TSS removal to meet anticipated permit limits in the near-term. The plant operates all eight aerators in staggered on/off cycles, adjusting the on-time as needed (typically around 75–80%). If all 8 aerators were operated continuously, they are expected to meet the aeration demand only through approximately 2028. Adding two additional aerators will provide the capacity needed to maintain the desired dissolved oxygen levels while continuing the on/off operation cycle that supports anoxic conditions, alkalinity recovery, and good sludge settleability. This effort will also include replacement of the aeration MCC.

CIP-03 Grit Classifier and Grit Pumps

This project includes replacement of damaged grit equipment. The current grit washer has a significant physical crack down the length of the auger which will fail in the near future. The purpose is to provide improved grit removal in the near term by replacing the grit auger with a duplex grit pump system and grit classifier. The new grit equipment will be installed adjacent to the existing infrastructure and will be relocated to the new headworks building when constructed begins during CIP-04.

CIP-04 New Secondary Clarifier Associated with New RAS and WAS Pumps

This project adds a third secondary clarifier (SC3), which serves near-term AAF. The required solids loading rate for both the design MMF and the design PIF can be 30% less than capacity needed for design flows and must be addressed in the near term. This also serves as back up the capacity of the existing two SCs, allowing the current two SCs to be off duty for improvement purposes at the same time. This effort will include upgrades to the electrical system. This effort will include upgrades to the electrical system.

CIP-05 Headworks Improvements with New Grit and Screening Equipment

This project includes replacement of damaged grit system and the addition of a new screen; upsizing from 15 MGD to 20 MGD. Additionally, the design and Permit PIF conditions and the detention time is estimated to be significantly below the typical range at Design and Permit MMF and PIF conditions. An additional screen is recommended because the design

DRAFT

flow surpasses the combined capacity of both screens. This effort will include upgrades to the electrical system. This improvement includes a new headworks building.

CIP-06 New Aeration Basins and Blower Building

This project constructs new MLE aeration basins and a blower building to ensure sufficient treatment capacity to meet permit limits for long-term. This CIP aligns with Alternative 5 addressed in the aeration basin alternative analysis described in Section 8.5. In addition to the new basin, this includes the installation of one surface aerator was included as a near-term improvement, allowing the existing aeration basins to serve for additional years and enabling one basin to be taken offline for inspection and cleaning of potential grit accumulation. This effort will include upgrades to the electrical system.

CIP-07 Replacement of Sludge Collection Mechanism of Two Existing Secondary Clarifiers

This project installs a new sludge collection mechanism in SC1 and SC2. Add RAS and WAS wet wells to SC1 along with a pumping system, ensuring that the operation of one SC does not interfere with the functioning of the other SCs. These basins have not been able to be taken offline and adequately cleaned and inspected for a number of years. Condition of the internal mechanisms should be addressed prior to commencement of this CIP. This effort will include upgrades to the electrical system.

CIP-08 Influent Pump Station and One Sewer Manhole

This project constructs a new influent pump station featuring a large wet well volume and redirect the sewer line to accommodate the flow capacity needed for long-term operations. The IPS will exceed the system's estimated capacity of 15.2 MGD and will not be able to accommodate the design PIF of 16.1 MGD by 2044. Additionally, the IPS wet well is undersized which causes the collection line near the WWTF to experience surcharging during peak flow conditions. This effort will include upgrades to the electrical system.

CIP-09 UV Disinfection Replacement and Addition

This project replaces the existing UV lamps, which will be near the end of their service life by 2040, with a new UV system to ensure long-term disinfection capacity. Current UV dosing is rated for 15 MGD. Under design PIF conditions, unless dosing is modified there will be insufficient treatment by 2044 and additional banks are recommended. This effort will include upgrades to the electrical system.

DRAFT

CIP-010 Digester Motor Control Center Replacement

This project will decommission and replace MCC units in the digester building. The digester building MCC for the solids system has missing parts, many parts not per original design, and the bus capacitor appeared to be nonfunctioning. The aeration basin MCC, power system MCC, RAS system MCC, DAFT MCC were also rated in very poor condition but will be addressed within the scope of the prior noted CIPs. While the current state of the electrical system WWTF wide is in poor condition, it is more practical to break this effort into pieces and replace equipment not just in kind, but with the new loads of new system improvements in mind. Since a CIP for the digester system itself is being addressed outside the scope of this GSP, it is still vital to address electrical concerns within the solids system MCC.

Collection System Repair & Replacement (R&R) Program

The R&R program will establish an annual fund for collection system upgrades to address aging infrastructure, I/I, and future capacity constraints. The R&R program may also include services for video inspection (CCTV), condition assessment, identification, modeling, and execution of pipeline repairs and rehabilitation. It is recommended that the City prioritize which sewer system sections to replace or line based on the I/I reduction evaluation.

The list of projects with the associated engineer's OPCC is found in Table10-1 and Table 10-2.

Table 10-1 lists the proposed CIP projects for 2024 through 2044 and includes the following information:

- Project Number
- Project Name
- Type of Project: Replacement, upgrade, or expansion including the percentage of funds needed for it.
- Opinion of Probable Project Cost (in 2024 dollars)
- Combined design and construction costs by year.

DRAFT

	City of Ellensburg Capital Imrprovement Projects	Replacement	Upgrade	Expansion	Opinion of Probable Construction Cost[1][2]	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Design + Construction Costs	Projected Years of Work to be Conducted
2025-2026 (Preliminary) Sewer Construction Budget[3]	Sewer Main Extensions					$ 50,000	$ 50,000									100000	2025-2026
	Sewer Main Oversizing					$ 50,000	$ 50,000									100000	
	Anderson Road Sewer - Phase II					$ 2,900,000										2900000	
	Cured in Place						$ 400,000									400000	
	Methane Recapture					$ 40,000	$ 1,000,000									1040000	
	Wenas Street Sewer Extenstion (Removal of Cora Lift Station)					$ 500,000	$ 2,500,000									3000000	
CIP-01	RAS Building Improvements	100%	0%	0%	$ 3,200,000	$ 348,000	$ 1,426,000	$ 1,426,000								$ 3,200,000	2025 - 2026
CIP-02	Aeration Improvements	0%	100%	0%	$ 1,900,000		$ 198,000	$ 1,702,000								$ 1,900,000	2026 - 2026
CIP-03	Grit Classifier and Grit Pumps	0%	100%	0%	$ 1,600,000		$ 165,000	$ 1,435,000								$ 1,600,000	2026-2027
CIP-04	New Secondary Clarifier Associated with New RAS and WAS Pumps	0%	0%	100%	$ 23,100,000			$ 2,358,000	$ 10,371,000	$ 10,371,000						$ 23,100,000	2027 - 2028
CIP-05	Headworks Improvements with New Grit and Screening Equipment	0%	25%	75%	$ 8,800,000					$ 894,000	$ 7,906,000					$ 8,800,000	2029 - 2030
CIP-06	New Aeration Basins and Blower Building	0%	100%	0%	$ 51,600,000							$ 5,265,000	$ 23,167,500	$ 23,167,500		$ 51,600,000	2031 - 2033
CIP-07	Replacement of Sludge Collection Mechanism of Two Existing Secondary Clarifiers	0%	100%	0%	$ 13,700,000										$ 1,401,000	$ 13,700,000	2034 - 3035
CIP-08	Influent Pump Station and One Manhole	0%	75%	25%	$ 16,700,000											$ 16,700,000	2036 - 2038
CIP-09	UV Disinfection Replacement and Addition	0%	100%	0%	$ 4,400,000											$ 4,400,000	2039 - 2040
CIP-10	Digester MCCs Replacement	100%	0%	0%	$ 1,800,000											$ 1,800,000	2041 - 2042
Capital Improvement Plan - Total Opinion of Probably Construction Cost					$ 126,800,000	$ 3,888,000	$ 5,789,000	$ 6,921,000	$ 10,371,000	$ 11,265,000	$ 7,906,000	$ 5,265,000	$ 23,167,500	$ 23,167,500	$ 1,401,000		
R&R	Collection System Repair and Replacement Program	*As needed*				$ -	$ -	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 4,500,000	Annually starting 2027
Annual Division of probably Cost						$ 3,888,000	$ 5,789,000	$ 7,171,000	$ 10,621,000	$ 11,515,000	$ 8,156,000	$ 5,515,000	$ 23,417,500	$ 23,417,500	$ 1,651,000	$ 126,800,000	2027 - 2044

Notes:
(1) Costs are in 2025 dollars.
(2) Typical project costs reflect design costs year 1, and construction costs in subsequent years.
(3) 2025-2026 (Preliminary) Sewer Construction Budget relates to anticipated budget items provided by the City. For purposes of this effort, this excludes projects the City outlined if already itemized within CIP-01 to CIP-10
(4) CIP-01 design fees include some costs paid prior to 2025.

Figure 10-2: 20-Year CIP (2025-2034) (Unescalated $)

DRAFT

	City of Ellensburg Capital Imrprovement Projects	Replacement	Upgrade	Expansion	Opinion of Probable Construction Cost[1][2]	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Design + Construction Costs	Projected Years of Work to be Conducted
2025-2026 (Preliminary) Sewer Construction Budget[3]	Sewer Main Extensions															100000	2025-2026
	Sewer Main Oversizing															100000	
	Anderson Road Sewer - Phase II															2900000	
	Cured in Place															400000	
	Methane Recapture															1040000	
	Wenas Street Sewer Extenstion (Removal of Cora Lift Station)															3000000	
CIP-01	RAS Building Improvements	100%	0%	0%	$ 3,200,000											$ 3,200,000	2025 - 2026
CIP-02	Aeration Improvements	0%	100%	0%	$ 1,900,000											$ 1,900,000	2026 - 2026
CIP-03	Grit Classifier and Grit Pumps	0%	100%	0%	$ 1,600,000											$ 1,600,000	2026-2027
CIP-04	New Secondary Clarifier Associated with New RAS and WAS Pumps	0%	0%	100%	$ 23,100,000											$ 23,100,000	2027 - 2028
CIP-05	Headworks Improvements with New Grit and Screening Equipment	0%	25%	75%	$ 8,800,000											$ 8,800,000	2029 - 2030
CIP-06	New Aeration Basins and Blower Building	0%	100%	0%	$ 51,600,000											$ 51,600,000	2031 - 2033
CIP-07	Replacement of Sludge Collection Mechanism of Two Existing Secondary Clarifiers	0%	100%	0%	$ 13,700,000	$ 12,299,000										$ 13,700,000	2034 - 3035
CIP-08	Influent Pump Station and One Manhole	0%	75%	25%	$ 16,700,000		$ 1,704,000	$ 7,498,000	$ 7,498,000							$ 16,700,000	2036 - 2038
CIP-09	UV Disinfection Replacement and Addition	0%	100%	0%	$ 4,400,000					$ 451,500	$ 3,948,500					$ 4,400,000	2039 - 2040
CIP-10	Digester MCCs Replacement	100%	0%	0%	$ 1,800,000							$ 183,000.00	$ 1,617,000			$ 1,800,000	2041 - 2042
Capital Improvement Plan - Total Opinion of Probably Construction Cost					$ 126,800,000	$ 12,299,000	$ 1,704,000	$ 7,498,000	$ 7,498,000	$ 451,500	$ 3,948,500	$ 183,000	$ 1,617,000	$ -	$ -		
R&R	Collection System Repair and Replacement Program	*As needed*				$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 4,500,000	Annually starting 2027
	Annual Division of probably Cost					$ 12,549,000	$ 1,954,000	$ 7,748,000	$ 7,748,000	$ 701,500	$ 4,198,500	$ 433,000	$ 1,867,000	$ 250,000	$ 250,000	$ 126,800,000	2027 - 2044

Notes:
(1) Costs are in 2025 dollars.
(2) Typical project costs reflect design costs year 1, and construction costs in subsequent years.
(3) 2025-2026 (Preliminary) Sewer Construction Budget relates to anticipated budget items provided by the City. For purposes of this effort, this excludes projects the City outlined if already itemized within CIP-01 to CIP-10
(4) CIP-01 design fees include some costs paid prior to 2025.

Figure 10-3: 20-Year CIP (2035-2044) (Unescalated $)

DRAFT

Section 11: Financial Analysis

In process by FCS Gorup

DRAFT

Appendix A SEPA Checklist

DRAFT

Appendix B NPDES Permit

DRAFT

Appendix C City of Ellensburg WWTF Aeration Basin Study

DRAFT

Appendix D WWTF Flows and Loads Report, 2023

DRAFT

Appendix E WWTF Modeling Results

DRAFT

Appendix F Ellensburg Secondary Process Capacity Assessment and Hydraulic Analysis Results Presentation, March 2023

DRAFT

Appendix G Aeration Basin Alternatives Analysis

DRAFT

Appendix H CIP Project Site Layouts

DRAFT

Appendix A SEPA Checklist

DRAFT

Appendix B NPDES Permit

DRAFT

Issuance Date: November 9, 2018
Effective Date: January 1, 2019
Expiration Date: December 31, 2023

National Pollutant Discharge Elimination System
Waste Discharge Permit No. WA0024341

State of Washington
DEPARTMENT OF ECOLOGY
Central Regional Office

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 ELLENSBURG PUBLICLY-OWNED TREATMENT WORKS
2415 CANYON ROAD
ELLENSBURG, WA 98926

is authorized to discharge in accordance with the Special and General Conditions that follow.

Treatment Plant Location: Same as above

Receiving Water Body & I.D. No. (Outfall 001):
Yakima River, River Mile 151.6
ID# 1192269462537

Discharge Location:
Latitude: 46.961825
Longitude: -120.544572

Receiving Water Body I.D. No. (Outfall 002):
Wilson Creek
ID # 1204996469262
Outfall 002 to be used for emergency bypass only.

Discharge Location:
Latitude: 46.968119
Longitude: -120.538764

Treatment Type:
Class III, Activated Sludge, Complete Mix Aeration, Secondary Clarification, Ultraviolet Disinfection and Anaerobic Digestion.

David B Bowen

David B. Bowen
Section Manager, Water Quality Program
Central Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals ***5***

Special Conditions ***7***

S1. Discharge limits **7**
S1.A. Effluent limits 7
S1.B. Mixing zone authorization 8

S2. Monitoring requirements **9**
S2.A. Monitoring schedule 9
S2.B. Sampling and analytical procedures 12
S2.C. Flow measurement, field measurement, and continuous monitoring devices 12
S2.D. Laboratory accreditation 13
S2.E. Request for reduction in monitoring 14

S3. Reporting and recording requirements **14**
S3.A. Discharge monitoring reports 14
S3.B. Permit Submittals and Schedules 16
S3.C. Records retention 16
S3.D. Recording of results 17
S3.E. Additional monitoring by the Permittee 17
S3.F. Reporting permit violations 17
S3.G. Other reporting 19
S3.H. Maintaining a copy of this permit 19

S4. Facility loading **20**
S4.A. Design criteria 20
S4.B. Plans for maintaining adequate capacity 20
S4.C. Duty to mitigate 21
S4.D. Notification of new or altered sources 21
S4.E. Infiltration and inflow evaluation 21
S4.F. Wasteload assessment 22

S5. Operation and maintenance **22**
S5.A. Certified operator 22
S5.B. Operation and maintenance program 23
S5.C. Short-term reduction 23
S5.D. Electrical power failure 23
S5.E. Prevent connection of inflow 24
S5.F. Bypass procedures 24
S5.G. Operations and maintenance (O&M) manual 26

S6. Pretreatment **27**
S6.A. General requirements 27
S6.B. Duty to enforce discharge prohibitions 27
S6.C. Wastewater discharge permit required 28
S6.D. Identification and reporting of existing, new, and proposed industrial users 29

S6.E. Industrial user survey 29

S7. Solid wastes 29
S7.A. Solid waste handling 29
S7.B. Leachate 30

S8. Application for permit renewal or modification for facility changes 30

S9. Compliance schedule 30

S10. Combined sewer overflows 31
S10.A. Authorized combined sewer overflow (CSO) discharge locations 31
S10.B. Nine minimum controls 31
S10.C. Combined sewer overflow report 32
S10.D. Combined sewer overflow reduction plan amendment 33

S11. Acute toxicity 33
S11.A. Testing when there is no permit limit for acute toxicity 33
S11.B. Sampling and reporting requirements 34

S12. Chronic toxicity 35
S12.A. Testing when there is no permit limit for chronic toxicity 35
S12.B. Sampling and reporting requirements 35

General Conditions 36

G1. Signatory requirements 36

G2. Right of inspection and entry 38

G3. Permit actions 38

G4. Reporting planned changes 39

G5. Plan review required 40

G6. Compliance with other laws and statutes 40

G7. Transfer of this permit 40

G8. Reduced production for compliance 41

G9. Removed substances 41

G10. Duty to provide information 41

G11. Other requirements of 40 CFR 41

G12. Additional monitoring 41

G13. Payment of fees 41

G14. Penalties for violating permit conditions 41

G15. Upset 42

G16. Property rights 42

G17. Duty to comply 42

G18. Toxic pollutants 43

G19. Penalties for tampering 43

G20. Compliance schedules 43

G21. Service agreement review 43

Appendix A--List Of Pollutants With Analytical Methods, Detection Limits And Quantitation Levels 44

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	**Monthly** Discharge Monitoring Report (DMR)	Monthly	**February 15, 2019**
S3.A.4.b.	Single Sample Priority Pollutant Data DMR	Four consecutive quarters	**April 1st of each year**
S3.A.4.c.	Permit Renewal Application Monitoring Data	4/permit cycle	**April 15, 2019**
S3.F	Reporting Permit Violations	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	Annually	**October 1, 2019**
S4.F	Wasteload Assessment	1/permit cycle	**December 31, 2022**
S5.F	Bypass Notification	As necessary	
S5.Ga.1.	Operations and Maintenance Manual Update or Review Confirmation Letter	Annually	**January 15th of each year**
S6.B.4	Notify Ecology when Industrial Users violate discharge prohibitions	As necessary	
S6.C.2	Notify Ecology of any proposed discharger which may be a SIU	As necessary	
S6.D	Submit copies of Industrial User notifications letters	As necessary	
S6.E	Industrial User Survey Submittal	1/permit cycle	**January 15, 2020**
S8	Application for Permit Renewal	1/permit cycle	**December 31, 2022**
S9	Compliance schedule – Influent Flow Meter		**January 1, 2020**
S10.C	Combined Sewer Overflow	As necessary	
S10.D	Combined Sewer Overflow Plan Amendment		**January 1, 2020**
S11.A.4.	Acute Toxicity Effluent Test Results with Permit Renewal Application	1/permit cycle	**December 31, 2022**

Permit Section	Submittal	Frequency	First Submittal Date
S12.A.4.	Chronic Toxicity Effluent Test Results with Permit Renewal Application	1/permit cycle	**December 31, 2022**
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 **January 1, 2019**, the Permittee may discharge treated domestic wastewater to the Yakima River, and to Wilson Creek in emergencies, at the permitted location subject to compliance with the following limits:

Effluent Limits: Outfall 001 & Outfall 002 **Outfall 001 Latitude 46.5745 Longitude -120.5478** **Outfall 002 Latitude 46.9883 Longitude -120.5378**		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Biochemical Oxygen Demand (5-day) (BOD_5)	30 milligrams/liter (mg/L) 1,500 pounds/day (lbs/day) 85% removal of influent BOD_5	45 mg/L 2,250 lbs/day
Total Suspended Solids (TSS)	30 mg/L 1,200 lbs/day 85% removal of influent TSS	45 mg/L 1,800 lbs/day
Parameter	**Minimum**	**Maximum**
pH	6.0 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [c]	100/100 milliliter (mL)	200/100 mL
Parameter	**Average Monthly**	**Maximum Daily [d]**
Total Ammonia (as NH3-N)	NA	8.2 mg/L; 547 lbs/day

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	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
d	Maximum daily effluent limit is the highest allowable daily discharge. The daily discharge is the average discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. This does not apply to pH or temperature.

S1.B. Mixing zone authorization

The following paragraph defines the maximum boundaries or flow-volume restriction of the mixing zones:

The length of the chronic and acute mixing zones extends downstream no greater than 300.5 and 30.0 feet, respectively. The width of the chronic and acute mixing zones is no more than 36.2 feet and 25.1 feet, respectively.

Available Dilution (dilution factor)	
Acute Aquatic Life Criteria	7.4
Chronic Aquatic Life Criteria	20.1
Human Health Criteria - Carcinogen	131.4
Human Health Criteria - Non-carcinogen	44.0

S2. Monitoring requirements

S2.A. Monitoring schedule

The Permittee must monitor in accordance with the following schedule and the requirements specified in Appendix A.

Parameter	Units & Speciation	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	Continuous [a]	Measurement
Biochemical Oxygen Demand (BOD_5)	mg/L	3/week [b]	24-hr. composite [c]
Biochemical Oxygen Demand (BOD_5)	lbs/day	3/week	Calculation [d]
Total Suspended Solids (TSS)	mg/L	3/week	24-hr. composite
Total Suspended Solids (TSS)	lbs/day	3/week	Calculation
(2) Final wastewater effluent			
Final Wastewater Effluent means wastewater exiting 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, the Permittee must dechlorinate and reseed the sample.			
Flow	MGD	Continuous	Measurement
BOD_5	mg/L	3/week	24-hr. composite
BOD_5	lbs/day	3/week	Calculation
BOD_5	% Removal	monthly	Calculation [e]
TSS	mg/L	3/week	24-hr. composite
TSS	lbs/day	3/week	Calculation
TSS	% Removal	monthly	Calculation

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Total Ammonia	mg/L	1/week [f]	24-hr. composite
Total Ammonia	lbs/day	1/week	Calculation
Dissolved Oxygen	mg/L	Daily	Grab [g]
pH	Standard Units	5/week	Grab
Temperature [h]	° C	Continuous	Measurement
Fecal Coliform Bacteria	# colonies/ 100ml	3/week	Grab
Total Hardness	mg/L as $CaCO_3$	4/year [i]	24-hr. composite
(3) Whole effluent toxicity testing – final wastewater effluent			
Acute Toxicity Testing		Two quarters / Summer & Winter prior to re-application	24-hr. composite
(4) Whole effluent toxicity testing – final wastewater effluent			
Chronic Toxicity Testing		Two quarters / Spring & Fall prior to re-application	24-hr. composite
(5) Outfall 002 Combined Sewer Overflow to Wilson Creek (Emergencies Only)			
Flow	Total Gallons	1 per event	Calculation
BOD_5	mg/L	1 per event	Grab
TSS	mg/L	1 per event	Grab
Fecal Coliform Bacteria	# colonies/ 100ml	1 per event	Grab
(6) Permit renewal application requirements – final wastewater effluent			
The Permittee must record and report the wastewater treatment plant flow discharged on the day it collects the sample for priority pollutant testing with the discharge monitoring report.			
Total Residual Chlorine	mg/L	Once per year [j]	Grab
Total Kjeldahl Nitrogen	mg/L as N	Once per year [j]	24-Hour composite
Nitrate plus Nitrite	mg/L as N	Once per year [j]	24-Hour composite
Oil and Grease	mg/L	Once per year [j]	Grab

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Phosphorus (Total)	mg/L as P	Once per year [j]	24-Hour composite
Total Dissolved Solids	mg/L	Once per year [j]	24-Hour composite
Cyanide	micrograms/liter (µg/L)	Once per year [j]	Grab
Total Phenolic Compounds	µg/L	Once per year [j]	24-Hour composite
Total Lead	µg/L	Quarterly	24-Hour composite
Priority Pollutants (PP) – Total Metals	µg/L; nanograms(ng/L) for mercury	Four consecutive quarters [k] Same time as WET test samples are collected	24-Hour composite Grab for mercury
PP – Volatile Organic Compounds	µg/L	Four consecutive quarters Same time as WET test samples are collected	Grab
PP – Acid-extractable Compounds	µg/L	Four consecutive quarters Same time as WET test samples are collected	24-Hour composite
PP – Base-neutral Compounds	µg/L	Four consecutive quarters Same time as WET test samples are collected	24-Hour composite

a Continuous means without interruption throughout the operating and discharging hours of the Permittee's facility, except for infrequent shutdowns for maintenance.

b 3/week means three (3) times during each calendar 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 Calculation" 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 Calculate the Percent (%) removal of BOD and TSS using the following algorithm (concentrations in mg/L): (Average Monthly Influent Concentration - Average Monthly Effluent Concentration)/Average Monthly Influent Concentration.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
[f] 1/week means collected once each calendar week, on a rotational basis throughout the days of the week, and may exclude weekends and holidays.			
[g] Grab means an individual sample collected over a fifteen (15) minute, or less, period.			
[h] Temperature grab sampling must occur when the effluent is at or near its daily maximum temperature, which is usually in the late afternoon. If temperature is measured continuously, the Permittee must determine and report a daily maximum from half-hour measurements in a 24-hour period. To determine the daily average, use the temperature on the half-hour from the chart for the twenty-four (24) hour period and calculate the average of the values. Continuous monitoring instruments must achieve an accuracy of 0.2 degrees C and the Permittee must verify accuracy annually.			
[i] "4/year" means once each quarter of the year. The quarters are defined as January through March, April through June, July through September, and October through December.			
[j] Sampling events must rotate through the seasons; 1st quarter 2019, 2nd quarter 2020, 3rd quarter 2021, and 4th quarter 2022, and so on. Report in the month following the quarter.			
[k] Sampling events must rotate through the seasons; Concurrent with Whole Effluent Toxicity Testing			

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. Establish a calibration frequency for each device or instrument in the O&M manual that conforms to the frequency recommended by the manufacturer.
7. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
8. 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 **January 1, 2019** (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.

2. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.

3. 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.

4. 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 annually DMRs for priority pollutant test results by April 1st of each year.
c. Submit permit renewal application monitoring data in WQWebDMR as required in Special Condition S2.6 according to dates given in S2 footnote j and with permit application.

5. 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.

6. 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.

7. Report single analytical values between the detection level (DL) and the quantitation level (QL) by entering the estimated value, the code for estimated value/below quantitation limit (j) and any additional information in the comments. Submit a copy of the laboratory report as an attachment using WQWebDMR.

8. **Not** report zero for bacteria monitoring. Report as required by the laboratory method.

9. Calculate and report an arithmetic average value for each day for bacteria if multiple samples were taken in one day.

10. 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.

11. 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.

12. 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 detection value and the quantitation value for the sample analysis.
    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.

13. 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).

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.

When another permit condition requires submittal of a paper (hard-copy) report, the Permittee must ensure that it is postmarked or received by Ecology no later than the dates specified by this permit. Send these paper reports to Ecology at:

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 report any failure of the disinfection system or use of Outfall 002 to Wilson Creek immediately to Ecology's Regional Office 24 hour number listed below:

Central Regional Office	509-575-2490
Kittitas County Public Health	509-674-6902

The Permittee must immediately report to Ecology, the Department of Health, Drinking Water Program, and the Local Health Jurisdiction (at the numbers listed below), all:

- Failures of the disinfection system.

- Collection system overflows discharging to a water body that may be used for drinking water.
- Plant bypasses discharging to a water body used as a source of drinking water.
- Any other failures of the sewage system (pipe breaks, etc.)

Central Regional Office	509-575-2490
Department of Health,	800-521-0323 (business hours)
Drinking Water Program	877-481-4901 (after business hours)
Kittitas County Public Health	509-674-6902

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)	8 MGD
Peak Instantaneous Design Flow (PIDF)	15 MGD
BOD_5 Influent Loading for Maximum Month	10,000 lb/day
TSS Influent Loading for Maximum Month	8,000 lb/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: https://fortress.wa.gov/ecy/publications/SummaryPages/9703.html. The Permittee may use monitoring records to assess measurable infiltration and inflow.

2. 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.

3. The Permittee must submit a report summarizing the results of the evaluation and any recommendations for corrective actions by **October 1, 2019 and annually thereafter.**

S4.F. Wasteload assessment

The Permittee must conduct an annual assessment of its influent flow and waste load and submit a report to Ecology by **December 31, 2022**. 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. BOD_5 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. The Permittee must notify Ecology when the operator in charge

at the facility changes. It must provide the new operator's name and certification level and provide the name of the operator leaving the facility.

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

A bypass is the intentional diversion of waste streams from any portion of a treatment facility. This permit prohibits all bypasses except when the bypass is for essential maintenance, as authorized in special condition S5.F.1, or is approved by Ecology as an anticipated bypass following the procedures in S5.F.2.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit allows bypasses for essential maintenance of the treatment system when necessary to ensure efficient operation of the system. The Permittee may bypass the treatment system for essential maintenance only if doing so does not cause violations of effluent limits. The Permittee is not required to notify Ecology when bypassing for essential maintenance. However the Permittee must comply with the monitoring requirements specified in special condition S2.B.

2. Anticipated bypasses for non-essential maintenance

   Ecology may approve an anticipated bypass under the conditions listed below. This permit prohibits any anticipated bypass that is not approved through the following process.

a. If a bypass is for non-essential maintenance, the Permittee must notify Ecology, if possible, at least ten (10) days before the planned date of bypass. The notice must contain:

- A description of the bypass and the reason the bypass is necessary.
- An analysis of all known alternatives which would eliminate, reduce, or mitigate the potential impacts from the proposed bypass.
- A cost-effectiveness analysis of alternatives.
- 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 recurrence 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 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 determine if the Permittee has met the conditions of special condition S5.F.2 a and b and consider the following prior to issuing a determination letter, an administrative order, or a permit modification as appropriate for an anticipated bypass:

- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.
- If the 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.

- If feasible alternatives to the bypass exist, such as:

  - The use of auxiliary treatment facilities.
  - Retention of untreated wastes.
  - Stopping production.
  - 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 which occurred during normal periods of equipment downtime or preventative maintenance.
  - Transport of untreated wastes to another treatment facility.

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 and confirm this review by letter to Ecology by January 15th of each year.
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.
8. Specify other items on case-by-case basis such as O&M for collection systems pump stations, lagoon liners, etc.

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, (BOD_5, 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.

S6.E. Industrial user survey

The Permittee must complete an industrial user survey listing all SIUs and potential significant industrial users (PSIUs) discharging to the POTW. The Permittee must submit the survey to Ecology by **January 15, 2020**. At a minimum, the Permittee must develop the list of SIUs and PSIUs by means of a telephone book search, a water utility billing records search, and a physical reconnaissance of the service area. Information on PSIUs must include, at a minimum, the business name, telephone number, address, description of the industrial process(s), and the known wastewater volumes and characteristics.

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 **December 31, 2022**.

The Permittee must also submit a new application or addendum 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. Compliance schedule

By the dates tabulated below, the Permittee must complete the following tasks and submit a report describing, at a minimum:

- Whether it completed the task and, if not, the date on which it expects to complete the task.
- The reasons for delay and the steps it is taking to return the project to the established schedule.

	Tasks	Date Due
1.	Install influent flow meter	**January 1, 2020**
2.	Notify Ecology when meter is installed and operational	**January 1, 2020**

S10. Combined sewer overflows

S10.A. Authorized combined sewer overflow (CSO) discharge locations

Beginning on **January 1, 2020**, the Permittee may discharge domestic wastewater from the following list of combined sewer overflow (CSOs) outfalls which represent occasional point sources of pollutants as a result of overloading of the combined sewer system during precipitation events. The permit prohibits discharges not caused by precipitation. This permit does not authorize a discharge from a CSO that causes adverse impacts that threaten characteristic uses of the receiving water as identified in the water quality standards, chapter 173-201A WAC.

Outfall Number	Receiving Water Body	Latitude	Longitude
001	Yakima River	46.5745	-120.5478
002	Wilson Creek (emergencies only)	46.9883	-120.5378

S10.B. Nine minimum controls

In accordance with chapter 173-245 WAC and US EPA CSO control policy (59 FR 18688), the Permittee must implement and document the following nine minimum controls (NMC) for CSOs. The Permittee must document compliance with the NMC in the annual CSO report as required in Special Condition S10.C.

The Permittee must comply with the following technology-based requirements; the Permittee must:

1. Implement proper operation and maintenance programs for the sewer system and all CSO outfalls to reduce the magnitude, frequency, and duration of CSOs. The program must consider regular sewer inspections; sewer, catch basin, and regulator cleaning; equipment and sewer collection system repair or replacement, where necessary; and disconnection of illegal connections.
2. Implement procedures that will maximize use of the collection system for wastewater storage that can be accommodated by the storage capacity of the collection system in order to reduce the magnitude, frequency, and duration of CSOs.
3. Review and modify, as appropriate, its existing pretreatment program to minimize CSO impacts from the discharges from non-domestic users.
4. Operate the Permittee's wastewater treatment plant at maximum treatable flow during all wet weather flow conditions to reduce the magnitude,

frequency, and duration of CSOs. The Permittee must deliver all flows to the treatment plant within the constraints of the treatment capacity of the POTW.

5. Not discharge (prohibited) overflows from CSO outfalls except as a result of precipitation events. The Permittee must report each dry weather overflow to the permitting authority immediately per Special Condition S3.E. When it detects a dry weather overflow, the Permittee must begin corrective action immediately and inspect the dry weather overflow each subsequent day until it has eliminated the overflow.
6. Implement measures to control solid and floatable materials in CSOs.
7. Implement a pollution prevention program focused on reducing the impact of CSOs on receiving waters.
8. Implement a public notification process to inform the citizens of when and where CSOs occur. The process must include (a) mechanism to alert persons of the occurrence of CSOs and (b) a system to determine the nature and duration of conditions that are potentially harmful for users of receiving waters due to CSOs.
9. Monitor CSO outfalls to characterize CSO impacts and the efficacy of CSO controls. This must include collection of data that it will use to document the existing baseline conditions, evaluate the efficacy of the technology-based controls, and determine the baseline conditions upon which it will base the long-term control plan. This data must include:

    a. Characteristics of the combined sewer system, including the population served by the combined portion of the system and locations of all CSO outfalls in the CSS.
    b. Total number of CSO events, and the frequency and duration of CSOs for a representative number of events.
    c. Locations and designated uses of receiving water bodies.
    d. Water quality data for receiving water bodies.
    e. Water quality impacts directly related to CSO (e.g., beach closing, floatables, wash-up episodes, fish kills).

S10.C. Combined sewer overflow report

The Permittee must submit a CSO Report to Ecology for review and approval per event. The CSO Report must cover the previous years since the previous event. The report must comply with the requirements of WAC 173-245-090(1) and must include documentation of compliance with the Nine Minimum Controls for CSOs described in Special Condition S10.B. The CSO report must include the following information:

1. A summary of the number and volume of untreated discharge events per outfall

2. A summary of the 5-year moving average number of untreated discharge events per outfall, calculated once annually.
3. An event-based reporting form (provided by Ecology) for all CSO discharges for the reporting period, summarizing all data collected according to the monitoring schedule in Special Condition S2.A.
4. A list of CSO reduction projects planned for the next year.

S10.D. Combined sewer overflow reduction plan amendment

Along with the application for permit renewal, the Permittee must submit an amendment of its CSO Reduction Plan to Ecology for review and approval by **December 31, 2022.** The amendment must comply with the requirements of WAC 173-245-090(2) and contain the following:

1. Information describing which of the permitted CSO outfalls can be categorized as meeting the Performance Standard for Controlled CSOs, defined as no more than an average of one untreated discharge per outfall per year. The Permittee may base this assessment on long-term discharge data (up to 5 years, past and present data), modeling, or other reasonable methods as approved by Ecology.

2. For each CSO Outfall that does not meet the Performance Standard for Controlled CSOs defined above:

    a. Identify CSO control alternatives to achieve an average of no more than one untreated CSO event per year per outfall.
    b. Provide an evaluation of each of the alternatives and a selection of a preferred alternative that will ensure compliance with Washington State regulations (WAC 173-245), and
    c. The expected compliance date.

S11. Acute toxicity

S11.A. Testing when there is no permit limit for acute toxicity

The Permittee must:

1. **Conduct acute toxicity testing on final effluent once in the last summer and once in the last winter prior to submission of the application for permit renewal**.
2. Conduct acute toxicity testing on a series of at least five concentrations of effluent, including 100% effluent and a control.
3. Submit the results to Ecology by **December 31, 2022.**

4. 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	*Pimephales promelas*	EPA-821-R-02-012
Daphnid 48-hour static test	*Ceriodaphnia dubia, Daphnia pulex,* or *Daphnia magna*	EPA-821-R-02-012

S11.B. 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 toxicity data, bench sheets, and reference toxicant results for test methods. In addition, the Permittee must submit toxicity test data in electronic format (CETIS export file preferred) for entry into Ecology's database.
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 may sample receiving water at the same time as the effluent and instruct the lab to measure the hardness of both and increase the hardness of the effluent sample to match the hardness of the receiving water sample prior to beginning the toxicity test. Otherwise, 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 14% 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.

S12. Chronic toxicity

S12.A. Testing when there is no permit limit for chronic toxicity

The Permittee must:

1. **Conduct chronic toxicity testing on final effluent once in the last spring and once in the last fall prior to submission of the application for permit renewal**.
2. 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 14% effluent. The series of dilutions should also contain the CCEC of 5% effluent.
3. 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.
4. Submit the results to Ecology **December 31, 2022**.
5. 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	*Pimephales promelas*	EPA-821-R-02-013
Water flea survival and reproduction	*Ceriodaphnia dubia*	EPA-821-R-02-013

S12.B. 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 toxicity data, bench sheets, and reference toxicant results for test methods. In addition, the Permittee must submit toxicity test data in

electronic format (CETIS export file preferred) for entry into Ecology's database.

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 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 sample receiving water at the same time as the effluent and instruct the lab to measure the hardness of both and increase the hardness of the effluent sample to match the hardness of the receiving water sample prior to beginning the toxicity test. Otherwise, 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 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 5% effluent. The ACEC equals 14% effluent.
8. 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 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
2. 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.
3. 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.F.
4. The Permittee complied with any remedial measures required under S3.F 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. The list also includes pulp and paper pollutants identified in 40 CFR Part 430 and the dioxin and furan congeners identified using EPA Method 1613.

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 CaCO3
Aluminum, Total	7429-90-5	200.8	2.0	10
Ammonia, Total (as N)		SM4500-NH3-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
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

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
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 CaCO3
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-NO3- 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^2F/D/E/G		0.2 mg/L
Sulfite (as mg/L SO_3)		SM4500-SO3B		2 mg/L
Temperature (max. 7-day avg.)		Analog recorder or Use micro-recording devices known as thermistors		0.2º C
Tin, Total	7440-31-5	200.8	0.3	1.5
Titanium, Total	7440-32-6	200.8	0.5	2.5

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
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 C	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
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

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					
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	2.0	4.0
2,4 dinitrophenol	59	51-28-5	625	1.5	3.0
2-Nitrophenol	57	88-75-5	625	0.5	1.0
4-Nitrophenol	58	100-02-7	625	1.0	2.0
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

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					
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
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	20	40
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	1.3	5.0
Benzo(*a*)pyrene	73	50-32-8	610/625	0.5	1.0
Benzo(*ghi*)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	0.5	1.0
Bis(*2-ethylhexyl*)phthalate	66	117-81-7	625	0.3	1.0
4-Bromophenyl phenyl ether	41	101-55-3	625	0.3	0.5
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-*h*)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	2.0	14.0
Diethyl phthalate	70	84-66-2	625	1.9	7.6
Dimethyl phthalate	71	131-11-3	625	1.6	6.4

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)					
Di-n-butyl phthalate	68	84-74-2	625	0.5	1.0
2,4-dinitrotoluene	35	121-14-2	609/625	1.0	2.0
2,6-dinitrotoluene	36	606-20-2	609/625	1.0	2.0
Di-n-octyl phthalate	69	117-84-0	625	0.3	0.6
1,2-Diphenylhydrazine (*as Azobenzene*)	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
Hexachlorobutadiene	52	87-68-3	625	0.5	1.0
Hexachlorocyclopentadiene	53	77-47-4	1625B/625	2.0	4.0
Hexachloroethane	12	67-72-1	625	0.5	1.0
Indeno(*1,2,3-cd*)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	0.4	0.75
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	1.0	2.0
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 - Modified	0.05	0.2
PCB-1254	107	11097-69-1	608 - Modified	0.05	0.2
PCB-1221	108	11104-28-2	608 - Modified	0.05	0.2
PCB-1232	109	11141-16-5	608 - Modified	0.05	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***
PESTICIDES/PCBs					
PCB-1248	110	12672-29-6	608 - Modified	0.05	0.2
PCB-1260	111	11096-82-5	608 - Modified	0.05	0.2
PCB-1016 [9]	112	12674-11-2	608 - Modified	0.05	0.2
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, or 5) x 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-dichlorpropropene (10061-01-5) and trans-1, 3-dichloropropene (10061-02-6).

7. Total Benzofluoranthenes - Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.

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.

Appendix C City of Ellensburg WWTF Aeration Basin Study

DRAFT

CITY OF ELLENSBURG

KITTITAS COUNTY **WASHINGTON**

WWTF AERATION BASIN STUDY

G&O #18015
OCTOBER 2018

Gray & Osborne, Inc.
CONSULTING ENGINEERS

CITY OF ELLENSBURG

KITTITAS COUNTY **WASHINGTON**

WWTF AERATION BASIN STUDY

DOUGLAS A. WELCH
STATE OF WASHINGTON
29743
REGISTERED
PROFESSIONAL ENGINEER
10/2/18

CHADWICK D. NEWTON
STATE OF WASHINGTON
39385
REGISTERED
PROFESSIONAL ENGINEER
10/2/2018

G&O #18015
OCTOBER 2018

Gray & Osborne, Inc.
CONSULTING ENGINEERS

TABLE OF CONTENTS

CHAPTER 1 – INTRODUCTION

PURPOSE AND SCOPE 1-1
OVERVIEW 1-1
EXISTING WWTF 1-2
STUDY OUTLINE 1-3

CHAPTER 2 – WWTF DESIGN CRITERIA

INTRODUCTION 2-1
EXISTING WWTF DESIGN CRITERIA 2-1
EXISTING FLOWS AND LOADINGS 2-3
PROJECTED FLOW RATES 2-7
- Population and ERUs 2-7
- Annual Average Flow Rates 2-8
- Maximum Month Flow Rates 2-9
- Maximum Day Flow Rates 2-9
- Peak Hour Flow Rates 2-10

PROJECTED SOLIDS AND ORGANIC LOADING RATES 2-11
- BOD_5 Loading 2-12
- TSS Loading 2-12
- Nitrogen Loading 2-14

SUMMARY OF PROJECTED FUTURE FLOWS AND LOADINGS 2-15
RECOMMENDED AERATION BASIN INFLUENT FLOWS AND LOADINGS 2-17

CHAPTER 3 – WWTF AERATION BASIN ALTERNATIVES

INTRODUCTION 3-1
EVALUATION OF EXISTING WWTF AERATION BASINS 3-2
- Existing Aeration Basin Design Criteria 3-2
- SRT and Sludge Production Calculation 3-3
- Aeration Requirements 3-5
- Alkalinity Requirements 3-7

EVALUATION OF RECENT PERFORMANCE 3-8
- SRT and Aeration 3-8
- Recent Electrical Consumption 3-9

EVALUATION OF AERATION BASIN ALTERNATIVES 3-9
- Alternative 1: Existing Basins with Surface Aerators 3-10
- Alternative 2: Existing Basins with Invent Mixers 3-14
- Alternative 3: Existing Basins with Diffusers 3-23
- Alternative 4: New Aeration Basin 3-30

CONCLUSION 3-36

CHAPTER 4 – COMPARISON AND SELECTION FO ALTERNATIVES

INTRODUCTION 4-1
NON-MONETARY COMPARISON 4-1
COST COMPARISON 4-3
SUMMARY AND RECOMMENDATIONS 4-5
IMPLEMENTATION 4-5

LIST OF TABLES

No.	Table	Page
2-1	Ellensburg WWTF Existing Design Criteria	2-1
2-2	Ellensburg WWTF Effluent Limits	2-2
2-3	Historical WWTF Influent Flow and Loading Rates (January 2008 through December 2017)	2-3
2-4	Ellensburg Sewer Service Area Population and ERU Projections	2-7
2-5	Ellensburg WWTF Annual Average Flow Projections	2-8
2-6	Ellensburg WWTF Maximum Month Flow Projections	2-9
2-7	Ellensburg WWTF Maximum Day Flow Projections	2-10
2-8	Ellensburg WWTF Peak Hour Flow Projections	2-11
2-9	Ellensburg WWTF BOD_5 Loading Rate Projections	2-13
2-10	Ellensburg WWTF TSS Loading Rate Projections	2-14
2-11	Ellensburg WWTF TKN Nitrogen Loading Rate Projections	2-15
2-12	Ellensburg WWTF Recommended 2037 Flow and Loading Rate Design Criteria	2-16
2-13	Ellensburg WWTF Recommended 2037 Aeration Basin Influent Design Criteria	2-18
3-1	WWTF Aeration Basin Existing Design Criteria	3-3
3-2	Alternative 1 Existing Basins with Surface Aerators Aeration Basin Design Data	3-11
3-3	Alternative 1 Existing Basins with Surface Aerators Preliminary Project Cost Estimate (2018 Dollars)	3-13
3-4	Alternative 1 Existing Basins with Surface Aerators Annual O&M Cost Estimates (2018 Dollars)	3-14
3-5	Alternative 2 Existing Basins with Invent Mixers Activated Sludge Evaluation Operational Data	3-16
3-6	Temporary Operation with One Existing Basin Activated Sludge Evaluation Operational Data	3-17
3-7	Alternative 2 Existing Basins with Invent Mixers Aeration Basin Design Data	3-18
3-8	Alternative 2 Existing Basins with Invent Mixers Design Data for Blower Alternatives	3-20
3-9	Alternative 2 Existing Basins with Invent Mixers (Initial Phase) Preliminary Project Cost Estimate (2018 Dollars)	3-21
3-10	Alternative 2 Existing Basins with Invent Mixers (Final Phase) Preliminary Project Cost Estimate (2018 Dollars)	3-22
3-11	Alternative 2 Existing Basins with Invent Mixers Annual O&M Cost Estimates (2018 Dollars)	3-22
3-12	Alternative 3 Existing Basin with Diffusers Activated Sludge Evaluation Operational Data	3-25
3-13	Alternative 3 Existing Basin with Diffusers Aeration Basin Design Data	3-25

No.	Table	Page
3-14	Alternative 3 Existing Basin with Diffusers Design Data for Blower Alternatives	3-27
3-15	Alternative 3 Existing Basin with Diffusers (Initial Phase) Preliminary Project Cost Estimate (2018 Dollars)	3-28
3-16	Alternative 3 Existing Basin with Diffusers (Final Phase) Preliminary Project Cost Estimate (2018 Dollars)	3-29
3-17	Alternative 3 Existing Basin with Diffusers Annual O&M Cost Estimates (2018 Dollars)	3-30
3-18	Alternative 4 New Aeration Basin Activated Sludge Evaluation Operational Data	3-32
3-19	Alternative 4 New Aeration Basin Aeration Basin Design Data	3-32
3-20	Alternative 4 New Aeration Basin Design Data for Blower Alternatives	3-34
3-21	Alternative 4 New Aeration Basin Preliminary Project Cost Estimate (2018 Dollars)	3-35
3-22	Alternative 4 New Aeration Basin Annual O&M Cost Estimates (2018 Dollars)	3-36
4-1	Non-Monetary Comparison of Aeration Basin Alternatives	4-2
4-2	Comparison of Capital Costs	4-4
4-3	Comparison of Annual Operation and Maintenance and Life Cycle Costs	4-4

LIST OF FIGURES

No.	Figure	On or Follows Page
1-1	Existing Site Plan	1-2
1-2	Existing Process Flow Diagram	1-2
2-1	Historic WWTF Monthly Average Influent Flow and Loading Rates	2-4
2-2	Historic WWTF Annual Average Influent Flow and Loading Rates	2-5
2-3	Historic WWTF and Industrial Influent BOD_5 Loading Rates	2-6
2-4	Projected Growth in WWTF Maximum Month Flow and Loading Rates	2-17
3-1	Alternative 1: Proposed Site Plan	3-10
3-2	Alternative 1: Proposed Process Flow Diagram	3-10
3-3	Alternative 2: Proposed Site Plan	3-14
3-4	Alternative 2: Proposed Process Flow Diagram	3-14
3-5	Alternative 3: Proposed Site Plan	3-24
3-6	Alternative 3: Proposed Process Flow Diagram	3-24
3-7	Alternative 4: Proposed Site Plan	3-30
3-8	Alternative 4: Proposed Process Flow Diagram	3-30

CHAPTER 1

INTRODUCTION

PURPOSE AND SCOPE

The purpose of the Wastewater Treatment Facility Aeration Basin Study is to determine how the City will upgrade their aeration basin system during the 20-year planning period to meet their permit requirements while reducing aeration system energy consumption.

In 2015, in the course of a study of the WWTF electrical system, the main circuit breaker in the main switchboard failed and was replaced on an emergency basis. Since then, the City has begun a program to replace and upgrade the electrical distribution system at the WWTF, which was primarily installed in 1974. Replacement of the breakers and motor control centers (MCCs) feeding the aeration basins requires planning for the future electrical load for the aeration system.

The scope of the Study includes the following elements:

- Analysis of recent historical flow and loading rates
- Analysis of recent historical energy consumption
- Evaluation of aeration system alternatives coupled with modification of the existing aeration basins
- Evaluation of aeration system alternatives coupled with construction of new aeration basins
- Capital and life cycle cost estimates for each alternative
- Recommendation of improvements

OVERVIEW

The City of Ellensburg is located in central Kittitas County along Interstate 90 near the foothills of the Cascade Mountains as shown in Figure 1-1. Ellensburg serves as the county seat. The City of Kittitas is seven miles to the east. The City of Ellensburg's topography slopes southwest to the Yakima River, and elevations within the service area range from 1,420 feet to 1,720 feet above mean sea level (amsl). The City's sewer system serves residential, business, commercial and industrial customers within the City limits. The City also provides sewer service to the Central Washington University (CWU) campus.

The City owns and operates the municipal sewer collection system and the Wastewater Treatment Facility (WWTF), which discharges to the Yakima River. The City Manager is John Akers, the Public Works Director is Ryan Lyyski and the Assistant Public Works Director is Rod Paul. The mailing address for the City is:

City of Ellensburg
501 North Anderson Street
Ellensburg, Washington 98926
509-962-7133

EXISTING WWTF

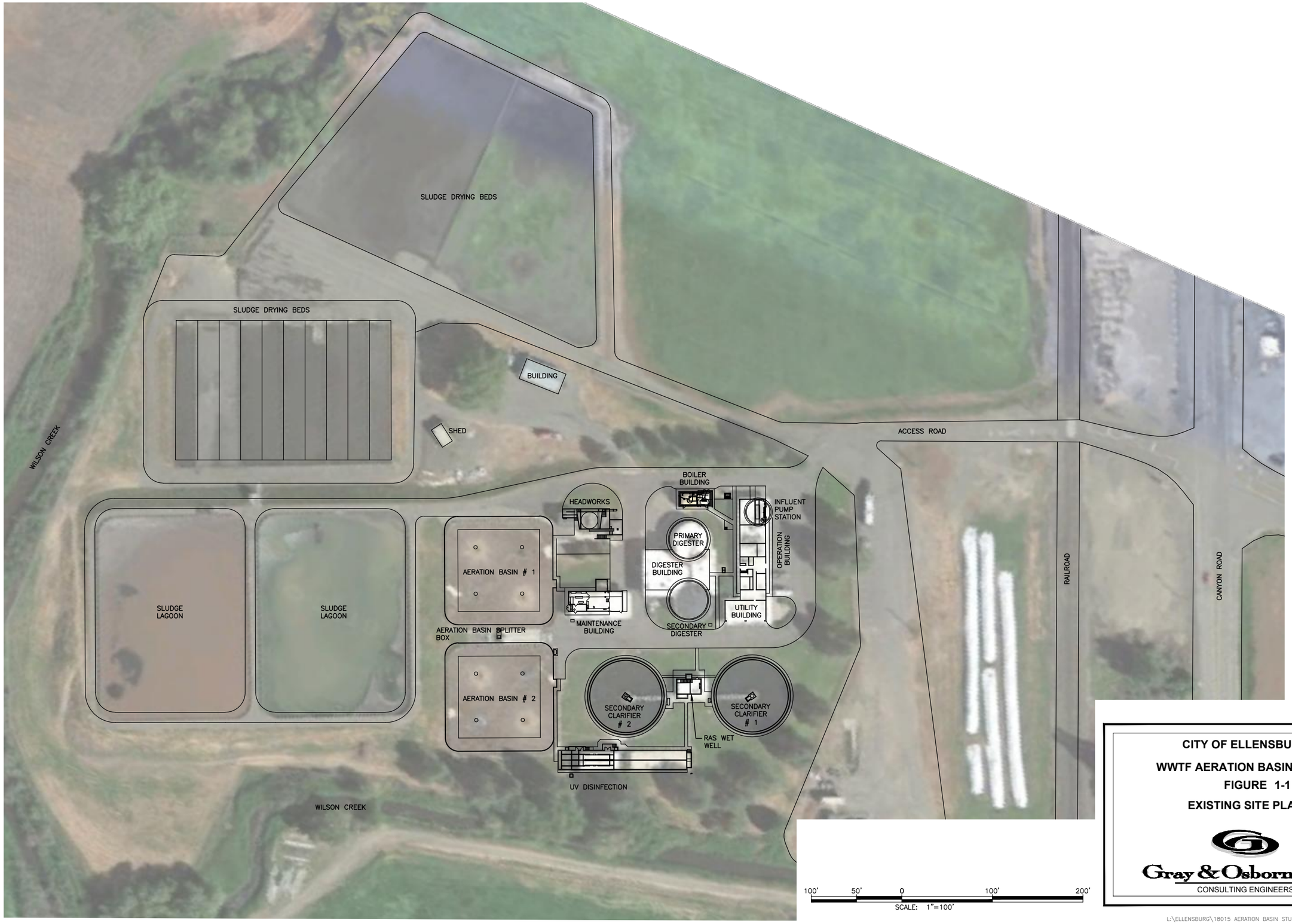
Prior to 1974, wastewater treatment for the City of Ellensburg was provided at a primary treatment facility that discharged into Wilson Creek. In 1974 the primary treatment facility was decommissioned and a newly constructed secondary treatment facility on an adjacent site that discharges into the Yakima River was placed in service.

The liquid treatment facilities at the Ellensburg Wastewater Treatment Facility include grit removal, screening, aeration basins, secondary clarifiers, UV disinfection system, and an outfall to the Yakima River. The solids treatment facilities include anaerobic digesters, gravity belt thickener, sludge storage lagoon, and sludge drying beds. A site plan and a process flow diagram of the existing WWTF are provided as Figures 1-1 and 1-2.

The Ellensburg WWTF utilizes the extended aeration activated sludge process to provide secondary treatment of wastewater. Raw wastewater from the 42-inch interceptor sewer enters the influent pump station. From the influent pump station wet well wastewater is pumped to the plant headworks. In the plant headworks the wastewater is degritted and screened to remove large particles that could damage downstream equipment. Grit and screenings are deposited in containers for off-site disposal at a sanitary landfill.

The screened and degritted wastewater enters the two aeration basins. Floating mechanical surface aerators provide air and mixing for the activated sludge process. Effluent from the aeration basin flows to the two secondary clarifiers where the activated sludge biomass is separated from the plant effluent. Secondary effluent receives disinfection by ultraviolet light prior to discharge to the Yakima River.

The solids that are wasted from the activated sludge process are thickened in either a dissolved air flotation thickener or a gravity belt thickener. Waste sludge is stabilized in the anaerobic digesters and stored in lagoons until it can be pumped to drying beds. The dried biosolids are stockpiled and subsequently hauled off site for beneficial reuse by land application. Supernatant from the lagoons is returned to the aeration basins during the autumn in order to thicken the waste sludge.



100' 50' 0 100' 200'

SCALE: 1"=100'

CITY OF ELLENSBURG

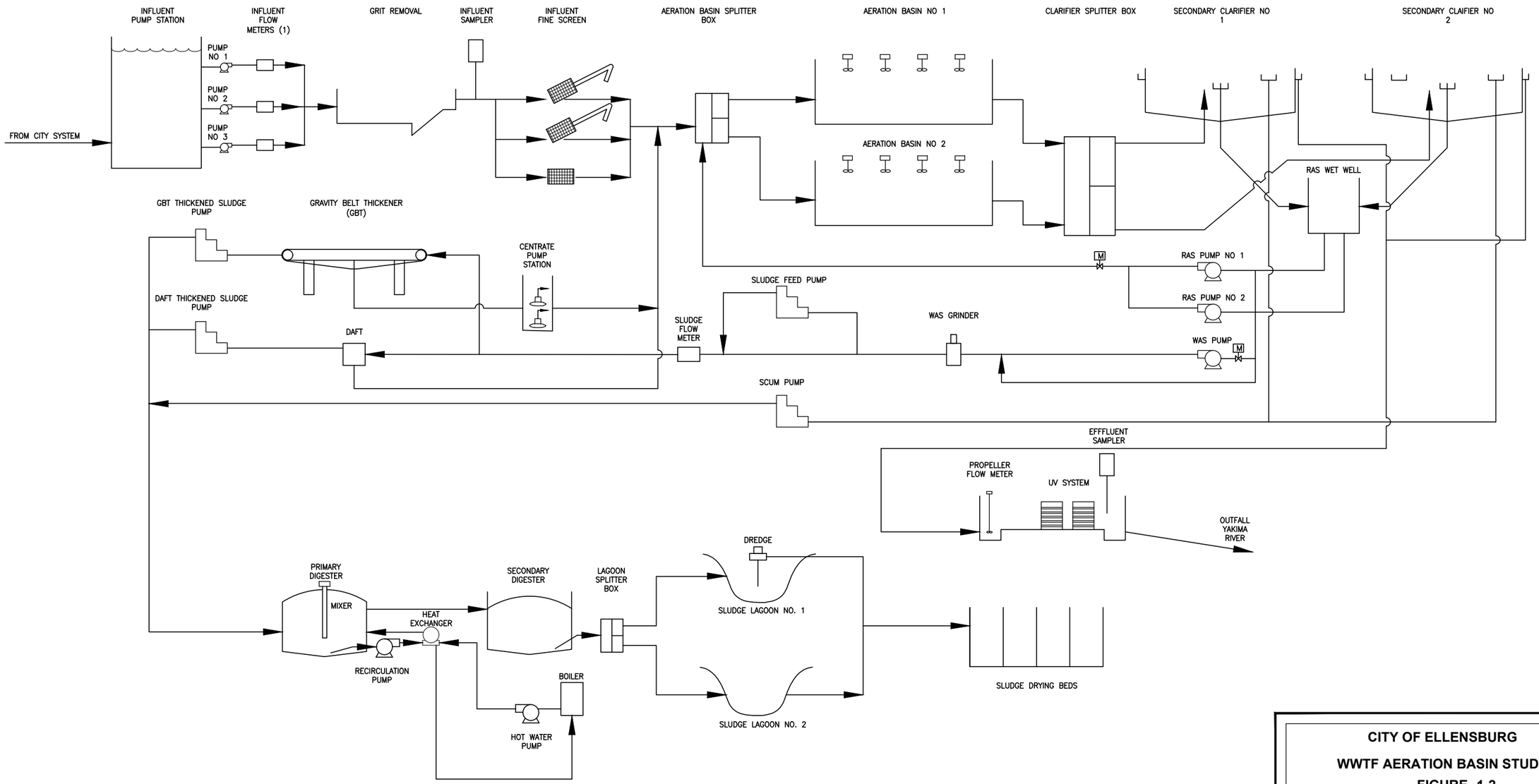
WWTF AERATION BASIN STUDY

FIGURE 1-1

EXISTING SITE PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\18015 AERATION BASIN STUDY\FIGURES\FIG 1-1-E-SITE.DWG



(1) INFLUENT FLOW METERS INSTALLED IN ELECTRICAL UPGRADE PHASE II PROJECT, 2018

CITY OF ELLENSBURG

WWTF AERATION BASIN STUDY

FIGURE 1-2

EXISTING PROCESS FLOW DIAGRAM

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\18015 AERATION BASIN STUDY\FIGURES\FIG 1-2.DWG

STUDY OUTLINE

This document is organized into the following chapters:

Chapter 1 – Introduction. This chapter presents information on the background of the project and the purpose and scope of the report.

Chapter 2 – Wastewater Treatment Facility Design Criteria. This chapter develops flows and loadings that are used in subsequent chapters to evaluate the capacity of the WWTF and to plan improvements to the existing WWTF.

Chapter 3 – WWTF Aeration Basin Alternatives. This chapter evaluates the existing aeration basin performance and capacity, and develops four improvement alternatives for the WWTF aeration basins.

Chapter 4 – WWTF Alternatives Evaluation and Recommendation. This chapter compares the aeration basin alternatives and recommends a capital improvement alternative at the WWTF.

CHAPTER 2

WWTF DESIGN CRITERIA

INTRODUCTION

The purpose of this chapter is to evaluate recent wastewater flow and loading rate trends at the Ellensburg Wastewater Treatment Facility (WWTF), and to update the projected 2031 flow and loading rates from the 2015 *Wastewater Treatment Facility Engineering Report*. The planning period for this Study extends through 2037, to be consistent with the December 2017 *City of Ellensburg Comprehensive Plan.*

Quantifying the existing loadings to the WWTF is necessary to determine the level at which the existing aeration basins are operating relative to their current capacities, and to project performance under projected flow and loading rates.

The methodology used to develop flow and loading rate projections is the same as in the 2015 *Engineering Report*, with the following updated inputs:

- Projected City population of 32,540 in 2037
- Infiltration/inflow estimates based on 2016 flow records
- Per capita BOD_5 and TSS loading rates based on 2016 flow records

EXISTING WWTF DESIGN CRITERIA

The design and permitted capacity of the existing wastewater treatment facilities is listed in the City's National Pollution Discharge Elimination System (NPDES) Permit #WA-002434-1, and shown in Table 2-1. The City's current NPDES permit was issued in 2011 and expired in 2016. The City applied for permit renewal in 2015, and Ecology administratively extended the 2011 permit via a letter in 2016.

TABLE 2-1

Ellensburg WWTF Existing Design Criteria(1)

Design Criteria	Value
Design Population Equivalent	31,000
Design Flow	
Maximum Month Flow (MMF)	8.0 mgd
Peak Hour Flow (PHF)	15.0 mgd
Design Load	
BOD_5 Maximum Month	10,000 lbs/day
TSS Maximum Month	8,000 lbs/day

(1) Criteria are from NPDES Permit #WA-002434-1. Record drawings do not contain design criteria.

The 2015 *Wastewater Treatment Facility Engineering Report* included a mixing zone study, which evaluated the potential of the WWTF effluent to cause the Yakima River to exceed water quality standards. The mixing zone analysis did not find any potential to exceed water quality standards for pH, dissolved oxygen, ammonia or metals.

The City's NPDES permit has a maximum daily effluent limit of 8.2 mg/L for ammonia. The Permit Fact Sheet does not contain calculations nor any further documentation on the reason for the limit or how the limit was derived. It is recommended that the City request that Ecology remove the current ammonia limit from the permit. However, Ecology has discretion in applying anti-backsliding restrictions and could retain the effluent ammonia limits to avoid backsliding.

The future permit limits, within the 20-year planning period, are expected to be the same as the existing permit for all pollutants, unless the City is successful in having Ecology remove the ammonia limit from its permit. The WWTF analysis presented in this Study is based on the existing NPDES permit effluent limits, including the existing ammonia limit, summarized in Table 2-2.

TABLE 2-2

Ellensburg WWTF Effluent Limits(1)

Parameter	Average Monthly	Average Weekly
BOD_5	30 mg/L	45 mg/L
TSS	30 mg/L	45 mg/L
Fecal Coliform	100/100 mL	200/100 mL
Parameter	**Average Monthly**	**Maximum Day**
NH_3	N/A	8.2 mg/L

(1) Effluent limitations are from NPDES Permit #WA-002434-1.

EXISTING FLOWS AND LOADINGS

WWTF records for the 10-year period from January 2008 through December 2017 were reviewed and analyzed to determine current wastewater characteristics and influent loadings. Recent wastewater flow and loading rates were then used in conjunction with projected population and growth rates to determine projected future wastewater flow and loading rates. Existing flows are further summarized in Table 2-3.

A graphical representation of 10 years of the average monthly WWTF flow and loading data is shown on Figure 2-1. To reduce noise and focus on long-term trends, in Figure 2-2 annual averages of WWTF flow, BOD_5 loading, TSS loading and NH_3 loading are shown.

TABLE 2-3

Historical WWTF Influent Flow and Loading Rates (January 2008 through December 2017)[1]

Year	Annual Average Flow (mgd)		Max. Month Flow (mgd)		Max. Day Flow (mgd)	
2008	3.02		3.82		5.05	
2009	2.99		3.74		11.6[2]	
2010	3.28		4.63		6.08	
2011	3.33		5.84		15.2[3]	
2012	2.79		4.39		5.84	
2013	3.03		4.67		5.52	
2014	3.08		4.72		5.46	
2015	2.96		3.76		5.64	
2016	**3.85**		6.05		8.76	
2017	3.54		**6.09**		**9.06**	
10-Year Average	3.18		4.77		7.82	
Year	**Annual Avg. BOD_5 (lbs/d)**	**Max. Month BOD_5 (lbs/d)**	**Annual Avg. TSS (lbs/d)**	**Max. Month TSS (lbs/d)**	**Annual Avg. NH_3 (lbs/d)**	**Max. Month NH_3 (lbs/d)**
2008	3,504	4,864	3,171	**4,448**	374	428
2009	4,120[2]	5,861[2]	2,848	3,379	403	**708**
2010	3,702	4,299	3,294	4,068	422	518
2011	3,811	5,477[3]	**3,379**	4,106	**443**	559
2012	3,452	4,163	2,975	3,737	432	523
2013	3,567	4,422	2,909	3,505	357	508
2014	3,733	4,734	2,895	3,312	308	397
2015	3,768	4,365	3,055	3,782	380	1,177[3]
2016	3,929	**4,981**	3,368	4,305	361	477
2017	**3,985**	4,908	3,285	4,335	355	480
10-Year Average	3,757	4,807	3,118	3,898	383	577

(1) The highest value for each parameter is marked in bold text, excepting outlier values.

(2) Data was considered a non-representative outlier, and was not factored into projections in the 2015 *Engineering Report*.

(3) Data is considered a non-representative outlier in this current analysis.

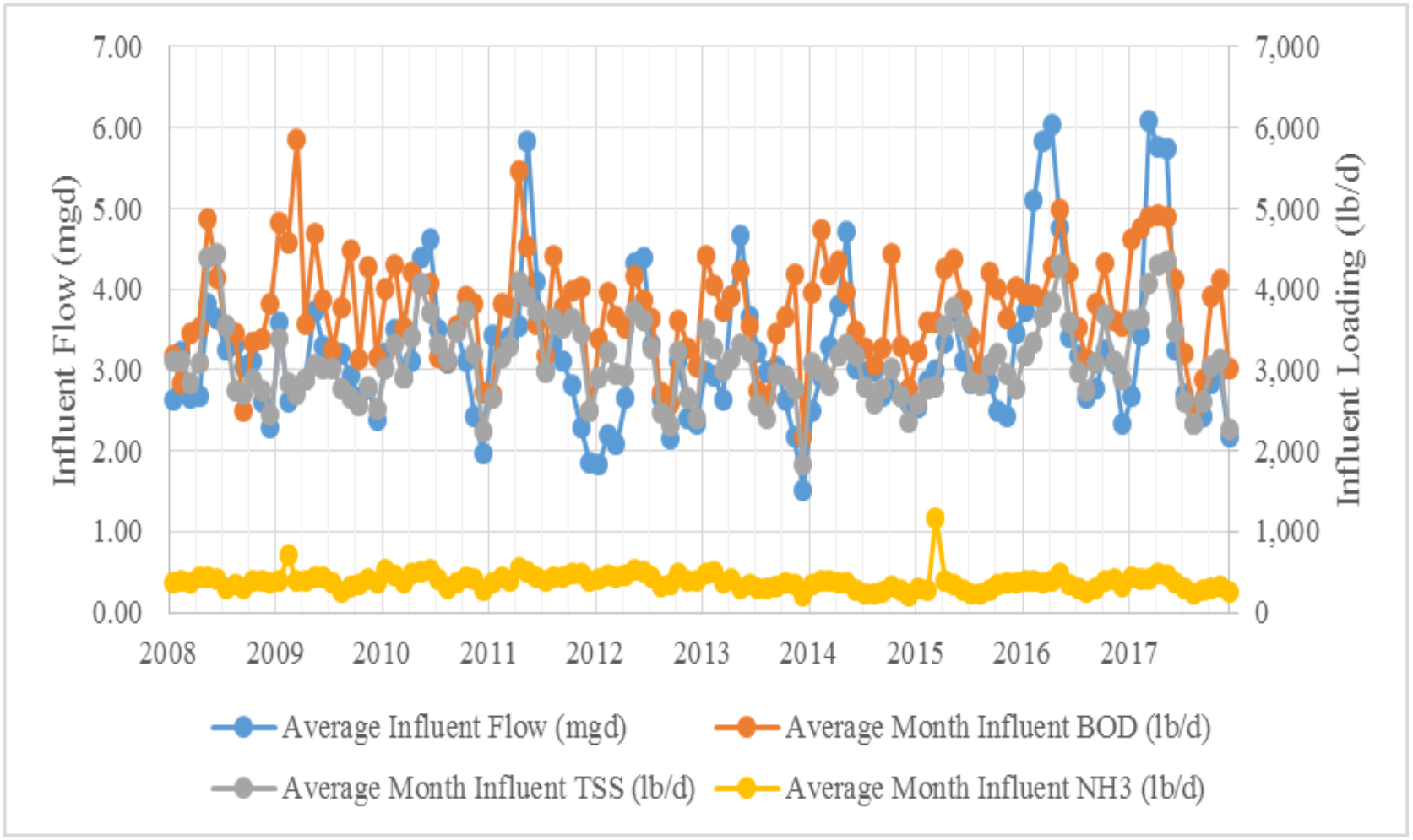


FIGURE 2-1

Historic WWTF Monthly Average Influent Flow and Loading Rates

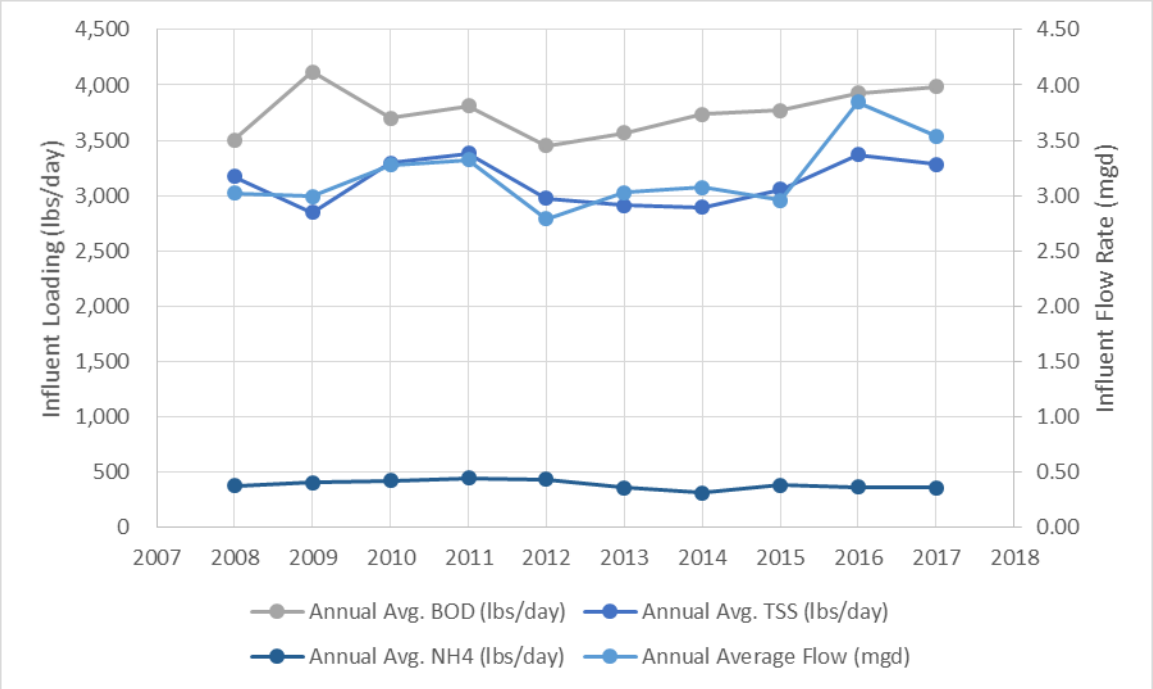


FIGURE 2-2

Historic WWTF Annual Average Influent Flow and Loading Rates

The WWTF has experienced a general increase in flow and loading over the past 10 years, particularly for flow and BOD_5 loading.

Particularly noticeable is Figure 2-1 is an increase in flow during the springtime in 2016 and 2017. During both these episodes, the average monthly flow exceeded 4.5 mgd during March, April and May with a maximum month flow of 6.09 mgd in March 2017, and a maximum day flow of 9.06 mgd on March 15, 2017. This season coincides with snowmelt and a rising groundwater table, both of which contribute toward infiltration and inflow (I/I).

WWTF operation data from 2016 and 2017 were reviewed to determine recent peak hourly flow rates. At least six incidences of peak hour flow in excess of 11.5 mgd were observed, coincident with the high springtime flow, and the highest peak hour flow of 12.9 mgd occurred on March 6, 2017.

Also of interest in the consistent trend of rising annual average BOD_5 loading since 2012. This trend correlates with increasing population, and is expected to continue with the City's recent 20-year population projection of 2 percent annual growth. Another factor in rising BOD loading could be due to increased industrial wastewater. Ammonia loadings have not increased in parallel, and the industrial wastewater received by the City is high in BOD and low in TSS and ammonia. The City has two significant industrial

dischargers. In Figure 2-3 the total City WWTF influent BOD_5 loading is compared to the two industrial wastewater loading rates.

Twin City Foods (TCF) is a frozen vegetable packing facility. TCF is permitted by State Waste Discharge Permit No. ST-5507, and has its own sprayfield treatment system that is operated between the months of April and October. In the winter TCF discharges to the City. Through an agreement with the City, TCF is allowed to discharge on a maximum month basis up to 100,000 gpd at a BOD_5 concentration of 850 mg/L (maximum mass loading of 709 lbs/day). In the 2015 *Engineering Report*, TCF data from 2006 to 2010 was reviewed; for this Study data from 2016 and 2017 has been reviewed. Actual BOD_5 mass loading rates have ranged from 57 to 472 lbs/day during the season of discharge to the City, and the recent data does not show any trend compared to earlier data.

The Iron Horse Brewery (IHB) began discharging brewery waste to the City in 2014, permitted by Temporary State Waste Discharge Permit ST-501278. Through an agreement with the City, modified in August 2016 to double the previously allowed flow rate, IHB is allowed to discharge on a maximum month basis up to 6,000 gpd at a BOD_5 concentration of up to 28,000 mg/L (maximum mass loading of 1,400 lbs/day). IHB data have been reviewed from 2014 through 2017. The actual BOD_5 concentrations have been much lower than the maximum allowed, ranging from 9,000 to 14,000 mg/L. Therefore, from September 2016 through December 2017 the average month BOD_5 loading has been 393 lbs/day. Since 2012 the City's annual average BOD_5 loading has increased by about 500 lbs/day, and the addition of IHB loading appears to be a contributing factor.

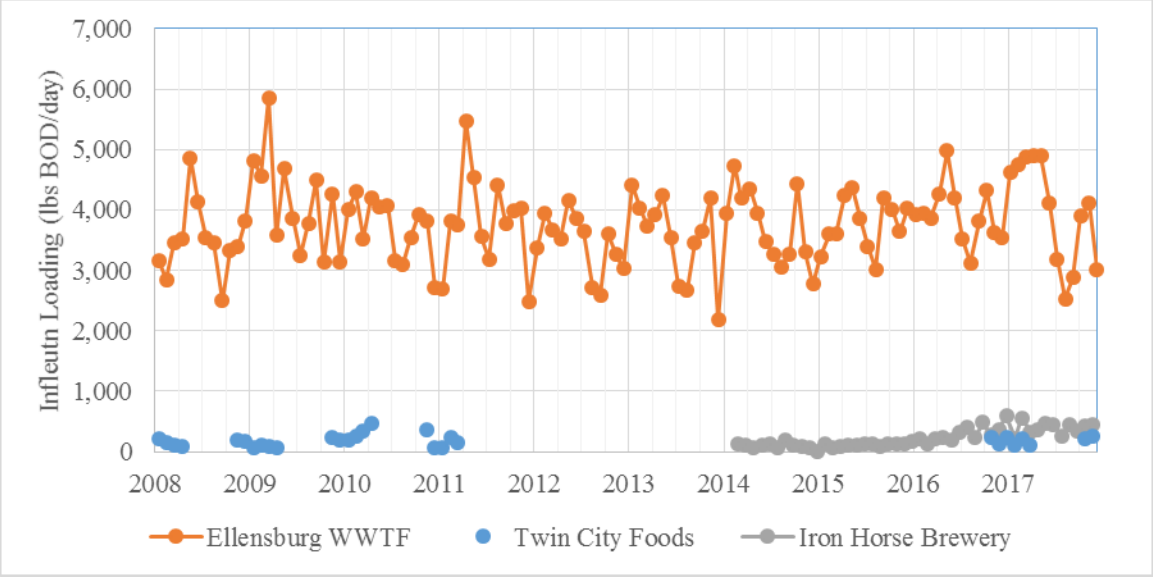


FIGURE 2-3

Historic WWTF and Industrial Influent BOD_5 Loading Rates

PROJECTED FLOW RATES

POPULATION AND ERUS

The use of equivalent residential units (ERU) is a way to express the amount of sewage generated by all customer classifications as an equivalent number of residential customers. The 2015 *Engineering Report* defines a wastewater ERU as 122 gpd based on an analysis of winter water use, which will also be used in this Study. Flow projections in the 2015 *Engineering Report* accounted for the population in City limits, plus a current sewered population outside City limits of 805 persons, projected to grow at the same rate as the City.

Table 2-4 provides the sewer service area populations and ERU quantities projected for 2037, along with the 2031 projections in the 2015 *Engineering Report* for comparison. Table footnotes explain the assumptions and calculations for each value, where it differs from the 2015 *Engineering Report*.

TABLE 2-4

Ellensburg Sewer Service Area Population and ERU Projections

Criteria	Base in 2015 Engr. Report	Current (2016-7)	2031 Projection	2037 projection
City Population	17,638	19,430(1)	25,201	32,540(2)
Population Outside City Limits Served by Sewer	805	805	1,150(3)	1,485(3)
Sewer Service Area Population	18,443	20,235	26,351	34,025
Residential ERUs/ Population	2.3	2.3	2.3	2.3
Residential ERUs	8,019	8,798	11,457	14,794
Non-Residential ERU Annual Growth Rate	N/A	N/A	1.8%	2.0%(2)
Non-Residential ERUs	6,824	7,487(4)	9,750	11,125(5)
Total ERUs (Not Including Twin City Foods or Iron Horse Brewery)	14,843	16,285	21,207	25,919

(1) Average of 2016 and 2017 Washington State Office of Financial Management (OFM) population estimates.
(2) Per the 2017 *City Comprehensive Plan*.
(3) Fraction of total sewer service population outside city limits assumed to remain constant.
(4) Non-residential ERUs estimated to have grown between 2011 and 2016-17 at the same rate as residential ERUs.
(5) 2037 non-residential ERUs projected using 2 percent annual growth from the 2016-17 estimate.

ANNUAL AVERAGE FLOW RATES

In Table 2-5, the components of annual average flow are summarized and projected for 2037, along with the 2031 projections in the 2015 *Engineering Report* for comparison. Table footnotes explain the assumptions and calculations for each value, where it differs from the 2015 *Engineering Report*.

The basis of the projection is the average of the recorded annual average flow rates in 2016 and 2017. Annual average flow rates have increased markedly since the data in the 2015 Engineering Report. As seen in Figure 2-1, the increase is primarily due to higher I/I in the spring. Per the methodology in the 2015 *Engineering Report*, the base sanitary flow as calculated as 122 gpd/ERU is subtracted from the measured annual average flow to determine the annual average I/I. The per acre annual average I/I based on 2016-2017 data is 429 gpd/acre, compared to 348 gpd/acre determined in the 2015 *Engineering Report*.

TABLE 2-5

Ellensburg WWTF Annual Average Flow Projections

Criteria	Base in 2015 Engr. Report	Current (2016-17)	2031 Projection	2037 Projection
Recorded Annual Average Flow (AAF) (mgd)	3.19(1)	3.69(2)	N/A	N/A
Annual Average Flow/ERU (gpd)(1)	122	122	122	122
Annual Average Sanitary Flow (mgd)(3)	1.81	1.99	2.59	3.16
Annual Average I/I per acre, existing (gpad)	348(4)	429(4)	348(5)	429(5)
Annual Average I/I per acre, new service area (gpad)	N/A	N/A	174(6)	215(6)
Sewer service area, existing (acres)(1)	3,970	3,970	3,970	3,970
Sewer service area, expanded (acres)(1)	N/A	N/A	1,332	1,332
Annual Average I/I (mgd)	1.38	1.70	1.61(7)	1.99(7)
TCF Annual Average flow (mgd)(1)	N/A	N/A	0.10	0.10
Total Annual Average Flow (mgd)	**3.19**	**3.69**	**4.30**	**5.25**

(1) Value per the 2015 *Engineering Report*.
(2) 24-month average from DMR data.
(3) Sanitary flow is estimated as the annual average flow per ERU (122 gpd/ERU) multiplied by the total ERUs listed in Table 2-4.
(4) Annual average I/I per acre is the annual average I/I (the difference between recorded annual average flow and the calculated sanitary flow) divided by the sewer service area.
(5) Annual average I/I per acre is projected to be the same as in the base year.
(6) Annual average I/I per acre in newly sewered areas is assumed to be 50 percent of the existing I/I rate per acre, per the 2015 *Engineering Report*.
(7) Annual average I/I is projected as I/I per acre multiplied by the acreage for existing and expanded service areas.

MAXIMUM MONTH FLOW RATES

In Table 2-6, the components of maximum month flow are summarized and projected for 2037, along with the 2031 projections in the 2015 *Engineering Report* for comparison. Table footnotes explain the assumptions and calculations for each value, where it differs from the 2015 *Engineering Report*.

The basis of the projection is the average of the recorded maximum month flow rates in 2016 and 2017. The base sanitary flow from Table 2-5 is subtracted from the maximum month flow to estimate the maximum month I/I. The maximum month I/I peaking factor is the ratio of the maximum month I/I over the annual average I/I. This peaking factor is applied to projected annual average I/I from Table 2-5 to project the future maximum month I/I. The base sanitary flow from Table 2-5 is added to the projected maximum month I/I to project the future total maximum month flow. TCF flow is not included in the maximum month flow projections per the 2015 *Engineering Report*, as TCF diverts flow to a sprayfield during summer.

TABLE 2-6

Ellensburg WWTF Maximum Month Flow Projections

Criteria	Base in 2015 Engr. Report	Current (2016-17)	2031 Projection	2037 Projection
Recorded Max. Month Flow (mgd)	4.63(1)	6.07(2)	N/A	N/A
Max. Month I/I Peaking Factor(3)	2.04	2.40	2.04	2.40
Max. Month I/I (mgd)	2.82(4)	4.08(4)	3.28(5)	4.77(5)
TCF Max. Month Flow (mgd)(1)	0	0	0	0
Total Max. Month Flow (mgd)	**4.63**	**6.07**	**5.87**	**7.93**

(1) Value per the 2015 *Engineering Report*.
(2) Average of the maximum months flow rates 2016 and 2017, from DMR data.
(3) For base years, the max. month I/I peaking factor is the ratio of max. month I/I to the annual average I/I listed in Table 2-4. Peaking factors are assumed to remain the same throughout the planning period.
(4) For base years, the max. month I/I = (recorded max. month flow) – (sanitary flow per Table 2-5).
(5) Projected max. month I/I is the peaking factor multiplied by the annual average I/I projected in Table 2-5.

MAXIMUM DAY FLOW RATES

In Table 2-7, the components of maximum day flow are summarized and projected for 2037, along with the 2031 projections in the 2015 *Engineering Report* for comparison. Table footnotes explain the assumptions and calculations for each value, where it differs from the 2015 *Engineering Report*.

The basis of the projection is the average of the recorded maximum day flow rates in 2016 and 2017. The base sanitary flow from Table 2-5 is subtracted from the maximum day flow to estimate the maximum day I/I. The maximum day I/I peaking factor is the ratio of the maximum day I/I over the annual average I/I. This peaking factor is applied to projected annual average I/I from Table 2-5 to project the future maximum day I/I. The base sanitary flow from Table 2-5 is added to the projected maximum day I/I to project the future total maximum day flow. TCF flow is not included in the maximum day flow projections per the 2015 *Engineering Report*, as TCF diverts flow to a sprayfield during summer.

TABLE 2-7

Ellensburg WWTF Maximum Day Flow Projections

Criteria	Base in 2015 Engr. Report	Current (2016-17)	2031 Projection	2037 Projection
Recorded Max. Day Flow (mgd)	6.78(1)	8.91(2)	N/A	N/A
Max. Day I/I Peaking Factor(3)	3.60	4.06	3.60	4.06
Max. Day I/I (mgd)	4.97(4)	6.92(4)	5.81(5)	8.08(5)
TCF Max. Day Flow (mgd)(1)	0	0	0	0
Total Max. Day Flow (mgd)	**6.78**	**8.91**	**8.40**	**11.25**

(1) Value per the 2015 *Engineering Report*.
(2) Average of the maximum day flow rates 2016 and 2017, from DMR data.
(3) For base years, the max. day I/I peaking factor is the ratio of max. day I/I to the annual average I/I listed in Table 2-5. Peaking factors are assumed to remain the same throughout the planning period.
(4) For base years, the max. day I/I = (recorded max. day flow) – (sanitary flow per Table 2-5).
(5) Projected max. day I/I is the peaking factor multiplied by the annual average I/I projected in Table 2-5.

PEAK HOUR FLOW RATES

In Table 2-8, the components of peak hour flow are summarized and projected for 2037, along with the 2031 projections in the 2015 *Engineering Report* for comparison. Table footnotes explain the assumptions and calculations for each value, where it differs from the 2015 *Engineering Report*.

WWTF operation data from 2016 and 2017 were reviewed to determine recent peak hourly flow rates. The highest peak hour flow of 12.9 mgd was used to calculate a revised peak hour I/I peaking factor. This peaking factor is applied to base year (2016-17) and projected annual average I/I to estimate the peak hour I/I flow.

Peak hour sanitary flow was calculated using a diurnal peaking factor applied to the annual average flow. The peaking factor was calculated to be 2.7 in the 2015 *Engineering Report* using the following equation provided in the Washington State Department of Ecology *Criteria for Sewage Works Design* (2008).

$$Peak\ Hour\ to\ Annual\ Average = {(18 + \sqrt{P})}/{(4 + \sqrt{P})}$$

The peak hour sanitary flow is added to the peak hour I/I to project the future total peak hour flow. TCF flow is not included in the peak hour flow projections per the 2015 *Engineering Report*, as TCF diverts flow to a sprayfield during summer.

TABLE 2-8

Ellensburg WWTF Peak Hour Flow Projections

Criteria	Base in 2015 Engr. Report	Current (2016-17)	2031 Projection	2037 Projection
Recorded Peak Hour Flow (mgd)	11.99(1)	12.90(2)	N/A	N/A
Peak Hour I/I Peaking Factor(3)	5.14	4.42	5.14	4.42
Peak Hour I/I (mgd)	7.10(4)	7.54(4)	8.29(5)	8.80(5)
Sanitary Diurnal Peaking Factor(1)	2.70	2.70	2.70	2.70
TCF Peak Hour Flow (mgd)(1)	0	0	0	0
Total Peak Hour Flow (mgd)	**11.99**	**12.90**	**15.28**	**17.34**

(1) Value per the 2015 *Engineering Report*.
(2) Highest peak hour flow rate in 2016 and 2017, from WWTF operational data.
(3) For base years, the peak hour I/I peaking factor is the ratio of peak hour I/I to the annual average I/I listed in Table 2-5. Peaking factors are assumed to remain the same throughout the planning period.
(4) For base years, the peak hour I/I = (recorded peak hour flow) – (sanitary flow (per Table 2-5) x sanitary diurnal peaking factor).
(5) Projected peak hour I/I is the peak hour I/I peaking factor multiplied by the annual average I/I projected in Table 2-5.

PROJECTED SOLID AND ORGANIC LOADING RATES

The BOD_5, TSS and nitrogen loading rates are evaluated on the basis of per capita loadings. The base year per capita loading is calculated as the measured loading rate divided by the population; this is performed for annual average and maximum month values. Future projections are the per capita loading rate multiplied by the projected population.

Average measured loading rates from 2016 and 2017 are used to update the per capita loading rates from the 2015 *Engineering Report*, which are then used to project 2037 loading rates.

BOD_5 LOADING

The BOD_5 loading represents the number of pounds per day of oxygen-demanding material that enters the WWTF. BOD_5 loadings are used to design and size the WWTF biological treatment processes (i.e., aeration basin) and BOD_5 loadings are used by Ecology to establish the "permitted capacity" for the WWTF. Because the permitted capacity applies to the maximum month, maximum month loadings are analyzed for design purposes. Annual average loading is important for determining biosolids production and operating costs, and is also calculated.

The industrial dischargers TCF and IHB are significant contributors of BOD_5 to the WWTF. Due to the magnitude of their BOD_5 loading on the WWTF, the base BOD_5 loading without industrial dischargers must be determined and used to calculate per-capita BOD_5 loading. Based on 2016 and 2017 data, the recorded annual average BOD_5 loading from TCF was 192 lbs/day and from IHB was 393 lbs/day (since increasing their allowed flow rate in August 2016). The combined annual average industrial BOD_5 loading during 2016 and 2017 was 585 lbs/day.

In the 2015 Engineering Report the projected annual average TCF's BOD_5 loading was 625 lb/day based on the maximum allowed per the City's contract. For the 2037 projections in this Study, it is assumed that the 2037 annual average BOD_5 loading rates for both industries will match the recent 2016-2017 loading rates. Projected maximum month BOD_5 industrial loading rates will include the maximum month loadings allowed per Contract. The TCF loading at maximum month was estimated as the maximum month concentration of 1,410 mg/L at the maximum flow of 100,000 gpd (1,175 lbs/day). The projected IHB maximum month loading of 1,401 lbs/day is the maximum month flow rate of 6,000 gpd at the maximum month BOD_5 concentration of 28,000 mg/L.

In Table 2-9, annual average and maximum month BOD_5 loading rates are shown for existing and future conditions.

TSS LOADING

The TSS loading rate represents the number of pounds per day of suspended material that enters the WWTF. TSS loadings are used to design and size the biological treatment processes. In municipal wastewater, BOD_5 and TSS loadings are typically of similar magnitude. TSS loadings are used by Ecology to establish the "permitted capacity" for the WWTF. Because the permitted capacity applies to the maximum month, maximum month loadings are analyzed for design purposes. Annual average loading is important for determining biosolids production and operating costs, and is also calculated.

TCF is a significant contributor of BOD_5 to the WWTF; however, it is unknown if they are a significant contributor of TSS to the WWTF. The City does not require TCF to sample and report TSS in their discharge. Due to the lack of TCF data, the base TSS

loading to the WWTF will be assumed to contain all TSS loadings to the WWTF; TCF loading will not be calculated separately. TSS loading to the WWTF from IHB is insignificant compared to the BOD_5 loading and will not be calculated separately.

In Table 2-10, annual average and maximum month TSS loading rates are shown for existing and future conditions.

TABLE 2-9

Ellensburg WWTF BOD_5 Loading Rate Projections

Criteria	Base in 2015 Engr. Report	Current (2016-17)	2031 Projection	2037 Projection
Population	18,042(1)	20,235	26,351	34,025
Annual Average BOD Loading				
Recorded Annual Average BOD Loading (lb/day)	3,479(1)	3,957(2)	N/A	N/A
TCF Annual Average BOD (lbs/day)	230(1)	192(2)	625	192(2)
IHB Annual Average BOD (lbs/day)	0	393(2)	0	393(2)
Annual Average Base BOD (lbs/day)	3,249(3)	3,372(3)	4,743(4)	5,670(4)
Annual Average BOD/ERU (lb/cap/day)	0.18	0.17	0.18	0.17
Total Annual Average BOD (lbs/day)	3,479	3,957	5,370	6,260
Maximum Month BOD Loading				
Recorded Max. Month BOD (lbs/day)	4,864(1)	4,944(2)	N/A	N/A
TCF Max. Month BOD (lbs/day) (1)	1,175	1,175	1,175	1,175
IHB Max. Month BOD (lbs/day)	0	587(2)	0	1,401
Max. Month Base BOD (lbs/day)	3,689(3)	3,182(3)	5,270(4)	6,805(4)
Max. Month BOD/ERU (lb/cap/day)	0.20	0.16	0.20	0.20(5)
Total Max. Month BOD (lbs/day)	**4,864**	**4,944**	**6,445**	**9,381**

(1) Value per the 2015 *Engineering Report*.
(2) Average of the loading rates 2016 and 2017, from DMR and operational data.
(3) For base years, the base BOD loading is the recorded loading minus the industrial loading.
(4) Projected Base BOD loading is the per capita loading multiplied by the population.
(5) The maximum month per capita BOD loading of 0.20 lb/cap/day is used for the 2037 projection to be consistent with Department of Ecology guidance. Using the calculated 2016-17 per capita loading of 0.16 could result in undersized facilities.

TABLE 2-10

Ellensburg WWTF TSS Loading Rate Projections

Criteria	Base in 2015 Engr. Report	Current (2016-17)	2031 Projection	2037 Projection
Population	18,042[(1)]	20,235	26,351	34,025
Annual Average TSS Loading				
Recorded Annual Average TSS (lb/day)	2,894[(1)]	3,326[(2)]	N/A	N/A
Annual Average TSS/ERU (lb/cap/day)	0.16	0.16	0.16	0.16
Annual Average TSS (lbs/day)[(3)]	N/A	N/A	4,215	5,593
Maximum Month TSS Loading				
Recorded Max. Month TSS (lb/day)	4,448[(1)]	4,320[(2)]	N/A	N/A
Max. Month TSS/ERU (lb/cap/day)	0.25	0.21	0.25	0.21
Max. Month TSS (lbs/day)[(3)]	N/A	N/A	**6,460**	**7,264**

(1) Value per the 2015 *Engineering Report*.
(2) Average of the loading rates 2016 and 2017, from DMR data.
(3) Projected TSS loading is the per capita loading multiplied by the population.

NITROGEN LOADING

Total nitrogen is comprised of organic nitrogen, ammonia, nitrite, and nitrate. Total Kjeldahl nitrogen (TKN) is the total of the organic and ammonia nitrogen. TKN loadings are used to design and size the ammonia and nitrogen removal processes at the facility. Currently there are no measurements of influent TKN taken at the WWTF, but there are measurements for influent ammonia. Typical domestic wastewaters have an ammonia:TKN ratio of 5:6. This typical ratio will be used to project the design TKN load for the WWTF. Maximum month TKN loadings are analyzed for design purposes. Annual average loading is important for determining alkalinity consumption and operating costs, and is also calculated.

TCF does discharge some ammonia to the WWTF, however according to the City's records, typically the discharge concentrations are less than 1 mg/L. The City does not require IHB to sample and report ammonia in their discharge, but it is believed to be not significant. Therefore, the nitrogen loading to the WWTF will be calculated based on the total historical ammonia load from all sources to the WWTF, and will not be based on a separate base load from TCF or IHB.

During 2016 and 2017 the measured maximum month ammonia loading was not as high as values in 2008 and 2010. For projecting future ammonia and TKN loading rates, the maximum month TKN loading per capita from the 2015 *Engineering Report* of 0.042 lbs/cap/day will be used instead of the lower rate of 0.028 lbs/cap/day based on 2016 and 2017 only.

In Table 2-11, annual average and maximum month TKN nitrogen loading rates are shown for existing and future conditions.

TABLE 2-11

Ellensburg WWTF TKN Nitrogen Loading Rate Projections

Criteria	Base in 2015 Engr. Report	Current (2016-17)	2031 Projection	2037 Projection
Population	18,042[(1)]	20,235	26,351	34,025
Annual Average TKN Loading				
Recorded Annual Average NH_3 (lb/day)	384[(1)]	358[(2)]	N/A	N/A
Annual Average TKN (lb/day)[(3)]	461	430	N/A	N/A
Annual Average TKN/capita (lb/cap/day)	0.026	0.021	0.026	0.021
Annual Average TKN (lbs/day)[(4)]	N/A	N/A	673	722
Maximum Month TKN Loading				
Recorded Max. Month NH_3 (lb/day)	639[(1)]	478[(2)]	N/A	N/A
Max. Month TKN (lb/day)[(3)]	767	574	N/A	N/A
Max. Month TKN/capita (lb/cap/day)	0.042	0.028	0.042	0.042[(4)]
Max. Month TKN (lbs/day)[(5)]	N/A	N/A	1,107	1,429

(1) Value per the 2015 *Engineering Report*.
(2) Average of the loading rates 2016 and 2017, from DMR data.
(3) TKN loading is estimated per textbook value as 6/5 of NH_3 loading.
(4) For the 2037 projection of max month TKN, the TKN/capita value from the 2015 Engineering Report is used, so that the projection accounts for the higher ammonia loadings observed in 2008 and 2010.
(5) Projected TKN loading is the per capita loading multiplied by the population.

SUMMARY OF PROJECTED FUTURE FLOWS AND LOADINGS

A summary of the existing WWTF design criteria (from the City's NPDES permit), the projected design criteria, and the recommended design criteria for the City of Ellensburg for the year 2037 is presented in Table 2-12.

The existing design criteria, as included in the NPDES permit, are greater than the 2037 projections shown in Table 2-12 except for peak hour flow. The recommended design criteria for the 20-year planning period shown in Table 2-12 preserve the existing design loadings to provide reserve capacity for industrial and commercial growth. The peak hour flow rate is not relevant to aeration system capacity, and therefore, will not affect this Study. We recommend a more thorough analysis of peak hour flows, based on installation of an influent flow meter instead of reliance on the effluent flow meter, prior to designing new facilities that depend on hydraulic capacity.

Since the existing design criteria do not include values for average annual flow, maximum day flow, average annual BOD_5, and average annual TSS, the recommended 2037 design criteria for these parameters were based on the ratio of average annual, or maximum day, to maximum month values in the projected design criteria. For example, the ratio of projected average annual flow (5.25 mgd) to the maximum month flow (7.93 mgd) is 0.66, therefore, the recommended average annual design flow is 0.66*8.0 = 5.30 mgd. This calculation was repeated to determine the recommended design maximum day flow, average annual BOD_5 loading and average annual TSS loading.

The recommended design criteria for influent TKN loading were estimated using a constant TKN/BOD_5 ratio between the projected 2037 and the design loadings. Because the industrial loads do not significantly contribute TKN to the WWTF, the base BOD_5 loading was used for the ratio. Subtracting the maximum month influent BOD_5 from TCF of 1,175 lbs/day and from IHB of 1,401 lbs/day from the design criteria of 10,000 lbs/day results in a base design maximum month influent BOD_5 loading of 7,424 lbs/day. Per Table 2-8, the projected 2037 base BOD_5 loading is 6,805 lbs/day. The recommended design maximum month TKN loading is then 1,559 lbs/day (7,424/6,805 * 1,429 = 1,559 lbs/day). The recommended design average annual TKN loading is proportional to the recommended maximum month TKN loading by the same peaking ratio as for the projected 2037 criteria.

In Figure 2-4, the projected growth in flow and loading rates at the Ellensburg WWTF during the 20-year planning period is presented. The growth is based on linear interpolation between the 2016-2017 values and the projected 2037 values.

TABLE 2-12

Ellensburg WWTF Recommended 2037 Flow and Loading Rate Design Criteria

Criteria	Existing NPDES Permit	2031 Projection (2015 Engr. Report)	2037 Projection	Recommended 2037 Design
Design Population	31,000	26,351	34,025	34,025
Flow Criteria				
Annual Average Flow (mgd)	NR	4.30	5.25	5.30
Max. Month Flow (mgd)	8.00	5.87	7.93	8.00
Max. Day Flow (mgd)	NR	8.40	11.25	11.25
Peak Hour Flow (mgd)	15.00	15.28	17.34	17.34
Loading Criteria				
Annual Avg. BOD Loading (lbs/day)	NR	5,370	6,260	6,673
Max. Month BOD Loading (lbs/day)	10,000	6,445	9,381	10,000
Annual Avg. TSS Loading (lbs/day)	NR	4,215	5,593	6,159
Max. Month TSS Loading (lbs/day)	8,000	6,460	7,264	8,000
Annual Avg. TKN Loading (lbs/day)	NR	673	722	788
Max. Month TKN Loading (lbs/day)	NR	1,107	1,429	1,559

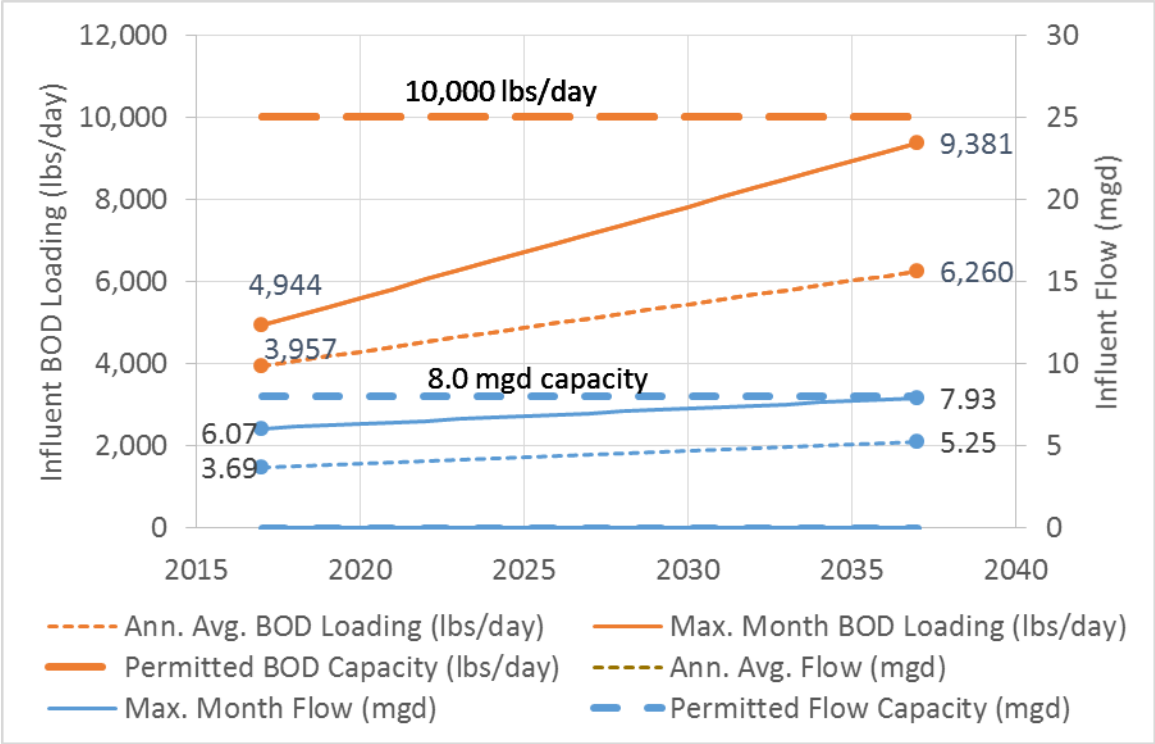


FIGURE 2-4

Projected Growth in WWTF Maximum Month Flow and Loading Rates

RECOMMENDED AERATION BASIN INFLUENT FLOWS AND LOADINGS

The wastewater entering the aeration basins consists of the influent wastewater plus internal recycle streams such as drains, centrate and sludge lagoon supernatant. Anaerobic digestion, which is used at the Ellensburg WWTF, produces liquid return streams that can be very high in ammonia. In some plants with anaerobic digestion, the recycle ammonia loading is a significant portion of the total ammonia loading to the aeration basin.

At the Ellensburg WWTF, the only significant liquid return stream from the anaerobic digestion system to the aeration basins is supernatant for the waste sludge lagoons. Supernatant from the lagoons is returned to the aeration basins during the autumn in order to thicken the waste sludge. The centrate from the gravity belt thickener (GBT) is not a concern since it is from thickening of WAS, which is not high in ammonia. Per City operations staff, up to a 12-inch water depth in one lagoon is returned to the aeration basins per year, at a rate of about 3 gpm. Water quality data on the supernatant was not available, but the recycled ammonia loading was estimated using a typical concentration of 1,500 mg/L ammonia.

In Table 2-13, the recommended aeration basin influent design criteria for the City of Ellensburg for the year 2037 are presented, which consist of the influent design criteria in Table 2-12 with the addition of the recycled supernatant.

The aeration basin evaluation in this Study will be based on the recommended design criteria in Table 2-13, to provide a capacity equal to or greater than the design capacity in the NPDES permit. This approach will allow capacity for future commercial and industrial growth.

TABLE 2-13

Ellensburg WWTF Recommended 2037 Aeration Basin Influent Design Criteria

Criteria	Recommended 2037 Design
Design Population	34,025
Flow Criteria	
Annual Average Flow (mgd)	5.300
Max. Month Flow (mgd)	8.004
Max. Day Flow (mgd)	11.254
Peak Hour Flow (mgd)	17.344
Loading Criteria	
Annual Avg. BOD Loading (lbs/day)	6,673
Max. Month BOD Loading (lbs/day)	10,000
Annual Avg. TSS Loading (lbs/day)	6,159
Max. Month TSS Loading (lbs/day)	8,000
Annual Avg. TKN Loading (lbs/day)	788
Max. Month TKN Loading (lbs/day)	1,595

CHAPTER 3

WWTF AERATION BASIN ALTERNATIVES

INTRODUCTION

The purpose of this chapter is to evaluate the existing City of Ellensburg Wastewater Treatment Facility (WWTF) aeration basins with respect to capacity, reliability and redundancy, and to develop and evaluate process alternatives to meet current and projected capacity and treatment requirements. The evaluated alternatives include modifications to the existing aeration basins and construction of new aeration basins. Estimated capital costs and operations and maintenance (O&M) costs for each alternative will be presented. Each alternative will be constructible and designed to provide the level of reliability and redundancy required by Washington State Department of Ecology guidelines.

The liquid treatment facilities at the City of Ellensburg WWTF include grit removal, screening, aeration basins, secondary clarifiers, UV disinfection system, and an outfall to the Yakima River. The solids treatment facilities include anaerobic digesters, gravity belt thickener, sludge storage lagoon, and sludge drying beds.

The following four alternatives will be described in this Chapter:

- Alternative 1, Existing Basins with Surface Aerators: No change to process except add more floating surface aerators.

- Alternative 2, Existing Basins with Invent Mixers: Compartmentalize existing basins into 4 cells each, install Invent mixers for mixing and aeration, with blowers; construct third basin in future.

- Alternative 3, Existing Basins with Diffusers: Compartmentalize existing basins into 4 cells each, install fine-bubble diffusers and blowers; construct third basin in future.

- Alternative 4, New Aeration Basin: Construct a new plug-flow, three-train aeration basin, with diffusers and blowers.

Alternative 1 is the low capital cost option, which allows the City to minimally meet the requirements of the current NPDES effluent permit, without providing capacity for denitrification or other potential future treatment requirements. Alternatives 2 through 4 include greater capital investment, and are designed to provide denitrification even at the maximum design capacity. The definition of denitrification and its benefits are described in this Chapter.

EVALUATION OF EXISTING WWTF AERATION BASINS

EXISTING AERATION BASIN DESIGN CRITERIA

Flow from the plant headworks enters the aeration basin splitter box where it mixes with return sludge from the secondary clarifiers and internal recycle flow, is split over weirs, and then enters each of the two concrete-lined aeration basins through pipes that extend to the center. At the end of each pipe, there is a 4-point diffuser that extends in an "X" pattern from the center inlet point into the basins. In the aeration basins the microorganisms in the activated sludge utilize the raw waste as a food source. These microorganisms require four essentials for life: food, nutrients, water, and oxygen. Food, nutrients, and water are supplied by the influent. Oxygen is supplied from the air and is transferred to the biological mass by means of floating mechanical surface aerators in the aeration basins.

The plant utilizes a complete mix activated sludge system, where all of the raw incoming waste is mixed throughout the entire volume of the aeration basin as quickly as possible. This creates a nearly homogeneous condition in the aeration basin so that the oxygen required for treatment is the same in all portions of the aeration basin. This results in uniform oxygen transfer efficiency. Adverse effects due to slug organic and hydraulic loads are minimized because the incoming wastes are distributed throughout the entire volume of the aeration basin.

Each aeration basin effluent discharges over a weir into a 30-inch diameter pipe and the flows from each basin combine to flow together through a 42-inch diameter pipe to the secondary clarifier splitter box. The overflow weir in each outlet box controls the water level in the aeration basin. Most of the incoming waste organic matter is consumed in the growth of new organisms. The organisms that grow in the aeration basin flocculate into settleable masses that are removed by the secondary clarifier.

Design criteria for the aeration basins are provided below in Table 3-1.

The performance of the existing aeration basins will be evaluated at the design flow and loading rates, based on parameters demonstrated in recent operational performance data.

Aeration basin capacity requirements are dependent on three major design criteria. These criteria are solids retention time (SRT), net heterotrophic and autotrophic yields, and design mixed liquor suspended solids (MLSS) concentration. SRT is the criteria of greatest importance for nitrification. The City's permit effluent limits include a limit for ammonia, and therefore, nitrification is required. The net specific growth rate of the nitrifying biomass is an order of magnitude lower than that of carbon oxidizing bacteria and is therefore used as the basis for determining the SRT of the aeration basin. Also, the SRT used to calculate the required value for nitrification must be the aerobic SRT since nitrification only occurs under aerobic conditions. Calculation of the required design SRT for the Ellensburg WWTF is provided below.

TABLE 3-1

WWTF Aeration Basin Existing Design Criteria

Aeration Basin	
Aeration Basin Structure	
Quantity	2
Dimensions	129 feet L x 129 feet W x12 feet SWD (floors are sloped at outer edges)
Volume, each	1.26 MG
Volume, Total	2.52 MG
HRT@ AAF, 4.30 mgd	14 hours
HRT@ MMF, 8.0 mgd	7.5 hours
Year Constructed	1972
Aerators	
Quantity	8 (4 each basin)
Type	Floating Surface Aerators
Motor	50 hp
Year Installed	2 Aerators replaced in 1999, 2 Aerators replaced in 2000, 2 Aerators replaced in 2001, 2 Aerators replaced in 2002

SRT AND SLUDGE PRODUCTION CALCULATION

The first step in determining the required design SRT is to calculate the maximum specific nitrifier growth rate ($\mu_{n,m}$), decay rate (k_{dn}), and ammonia half saturation coefficient (K_N) using the following equations. The winter design temperature of 10°C is based on historical WWTF records.

$$\mu_{n,m,10} = (\mu_{n,m}) \times (\theta^{t-20}) = (0.9/d) \times (1.072^{10-20}) = 0.449/day$$

$$k_{dn,10} = (k_{dn}) \times (\theta^{t-20}) = (0.17/d) \times (1.029^{10-20}) = 0.128/day$$

$$K_{N,10} = (K_N) \times (\theta^{t-20}) = (0.5\ mg/L) \times (1.0^{10-20}) = 0.5\ mg/L$$

The numerical values for the kinetic parameters above are typical for domestic wastewater.

Presently, the City is required by the NPDES permit to meet a maximum daily effluent ammonia concentration of 8.2 mg/L; to be conservative and provide a factor of safety, the design effluent ammonia concentration is assumed to be 2 mg/L. For the following calculations, a dissolved oxygen concentration (DO) of 2.0 mg/L and an oxygen half

saturation coefficient (K_O) of 0.5 mg/L are used. The design nitrifier growth rate is calculated as follows:

$$\mu_n = (\mu_{n,m,10})\left(\frac{N}{K_N + N}\right)\left(\frac{DO}{K_O + DO}\right) - k_{dn,10} = (0.449/d)\left(\frac{2.0}{0.5+2.0}\right)\left(\frac{2.0}{0.5+2.0}\right) - 0.128/d$$

This equation yields a net specific nitrifier growth rate of 0.160/d, which is then used to calculate the required SRT using the following equation:

$$SRT = 1/\mu_n = 6.26 \text{ days}$$

Applying a safety/peaking factor of 1.5 to this value, to account for daily fluctuations in ammonia loading, produces a required aerobic SRT of 9.4 days. The SRT required for nitrification is temperature dependent; at the annual average temperature of 15 degrees C the minimum SRT with safety factor is 5.8 days and at an average summer temperature of 18 degrees C the minimum SRT is 4.4 days.

In order to calculate the aerobic mass required in the aeration basins to provide the design SRT, the net sludge production for the treatment system must first be estimated. Assuming a cell yield of 0.45 lb VSS/lb biodegradeable COD (bCOD), an influent wastewater and biomass VSS/TSS ratio of 0.90 (based on operational data), and a design temperature of 10°C, the total sludge production can be determined using the following equation:

$$P_X = \left[\frac{(Y)(S - S_0)}{(1 + (k_{d,t})(SRT))0.85}\right] + \left[\frac{(f_d)(k_d)(Y)(S - S_0)(SRT)}{(1 + (k_{d,t})(SRT))0.85}\right] + \left[\frac{(Y_n)(NO_x)}{(1 + (k_{dn,t})(SRT))0.85}\right] + X_{iVSS} + X_{iTSS}$$

Where:

P_X = mass of waste activated sludge per day, lb/d (to be determined)
Y = heterotrophic cell yield = 0.45 lb/lb bCOD (from above)
S = mass influent bCOD, taken as 1.6 x influent $CBOD_5$ = 10,000 lb/day x (0.88 CBOD5/BOD5 ratio) x 1.6 bCOD/CBOD5 ratio) = 14,080 lb/day (211 mg/L at 8.0 mgd)
S_0 = mass of effluent bCOD, taken as 1.6 x effluent $sBOD_5$ = 200 lb/d (3 mg/L at 8.0 mgd))
k_d = heterotrophic decay rate at 20°C = 0.12/d
$k_{d,t}$ = (k_d) x (θ^{t-20}) = (0.12/d) x (1.04^{10-20}) = 0.081/day
SRT = solids retention time = 9.4 days (from above)
0.87 = ratio of mixed liquor VSS to TSS (from 2016-17 operational data)
f_d = fraction of cell mass remaining as cell debris = 0.15 lb/lb (typical for domestic wastewater)
$k_{dn,t}$ = 0.128 mg/L (from above)

Y_n = autotrophic cell yield = 0.15 lb/lb TKN (typical for domestic wastewater)

NO_x = amount of influent TKN oxidized to nitrate, iterated to exclude the TKN in the WAS production (6.8% of the VSS production) and the effluent (assumed to be 2 mg/L) = 1,025 lb/d

X_{iVSS} = volatile nonbiodegradable solids, volatile suspended solids (VSS) as 90 percent of TSS (per operation records), volatile nonbiodegradable solids calibrated as 33-percent VSS, 0.33 x 0.9 x influent TSS = 2,400 lb/d

X_{iTSS} = influent nonvolatile suspended solids, assumed as 0.1 x influent TSS = 800 lb/d

t = influent temperature = 10°C

The sludge production can then be calculated as follows:

$$P_x = \left[\frac{(0.45)(14{,}080-200)}{\left(1+(0.081)(9.4)\right)*0.87)}\right] + \left[\frac{(0.15)(0.081)(0.45)(14{,}080-200)(9.4)}{\left(1+(0.081)(9.4)\right)*0.87}\right] + \left[\frac{(0.15)(1{,}025)}{\left(1+(0.128)(9.4)\right)*0.87}\right] + 2{,}400 + 800 \;=\; 7{,}821 \text{ lb/day}$$

This equation yields a total estimated waste sludge production of 7,821 lb/d. This value is based on a calibration of the volatile nonbiodegradable solids (X_{iVSS}) using actual flow and loading rates and sludge production rates in 2016-2017 based on operational records.

At the design SRT of 9.4 days, this waste sludge production results in a required total aerobic mass of 73,520 lbs. With a known aeration basin volume of 2,512,000 gallons, the required MLSS concentration is calculated to be 3,510 mg/L. It is therefore determined that if the aeration basin is operated at a mixed liquor suspended solids concentration of approximately 3,500 mg/L, the basin will operate at the desired aerobic mass and design SRT at the design flow and loading rate. However, the aeration basins must be fully aerobic 24 hours per day to provide the aerobic SRT of 9.4 days.

AERATION REQUIREMENTS

To biologically oxidize the BOD_5 and ammonia in the wastewater into bacteria and harmless end products, oxygen must be continuously added to the aeration basin. The required amount of oxygen consists of a carbonaceous oxygen demand and a nitrogenous oxygen demand.

The carbonaceous oxygen demand is calculated as follows:

$$\textit{Carbonaceous } O_2 \textit{ Demand} = (S - S_0) - 1.42 * P_{xbio}$$

Where:

S = mass influent bCOD = 14,080 lb/day (from above)
S_0 = mass of effluent bCOD = 200 lb/d (from above)
P_{xbio} = biodegradable biological mass produced (lbs/day)

Biodegradable Biological Mass $P_{xbio} = [Y * (S – S_0)]/[1 + k_{dt}\ SRT]$

Where:

Y = heterotrophic cell yield = 0.45 lb/lb bCOD (from above)
$k_{d,t}$ = (k_d) x (θ^{t-20}) = (0.12/d) x (1.04^{10-20}) = 0.081/day (from above)
SRT = 9.4 days (from above)
P_{xbio} = biodegradable biological mass = 3,545 lb/day

Therefore, the carbonaceous oxygen demand is 8,847 lb/d.

The nitrogenous oxygen demand is calculated by first calculating the amount of nitrogen oxidized to nitrate:

Nitrogenous O_2 Demand = 4.33 * $(TKN_{in} – TKN_0 – 0.068 * P_{x,VSS})$

Where:

TKN_{in} = influent TKN, 1,595 lb/d (from above)
TKN_0 = effluent TKN, 134 lb/d (assumed 2 mg/L concentration)
$P_{x,VSS}$ = P_x per above equation without VSS correction factors = 6,420 lb/day

Therefore, the nitrogenous oxygen demand is 4,438 lb/d. Therefore, the total oxygen demand is 13,285 lb/d, as determined below.

Total O_2 demand = Carbonaceous O_2 demand + Nitrogenous O_2 demand
= 9,186 lb/d + 4,330 lb/d = 13,516 lb/d

Applying a safety factor of 1.33 to account for fluctuations in diurnal loads, results in a design oxygen demand of 17,670 lb/d.

Oxygenation equipment is specified based upon standard oxygen transfer rate (SOTR), the oxygen transfer rate in clean, 20 degrees C water with no suspended solids. The SOTR is calculated as follows:

$$AOTR = SOTR\left(\frac{\beta C_{S20} - C_O}{C_{S20}}\right)\left(1.024^{T-20}\right)\alpha$$

Where:

- α = oxygen transfer correction factor, 0.65 (typical for floating surface aerators)
- β = salinity surface tension factor, 0.95
- C_{S20} = dissolved oxygen concentration at 20°C and 1 atm, 9.08 mg/L
- C_O = operating dissolved oxygen concentration, 2 mg/L
- T = 20°C

The resulting SOTR is therefore 37,035 lb/d or 1,543 lb/hr.

There are eight 50-hp surface aerators in the aeration basins (four per basin) for a total horsepower rating of 400 hp. According to the manufacturer, the aerators have an oxygen transfer rating of 2.8 lbs O_2/hp/hr. For eight 50-hp aerators, this rating results in a total oxygen transfer of 1,120 lbs O_2/hr. The manufacturer's rating of the aerators is high and not typical according to *Wastewater Engineering, 4th Ed.* (Metcalf & Eddy, 2003), which states typical rating for these types of aerators to be 1.8-2.3 O_2/hp/hr. It is typical for manufacturers to overstate the oxygen transfer capacities; therefore, a more conservative approach will be considered. At 2.0 lbs O_2/hp/hr, the total oxygen transfer would be 800 lbs O_2/hr.

The *Criteria for Sewage Works Design* (Ecology, 2008) states in order to meet Ecology's reliability standards for a Reliability Class II facility, there must be a sufficient number of aerators to maintain the oxygen transfer with the largest aerator out of service. With one aerator out of service, the total oxygen transfer would be 980 lbs O_2/hr based on the manufacturer's rating and would be 700 lbs O_2/hr using the more conservative approach.

In either case, the aeration system does not meet the requirements for the design criteria. The inadequate aeration system is due to the change in treatment requirements following the addition of the ammonia effluent limit in 1996. The limit requires ammonia removal by biological nitrification which increases the oxygen demand. If the City was not required to nitrify, the aeration system would be adequate.

ALKALINITY REQUIREMENTS

The stoichiometric reaction for the oxidation of ammonia nitrogen to nitrate shows that two moles of hydrogen are produced for every mole of ammonia nitrogen oxidized. In a wastewater treatment system, these hydrogen ions are neutralized by the wastewater's natural alkalinity (buffering capacity), preventing this acid condition from significantly reducing the pH within the treatment system. However, if the alkalinity present in the influent wastewater is not sufficient to neutralize the hydrogen ions released during nitrification, the pH within the system will begin to drop. This, in turn, can lead to low mixed liquor and effluent pH and a significant reduction in nitrification efficiency. An effluent pH value below 6 is a permit violation. Mixed liquor with pH readings outside the range from 7.2 to 8.0 can have an inhibitory effect on the nitrifying organisms.

The mass of TKN oxidized (nitrification) must be determined in order to calculate how much alkalinity is consumed in the process. Following is the equation to determine the quantity of nitrates denitrified:

$$\text{Consumption} = (\text{Nitrification})\ (7.14\ \text{mg}\ CaCO_3)$$
$$= (1{,}025\ \text{lbs/d TKN Oxidized})\ (7.14\ \text{mg}\ CaCO_3) = 7{,}319\ \text{lb/day}$$

The total alkalinity consumed is calculated at 7,319 lb/d or 110 mg/L at a maximum monthly flow of 8.0 mgd and a design loading of 1,595 lb/d TKN. An alkalinity of 80 mg/L is required in the aeration basin to maintain a pH of 7.2. The total required alkalinity is 190 mg/L (110 mg/L + 80 mg/L).

The WWTF staff recently performed some influent alkalinity testing. The data indicates that the WWTF influent alkalinity has a concentration of approximately 162 mg/L, with an effluent alkalinity of 84 mg/L. These measurements are consistent with testing in 2010 showing an influent alkalinity concentration of 152 mg/L. It appears that the WWTF has a slight deficiency in alkalinity, and consequently effluent pH violations might be a problem at greater loadings in the future.

EVALUATION OF RECENT PERFORMANCE

SRT AND AERATION

During 2016 and 2017, the eight floating aerators were operated in a staggered "on/off" mode to save energy. Each aerator is on approximately 72 percent of the time, which means that the area around that aerator is anoxic approximately 28 percent of the time. Due to this mode of operation denitrification is occurring in the basin during the anoxic period or "off" time. During this period the average temperature of the mixed liquor was 15 degrees C and the aeration basins were operated with an average MLSS concentration of 1,350 mg/L. The resulting aerobic SRT was 6.25 days and the total SRT include anoxic periods was 8.7 days. This aerobic SRT is sufficient for nitrification with a safety factor of 1.5. Aeration demand was evaluated using the same equations as in the previous section; with the aerators on 72 percent of the time, six aerators were required to meet the oxygen demand at the annual average load, and eight aerators at the maximum month load. Currently, the WWTF does not have any aeration redundancy at maximum month load.

Denitrification is the conversion of nitrates (formed in nitrification) to nitrogen gas. When the aeration is turned off, the tank essentially acts as an anoxic reactor, as nitrate is used in lieu of oxygen for BOD_5 removal. Denitrification is typically employed in wastewater treatment facilities that have a total nitrogen limit. However, there are other benefits to denitrification including alkalinity recovery and reduced energy consumption. The nitrates are used for BOD removal rather than oxygen and therefore less aeration is required and less energy is consumed. During denitrification, alkalinity is recovered,

thereby reducing the alkalinity requirements in the influent and reducing the need for a caustic addition system.

The Ellensburg WWTF does not have a total nitrogen limit and is therefore not required to employ denitrification. However, since the aerators are operated in an on/off manner, the process is currently seeing the benefits of denitrification, and alternatives will be considered to maintain capacity for denitrification even at the design maximum month criteria.

RECENT ELECTRICAL CONSUMPTION

During 2017 a power meter was installed on the feeder circuit from the main distribution switchboard to the Chlorine Building MCC (MCC 1) that powers the aerators. The Chlorine Building feeder had a peak demand of 449.3 Amps on October 4, 2017, at 11:25 a.m. Since the existing floating surface aerators are constant speed, this peak demand should represent the power consumption with all eight aerators running simultaneously. However, this value slightly exceeds the nameplate motor capacity of the aerators (50 hp x 8 x 0.746 kW/hp / 90 percent motor efficiency) of 332 kW, as the Chlorine Building feeder powers other loads in addition to the eight aerators, including building heat and ancillary equipment. A peak aerator power consumption of 332 kW is used in this Study.

During 2016 and 2017, the eight floating aerators were operated in a staggered "on/off" mode to save energy. Each aerator is on approximately 72 percent of the time. Therefore the annual average power consumption is 72 percent of the peak consumption, which results in 2,092,000 kWh/year. At the recent electricity price of $0.068/kWh per summer 2018 City billing records, aeration represents an annual electrical cost of $142,000.

EVALUATION OF AERATION BASIN ALTERNATIVES

Presently, the aeration system does not have sufficient capacity for the design maximum month criteria, and does not meet reliability and redundancy standards. With one aerator out of service to meet reliability standards, the total oxygen transfer would be 700 lb O_2/hr using a more conservative design approach that derates the manufacturer's rating, while 1,543 lb O_2/hr are calculated for the design maximum month criteria.

The volume of the aeration basins is sufficient to fully nitrify the wastewater at an MLSS of 3,500 mg/L, which is considered the maximum for secondary clarifier performance. However, the entire volume of the aeration basins must be aerobic 24 hours per day to provide the required aerobic SRT. The aerators cannot be cycled off to provide denitrification and recover alkalinity at the design maximum month criteria.

It is recommended that the aeration capacity of the activated sludge system be increased. This Study will develop four alternatives, including modifications to the existing basins

and construction of new basins, to provide sufficient volume and aeration capacity for the design criteria.

Alternative 1 is the low capital cost option, which allows the City to minimally meet the requirements of the current NPDES effluent permit, without providing capacity for denitrification or other potential future treatment requirements. Alternative 1 is the installation of additional surface aerators in the existing two aeration basins.

Alternatives 2 through 4 include greater capital investment, and are designed to provide denitrification even at the maximum design capacity. These alternatives increase aeration by providing blowers and submerged diffusers, which would provide significant energy savings. Along with diffusers, these alternatives improve performance by converting the complete-mix basins to the plug-flow process by adding new concrete walls and installing other equipment in the existing basins, or in the case of Alternative 4, constructing new straight-wall concrete aeration basins.

ALTERNATIVE 1: EXISTING BASINS WITH SURFACE AERATORS

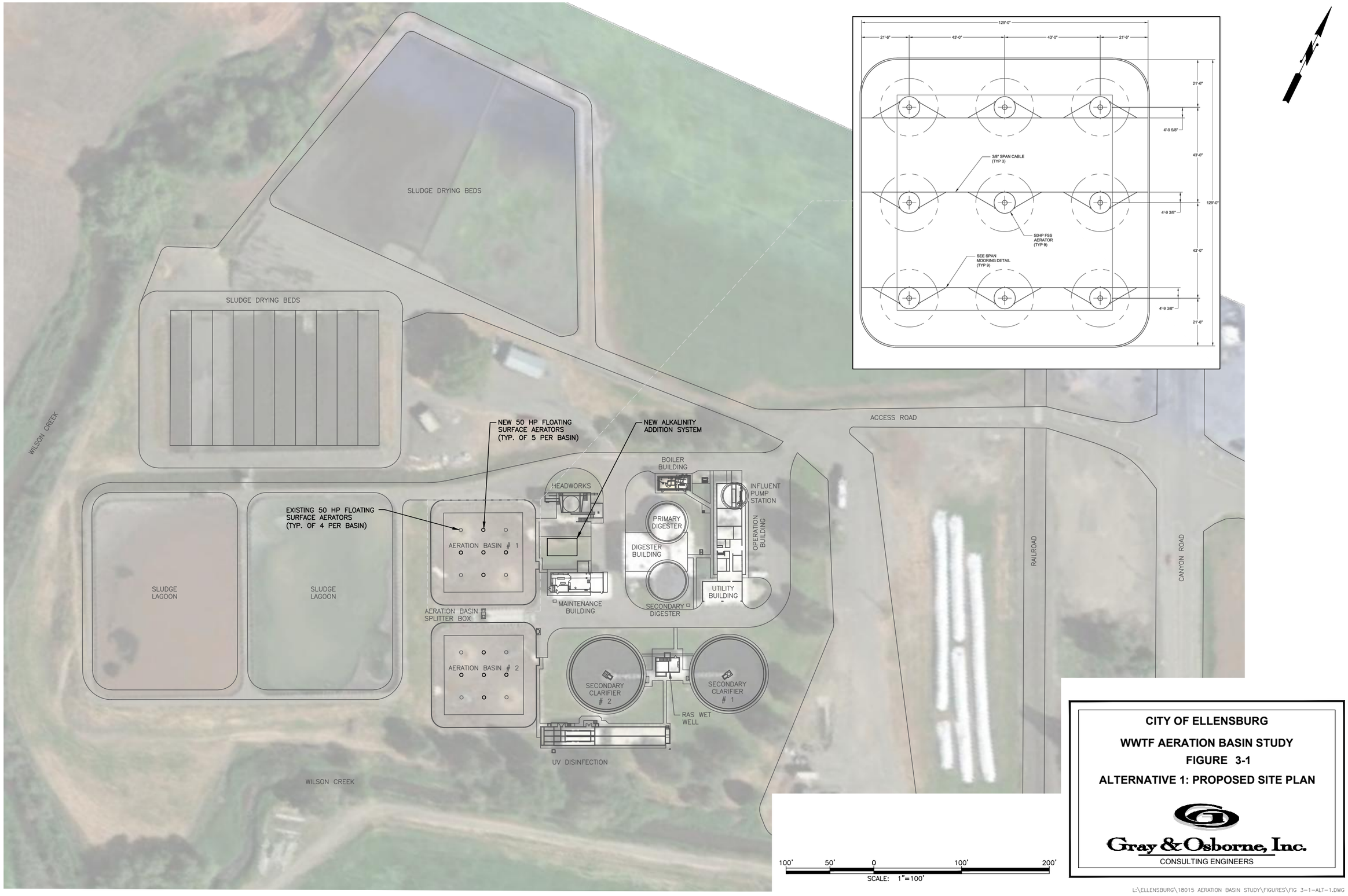
The first alternative is the installation of additional surface aerators to provide sufficient oxygen transfer and to meet reliability and redundancy criteria at the design criteria. This alternative does not provide sufficient volume to denitrify at the design loadings. In Figure 3-1 a proposed site plan is presented for this alternative and in Figure 3-2 a proposed process flow diagram is presented.

Alternative 1 consists of the following components:

- Five additional 50-hp floating surface aerators installed in each aeration basin.
- Caustic soda addition system for maintain alkalinity.

Using the more conservative design rating for aerator oxygen transfer (2.0 lbs O_2/hp/hr), this option would require the purchase and installation of ten new 50-hp aerators (five per basin). This option provides the City with 800 lb/hr of aeration capacity with one aerator out of service per basin, for a total of 1,600 lbs/hr. This option meets the aeration demands and Ecology's requirements for reliability and redundancy.

However, as noted in the previous section, the aeration basins must be fully aerobic 24 hours per day to provide the minimum aerobic SRT of 9.4 days for nitrification. The aerators cannot be cycled off to provide denitrification and recover alkalinity at the design maximum month criteria. The WWTF currently experiences an alkalinity drop in the aeration basin, and effluent pH violations might be a problem at greater loadings in the future. At the design loadings, the WWTF will have a deficiency in alkalinity, and a caustic soda (sodium hydroxide) addition system is recommended to increase the pH, since aeration volume will not be available to recover alkalinity through denitrification.



CITY OF ELLENSBURG

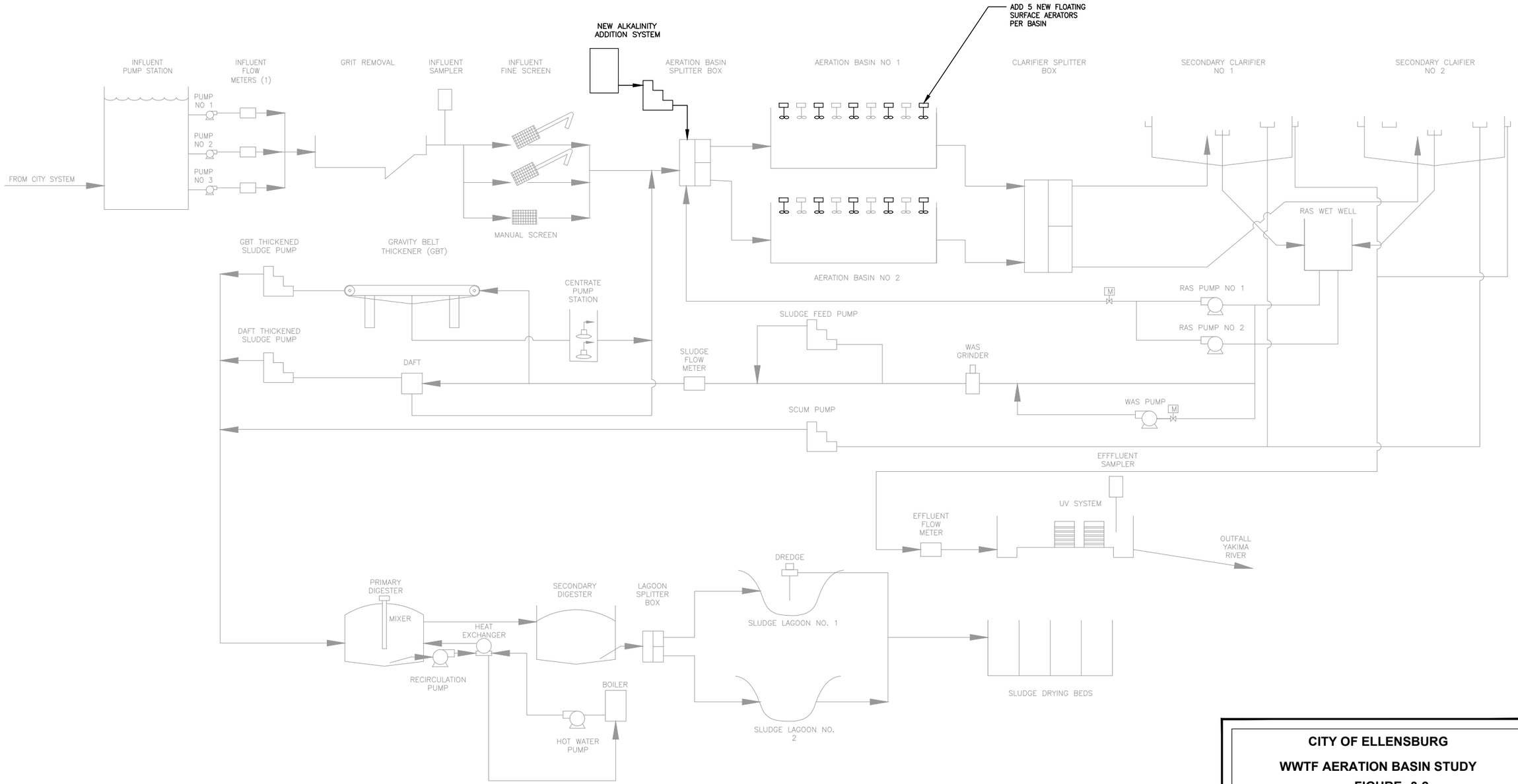
WWTF AERATION BASIN STUDY

FIGURE 3-1

ALTERNATIVE 1: PROPOSED SITE PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\18015 AERATION BASIN STUDY\FIGURES\FIG 3-1-ALT-1.DWG



(1) INFLUENT FLOW METERS INSTALLED IN ELECTRICAL UPGRADE PHASE II PROJECT, 2018

CITY OF ELLENSBURG

WWTF AERATION BASIN STUDY

FIGURE 3-2

ALTERNATIVE 1
PROPOSED PROCESS FLOW DIAGRAM

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\18015 AERATION BASIN STUDY\FIGURES\FIG 3-2.DWG

An advantage of Alternative 1 is that it can be constructed in each basin while the basin remains in service.

As this alternative does not provide sufficient volume to denitrify and recover alkalinity at the design loading rate, an alkalinity addition system is recommended. Two weeks of caustic soda (25-percent solution of sodium hydroxide, NaOH) storage would be provided in outdoor tanks. Secondary containment can be provided by constructing concrete curbs around the tank area. At the design maximum month loading, 770 gal/day of caustic soda would provide sufficient alkalinity to maintain an effluent alkalinity of 100 mg/L. At the projected 2037 annual average loading, alkalinity addition would not be required. The caustic soda would be metered into the aeration basin splitter box using a peristaltic pump.

In Table 3-2, the design criteria for Alternative 1 are provided.

TABLE 3-2

Alternative 1 Existing Basins with Surface Aerators
Aeration Basin Design Data

Parameter	Design Data
Aeration Basin Structure	
Quantity	2
Dimensions	129 feet L x 129 feet W x12 feet SWD (floors are sloped at outer edges)
Volume, each	1.26 MG
Volume, total	2.52 MG
Aerators	
Quantity per Basin	4 existing, 5 new (1 redundant)
Total Quantity	18
Type	Floating Surface Aerator
Motor Type	Vertical, Constant Speed
Motor Size	50 hp
Standard Oxygen Requirement (SOR)	100 lbs O_2/hr each (Firm capacity of 1,600 lbs O_2/hr)
Alkalinity Addition System	
Alkalinity Chemical	25% Caustic Soda
Design Dose Rate	770 gals/day
Quantity of Tanks	2
Tank Capacity, each.	6,000 gal
Sodium Hydroxide Solution Pump	
Quantity	1
Type	peristaltic pump
Design Flow Rate	0.5 gpm

The existing Chlorine Building Motor Control Center (MCC 1) would be replaced as part of any of these alternatives, as replacement is recommended in the *City of Ellensburg WWTP Electrical Distribution and SCADA Study* (Conley Engineering, 2015). The existing motor protection thermal overloads trip in the summer due to heat (steel doors in close proximity to the face of the existing MCC) and the space they are installed in does not have proper ventilation or HVAC. (The Chlorine Building is also known as the Maintenance Building.)

The additional aerators installed in Alternative 1 would add 553 amps of load to the existing measured 452 amps of demand at MCC 1. This would be 1,005 Amps of load on an 800 Amp feeder circuit from the main switchboard. The main service switchboard and the electrical service are incapable of serving the additional loads and a new electrical service would need to be installed. This would be Service Option 3 from the *Electrical Study*.

It should also be noted that the generator being installed at the Influent Pump Station was sized with the capability to run only four of eight aerators. This would mean that the generator could run around one quarter of the aeration loads in this alternative. Ecology guidelines are for critical aeration equipment to be provided with standby power, and therefore additional backup generator power would be installed near the Maintenance Building.

The electrical cost estimate for Alternative 1 includes a new electrical service to the Maintenance Building, a new adequately-sized MCC in the Maintenance Building and a new standby generator.

In Table 3-3, a preliminary project cost estimate for Alternative 1 is provided in 2018 dollars.

TABLE 3-3

Alternative 1 Existing Basins with Surface Aerators
Preliminary Project Cost Estimate (2018 Dollars)

No.	Item	Quantity	Unit Price	Amount
1	Mobilization/Demobilization	1 LS	$130,000	$130,000
2	Sitework	1 LS	$25,000	$25,000
3	Floating Surface Aerators	10 EA	$44,000	$440,000
4	Alkalinity Addition System	1 LS	$150,000	$150,000
5	Electrical and Instrumentation (Incl. New Electrical Service and MCC)	1 LS	$1,418,000	$1,418,000

Subtotal $2,163,000
Construction Contingency (20%) $433,000
Subtotal $2,596,000
Washington State Sales Tax (8%).....$208,000
Total Estimated Construction Cost.....$2,804,000
Engineering, Administrative and Legal Services (25%).....$701,000
TOTAL ESTIMATED PROJECT COST $3,510,000

Annual operation and maintenance (O&M) costs have been estimated for Alternative 1, both at current annual average loading and the design annual average loading (for 2037). Both estimates are presented in Table 3-4 in 2018 dollars. Labor costs are not included in O&M cost estimates as the total WWTF labor requirement does not differ significantly between any of the considered alternatives.

The electricity price of $0.068/kWh is based on a review of summer 2018 City electrical billing records for the wastewater treatment plant. Annual maintenance and repair costs are estimated at 1.5 percent of the installed equipment cost. The City has experienced an 8- to 10-year service life with the floating surface aerators used in Alternative 1. With a total of 18 aerators installed, the annual O&M cost estimate includes an allowance to replace two aerators annually, resulting in a 9-year replacement cycle.

Alkalinity addition is not required under annual average conditions, current or project for 2037. However, the maximum month design loadings for 2037 require substantial alkalinity addition. The annual budget for alkalinity addition in 2037 has been estimated at three months of the maximum month dose.

TABLE 3-4

Alternative 1 Existing Basins with Surface Aerators
Annual O&M Cost Estimates (2018 Dollars)

Item	Unit Price	Unit	Quantity	Unit	Cost
Initial Year					
Electrical Power	$0.068	kWh	2,091,187	kWh	$142,000
Maintenance and Repair	1.5%	Equip. Cost	$792,000	$	$12,000
Aerator Replacement Fund	$44,000	Equip. Cost	2	units	$88,000
Alkalinity Chemical (25 percent NaOH solution)	$1.27	gal	0	gal	$0
Total					**$242,000**
Design Year (2037)					
Electrical Power	$0.068	kWh	3,006,082	kWh	$204,000
Maintenance and Repair	1.5%	Equip. Cost	$792,000	$	$12,000
Aerator Replacement Fund	$44,000	Equip. Cost	2	units	$88,000
Alkalinity Chemical (25 percent NaOH solution)	$1.27	gal	69,300	gal	$88,000
Total					**$392,000**

ALTERNATIVE 2: EXISTING BASINS WITH INVENT MIXERS

In Alternative 2, interior walls would be constructed inside the two existing aeration basins, and each cell would be mixed and aerated by hyperbolic mixers with aeration sparge rings as manufactured by Invent. In Figure 3-3 a proposed site plan is presented for this alternative, and in Figure 3-4 a proposed process flow diagram is presented.

Alternative 2 consists of the following components (initial phase):

- Two interior concrete walls in each aeration basins, converting them from complete-mix to plug-flow, dividing each basin into quadrants (four cells).
- The four cells will be operated in series, with the first cell anoxic to provide denitrification (nitrate removal) when all four cells are not needed for oxidation.
- Two Invent mixers, each with an aeration spare ring, in each first and second cell (eight total).
- One Invent mixer, with aeration spare ring, in the third and fourth cells in each basin (four total).
- Access bridges across the center of each cell for the mixers.
- An internal recycle pump in the fourth cell in each basin (two pumps total).

CITY OF ELLENSBURG

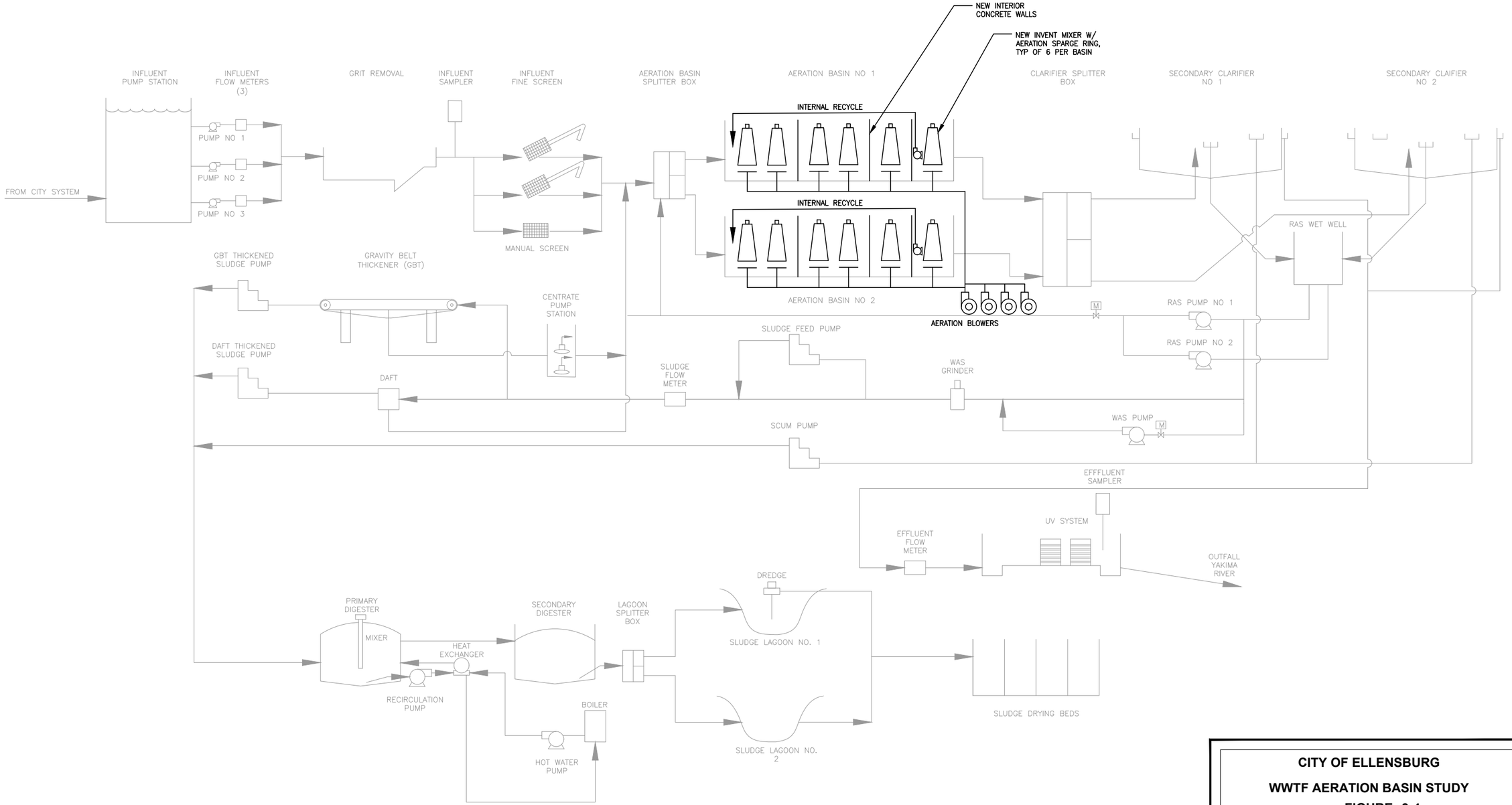
WWTF AERATION BASIN STUDY

FIGURE 3-3

ALTERNATIVE 2: PROPOSED SITE PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\18015 AERATION BASIN STUDY\FIGURES\FIG 3-3-ALT-2.DWG



(1) INFLUENT FLOW METER INSTALLED IN ELECTRICAL UPGRADE PHASE II PROJECT, 2018

CITY OF ELLENSBURG

WWTF AERATION BASIN STUDY

FIGURE 3-4

ALTERNATIVE 2
PROPOSED PROCESS FLOW DIAGRAM

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\18015 AERATION BASIN STUDY\FIGURES\FIG 3-4.DWG

- Four aeration blowers, a new electrical service and a new Motor Control Center installed in the existing Maintenance Building.

Hyperbolic mixers are an effective method to provide complete mixing and/or air to activated sludge process tanks. The equipment consists of a vertical shaft mounted to the floor below and to a walkway bridge above, rotating a hyperbolic mixing body with a series of fins, to provide mixing. A static sparge ring with diffusers is mounted below the mixing body, which aerates the liquid being forced away from the mixer. This type of mixing and aeration will be effective for the entire tank cell contents, including the perimeter side-slopes. Air to the sparge rings would be provided by aeration blowers housed in a new Blower Building.

The first cell in series can be made anoxic by turning off the air supply and continuing to run the mixer. A submersible axial flow pump will recycle nitrified activated sludge from the fourth (final) cell to the first (anoxic) cell to promote denitrification.

In Table 3-5, the process operational data for Alternative 2 are provided. At the annual average wastewater temperature of 15 degrees C, an aerobic SRT of 5.8 days is sufficient for nitrification, and denitrification can be provided with anoxic conditions in the first cell with an MLSS concentration of 1,220 mg/L or greater.

For maximum month loading conditions, the design minimum temperature of 10 degrees C and the aerobic SRT of 9.4 days were used in the evaluation. At influent BOD_5 loading greater than 6,667 lbs/day, all of the existing aeration basin volume must be used to fully aerate and nitrify the wastewater, so the first cell must become an aerobic cell. The influent design criteria of 10,000 lbs/day BOD_5 can be met in this fully aerobic mode.

To provide nitrogen removal at the design criteria of 10,000 lbs/day BOD_5, which will reduce aeration demand and recover alkalinity, a third aeration basin of equivalent design would be constructed in the future, when the influent BOD_5 loading routinely exceeds 6,667 lbs/day. Aeration Basin 3 would be located north of Basin 1.

TABLE 3-5

Alternative 2 Existing Basins with Invent Mixers
Activated Sludge Evaluation Operational Data

Criteria	Design Temperature (°C)	Aerobic SRT (day)	Total SRT (day)	MLSS(1) (mg/L)	AOR(2) (lb O_2/hr)	Air Rqmt. (scfm)
2016-17 Annual Average	15	5.8	7.7	1,220	213	2,780
Design Maximum Month w/Two Basins	10	9.4	9.4	3,510	661	8,120
Design Maximum Month w/Three Basins	10	9.4	12.5	3,120	624	7,855

(1) MLSS calculated as: [WAS mass flow (lb/d)] * SRT (d)/[Tank volume (mil. gal.) * 8.34].
(2) AOR = Actual oxygen requirement, including a 33 percent diurnal peaking factor.

To construct Alternative 2, one aeration basin must be removed from service at a time for construction of interior walls and installation of the mixers and pumps. Operation with one basin during current summer conditions was evaluated, and the results are in Table 3-6. The aerators must be run continuously. With a fully-aerobic MLSS of 1,450 mg/L, similar to the current average mixed liquor concentration, the SRT of 4.5 days is sufficient to nitrify with the typical summer temperature of 18 degrees C. One additional 50-hp floating surface aerator must be temporarily installed in the basin, for a total of five aerators running continuously to meet the oxygen demand in one basin.

One additional aerator will be sufficient for one-basin operations through the projected 2019 annual average flow rate. Once the influent BOD_5 loading exceeds approximately 4,220 lbs/day, projected for 2020, a total of six floating aerators is required (two aerators relocated from the out-of-service basin) to provide BOD removal and nitrification.

TABLE 3-6

Temporary Operation with One Existing Basin
Activated Sludge Evaluation Operational Data

Criteria	Design Temperature (°C)	Aerobic SRT (day)	Total SRT (day)	MLSS[(1)] (mg/L)	SOR[(2)] (lb O_2/hr)	Qty. of 50-hp Aerators
2016-17 Annual Average	18	4.5	4.5	1,450	468	5
Projected 2019 Annual Average	18	4.5	4.5	1,570	496	5
Projected 2020 Annual Average	18	4.5	4.5	1,630	510	6

In Table 3-7, the design criteria for Alternative 2 are provided. To provide sufficient oxygen transfer, two mixers with sparge rings are needed in the first aerobic cell. In typical operation, the first cell in series will be anoxic, so the second cell in series will be the first aerobic cell and have the highest aeration demand. However, with the current maximum design criteria of 10,000 lbs/day BOD_5 with two basins in service, all four cells must be aerobic and in that case the first cell will have highest aeration demand and require two mixers to be installed. When a third aeration basin is constructed, the maximum design criteria design criteria can be met with the first cell anoxic, so only one mixer for mixing only is required in the first cell. Some mixers can be relocated from the existing basins to the new basin at that time.

TABLE 3-7

Alternative 2 Existing Basins with Invent Mixers
Aeration Basin Design Data

Parameter	Design Data – Initial Phase	Design Data – Future Phase
Aeration Basin Structure		
Quantity	2	3
Dimensions	129 feet L x 129 feet W x12 feet SWD (floors are sloped at outer edges)	129 feet L x 129 feet W x12 feet SWD (new basin without sloped floor)
Volume, each	1.26 MG	1.26 MG
Volume, total	2.52 MG	3.77 MG
Quantity of Cell in Series	4	4
Mixer/Aerators		
Quantity per Basin		
Cell 1	2	1 (mixing only)
Cell 2	2	2
Cell 3	1	1
Cell 4	1	1
Total Quantity	12	15
Type	Hyperbolic Mixer w/Aeration Sparge Ring	
Mixer Motor Type	Vertical, Constant Speed	
Mixer Motor Size	50 hp	
Standard Oxygen Requirement (SOR), lbs/hour		
Cell 1	235	0
Cell 2	170	175
Cell 3	140	125
Cell 4	120	115
Oxygen Transfer Efficiency (OTE)	16.4 percent in cells with two mixers; 13.4 percent in cells with one mixer	
Internal Recycle Pump		
Quantity per Basin	1	1
Total Quantity	2	3
Type	Submersible Axial Flow	
Motor Type	Submersible, VFD	
Motor Size	12 hp	
Capacity	6,350 gpm at 2.5 ft TDH	
Aeration Blowers		
Quantity of Blowers	4 (3 duty, 1 standby)	
Capacity	2,615 scfm at 6.5 psig	

A number of different blower technologies were evaluated as part of this Study. The technologies are compared based on efficiency over the range of anticipated airflows from recent nighttime demands to design maximum month demands, as well as their respective installation and maintenance requirements including footprint and reliability.

The following five different blower technologies were evaluated:

1. Rotary positive displacement (PD) blowers. These are most common at smaller wastewater treatment facilities, but have excellent turndown capabilities.

2. Rotary lobe/screw compressor hybrid blowers. This type of blower is designed as a hybrid between the PD blower and a screw compressor, and operates at a speed of around 10,000 rpm. It offers higher efficiencies than PD blowers at a somewhat higher capital cost.

3. Turbo high speed single-stage centrifugal blowers. Theses blowers use a permanent magnet motor and air journal bearings to operate the blower shaft at up to 50,000 rpm to provide high energy efficiency. However, each hard start/stop cycle provides wear on the air journal bearings, and the systems include sensitive electronics that can be expensive to repair and replace.

4. Belt-driven high speed single-stage centrifugal blowers. Recently introduced to the wastewater market by Inovair, this type of blower promises high efficiencies at moderate cost. The system used standard three-phase motors and a drive belt to increase the blower shaft speed up to 50,000 rpm to provide high energy efficiency.

5. Multi-stage centrifugal blowers. These are the most traditional aeration blowers used at large wastewater treatment facilities. They are reliable, but the airflow can only be adjusted by throttling intake valves.

Three blowers will be provided to meet the air demand for the maximum month design criteria, and a fourth blower will be provided as a standby unit. The air supply provided in the initial phase will be sufficient for the design maximum month design criteria of 10,000 lbs/day BOD_5, although in the initial phase all four cells in each basin will need to be aerobic to distribute the air. The existing Maintenance Building would be retrofitted to accommodate the four new aeration blowers.

Table 3-8 compares the design criteria and electricity consumption for each type of blower. Based on this analysis, the electrical systems should be sized for four 150-hp blowers. A decision on blower type can be made during the design process.

The blowers would be controlled based on the dissolved oxygen concentration in the aeration basin, with blower motor speed increasing to meet higher oxygen demand and slowing down for lower demand. Ideally, the basin would be maintained at about 2.0 mg/L at all times for maximum energy savings while meeting the oxygen demand of the biological treatment process.

TABLE 3-8

Alternative 2 Existing Basins with Invent Mixers
Design Data for Blower Alternatives

Parameter	PD Blowers	PD/Screw Hybrid Blowers	Turbo Single-Stage Centrifugal Blowers		Multi-Stage Centrifugal Blowers
			PM Motor	Belt-Driven	
Blower Design Capacity	3 @ 2,710 scfm at 6.5 psig (plus redundant unit)				
Minimum Air Demand (scfm)	1170 scfm				
Minimum Blower Output (scfm)	356	785	1,449	640	1,075
Blower Motor Size	150	125	150	150 hp (stacked 75 hp units)	125
Total Electricity Consumption at Design Capacity (kW)	296	276	270	288	274
Total Electricity Consumption at Recent Annual Average (kW)	98	86	92	93	91
Equipment Cost for Four Blowers	$380,000	$448,000	$420,000	$400,000	$470,000
Annual Electrical Cost at Recent Annual Average(1)	$48,000	$42,300	$45,100	$45,500	$44,700
Annual Maintenance Cost(1)	$5,700	$6,700	$6,300	$6,000	$7,000

(1) Cost in 2018 dollars. Average electrical cost = $0.068/kWh. Annual equipment maintenance cost is estimated as 1.5 percent of the equipment cost.

Alternative 2 would have the same electrical distribution requirements as Alternative 1, as the total power consumption exceeds the capacity of the current Chlorine Building service and MCC. The electrical cost estimate for Alternative 2 includes a new electrical service to the Maintenance Building, a new adequately-sized MCC in the Maintenance Building and a new standby generator. The total load increase is larger than for

Alternative 1, and there is more equipment being added which requires starter buckets and power, instrumentation, and control circuits.

In Table 3-9, a preliminary project cost estimate for the initial phase of Alternative 2 is provided in 2018 dollars. In Table 3-10, a preliminary project cost estimate for the future phase of Alternative 2, constructing a third aeration basins, is provided in 2018 dollars.

TABLE 3-9

Alternative 2 Existing Basins with Invent Mixers (Initial Phase)
Preliminary Project Cost Estimate (2018 Dollars)

No.	Item	Quantity	Unit Price	Amount
1	Mobilization/Demobilization	1 LS	$370,000	$370,000
2	Sitework	1 LS	$50,000	$50,000
3	Aeration Basin Interior Walls and Access Bridges	2 EA	$900,000	$1,800,000
4	Invent Mixers with Sparge Rings	12 EA	$91,000	$1,092,000
5	Internal Recycle Pumps	2 EA	$56,000	$112,000
6	Aeration Blowers	4 EA	$154,000	$616,000
7	Modify Maintenance Building	1 LS	$20,000	$20,000
8	Painting	1 LS	$40,000	$40,000
9	Mechanical/Yard Piping/Vaults/Etc.	1 LS	$490,000	$490,000
10	Electrical and Instrumentation (Incl. New Electrical Service and MCC)	1 LS	$1,590,000	$1,590,000

Subtotal $6,180,000
Construction Contingency (20%) $1,236,000
Subtotal $7,416,000
Washington State Sales Tax (8%).....$593,000
Total Estimated Construction Cost.....$8,009,000
Engineering, Administrative & Legal Services (25%) $2,002,000
TOTAL ESTIMATED PROJECT COST.....$10,010,000

TABLE 3-10

Alternative 2 Existing Basins with Invent Mixers (Final Phase)
Preliminary Project Cost Estimate (2018 Dollars)

No.	Item	Quantity	Unit Price	Amount
1	Mobilization/Demobilization	1 LS	$185,000	$185,000
2	Sitework	1 LS	$100,000	$100,000
3	Aeration Basin Splitter Box Modifications	1 LS	$30,000	$30,000
4	New Aeration Basin with Interior Walls and Access Bridges	1 EA	$2,000,000	$2,000,000
5	Invent Mixers with Sparge Rings	3 EA	$91,000	$273,000
6	Internal Recycle Pumps	1 EA	$56,000	$56,000
7	Painting	1 LS	$10,000	$10,000
8	Mechanical/Yard Piping/Vaults/Etc.	1 LS	$265,000	$265,000
9	Electrical and Instrumentation	1 LS	$135,000	$135,000

Subtotal $3,054,000
Construction Contingency (20%) $611,000
Subtotal $3,665,000
Washington State Sales Tax (8%).....$293,000
Total Estimated Construction Cost.....$3,958,000
Engineering, Administrative & Legal Services (25%) $990,000
TOTAL ESTIMATED PROJECT COST $4,950,000

Annual operation and maintenance (O&M) costs have been estimated for Alternative 2 at current annual average loading and the design annual average loading (for 2037). Both estimates are presented in Table 3-11 in 2018 dollars. The 2037 O&M cost estimate includes the third aeration basin constructed in the final phase.

TABLE 3-11

Alternative 2 Existing Basins with Invent Mixers
Annual O&M Cost Estimates (2018 Dollars)

Item	Unit Price	Unit	Quantity	Unit	Cost
Initial Year					
Electrical Power	$0.068	kWh	3,511,393	kWh	$239,000
Maintenance and Repair	1.5%	Equip. Cost	$1,820,000	$	$27,000
Total					**$266,000**
Design Year (2037)					
Electrical Power	$0.068	kWh	5,363,450	kWh	$365,000
Maintenance and Repair	1.5%	Equip. Cost	$2,149,000	$	$32,000
Total					**$397,000**

ALTERNATIVE 3: EXISTING BASIN WITH DIFFUSERS

In Alternative 3, interior walls would be constructed inside the two existing aeration basins, and each cell would be mixed and aerated by a grid of fine-bubble diffuser disks. In addition, a big-bubble anoxic mixing system would be provided in the first cell for anoxic operation and in the sloped floor areas of each cell. In Figure 3-5 a proposed site plan is presented for this alternative and in Figure 3-6 a proposed process flow diagram is presented.

Alternative 3 consists of the following components (initial phase):

- Two interior HDPE baffle walls in each of the aeration basins, converting them from complete-mix to plug-flow, dividing each basin into quadrants (four cells).
- Fine-bubble diffusers installed on the flat floor area of each quadrant.
- Big-bubble anoxic mixing system installed in the first cell of each basin for anoxic operation and in the sloped floor areas of each cell.
- The four cells will be operated in series, with the first cell anoxic to provide denitrification (nitrate removal) when not required for oxidation.
- The first cell will be anoxic mixed by the big-bubble mixing system when anoxic, and aerated/mixed by fine bubble diffusers when needed for oxidation.
- An internal recycle pump in the fourth cell in each basin (two pumps total).
- Catwalks only as required to access instrumentation and the internal recycle pump.
- Four aeration blowers, air compressors for the big-bubble mixing system, a new electrical service and a new Motor Control Center installed in the existing Maintenance Building.

Alternative 3 is similar to Alternative 2, except for the form of aeration and mixing in the aeration basin cells.

Fine bubble diffusion is a subsurface form of aeration in which air is introduced in the form of very small bubbles. These systems have high oxygen transfer efficiency. Smaller bubbles result in more bubble surface area per unit volume, and therefore, greater oxygen transfer efficiency. The diffusion system consists of a grid of air piping and membrane diffusers placed on the basin floor to deliver the air in the form of fine bubbles. Low pressure air is delivered to the diffusers using blowers and air distribution piping. The disadvantage of the fine-bubble aeration in the existing basins is the lack of aeration and mixing in the 16-foot wide sloped floor area around two side of each cell. This may result in anoxic pockets that are not efficiently aerated, and settling could occur due to lack of mixing.

Therefore, we recommend adding a big-bubble mixing system in the side slope areas. This consists of several bubble-forming plates connected to a high-pressure air compressor (100 psi). A valve supplies air to the plate in two bumps per minute. Each bump produces a large bubble that rapidly rises to the surface, displacing mixed liquor and settling up a roll pattern in the tank. Because the bubbles are so large and rise so fast, there is negligible oxygen transfer. The mixed liquor in the sloped floor area will be pushed into the flat-floor area where it will be aerated by the fine-bubble diffusers.

The first cell in series can be made anoxic by turning off the fine-bubble diffusers and turning on a separate big-bubble mixer system on the flat floor of the first cell. A submersible axial flow pump will recycle nitrified activated sludge from the fourth (final) cell to the first (anoxic) cell to promote denitrification.

In Table 3-12, the process operational data for Alternative 3 are provided, which are the same as for Alternative 2, except the annual average airflow requirement is less due to the higher oxygen transfer efficiency of fine-bubble diffusers compared to mixer sparge rings. At the annual average wastewater temperature of 15 degrees C, an aerobic SRT of 5.8 days is sufficient for nitrification, and denitrification can be provided with anoxic conditions in the first cell with an MLSS concentration of 1,220 mg/L or greater.

For maximum month loading conditions, the design minimum temperature of 10 degrees C and the aerobic SRT of 9.4 days were used in the evaluation. At influent BOD_5 loading greater than 6,667 lbs/day, all of the existing aeration basin volume must be used to fully aerate and nitrify the wastewater, so the first cell must become an aerobic cell. The influent design criteria of 10,000 lbs/day BOD_5 can be met in this fully aerobic mode.

To provide nitrogen removal at the design criteria of 10,000 lbs/day BOD_5, which will reduce aeration demand and recover alkalinity, a third aeration basin of equivalent design would be constructed in the future, when the influent BOD_5 loading routinely exceeds 6,667 lbs/day. Aeration Basin 3 would be located north of Basin 1.

To construct Alternative 3, one aeration basin must be removed from service at a time for construction of interior walls and installation of the mixers and pumps. Temporary operation with one aeration basin would be required, same as described for Alternative 2.

SLUDGE DRYING BEDS

SLUDGE DRYING BEDS

WILSON CREEK

FUTURE AERATION BASIN # 3

BIG BUBBLE MIXERS, TYP

45'

AERATION BASIN # 1

HEADWORKS

BOILER BUILDING

INFLUENT PUMP STATION

PRIMARY DIGESTER

DIGESTER BUILDING

OPERATION BUILDING

FINE BUBBLE AERATION DIFFUSER GRID, TYP. OF 4 PER BASIN

INTERIOR CONCRETE BAFFLE WALLS, TYP.

CATWALKS, TYP.

SLUDGE LAGOON

SLUDGE LAGOON

MAINTENANCE BUILDING

UTILITY BUILDING

SECONDARY DIGESTER

AERATION BASIN SPLITTER BOX

(INSTALL NEW AERATION BLOWERS, COMPRESSORS AND MCCS)

SECONDARY CLARIFIER # 2

SECONDARY CLARIFIER # 1

RAS WET WELL

AERATION BASIN # 2

UV DISINFECTION

WILSON CREEK

ACCESS ROAD

RAILROAD

CANYON ROAD

100' 50' 0 100' 200'

SCALE: 1"=100'

CITY OF ELLENSBURG

WWTF AERATION BASIN STUDY

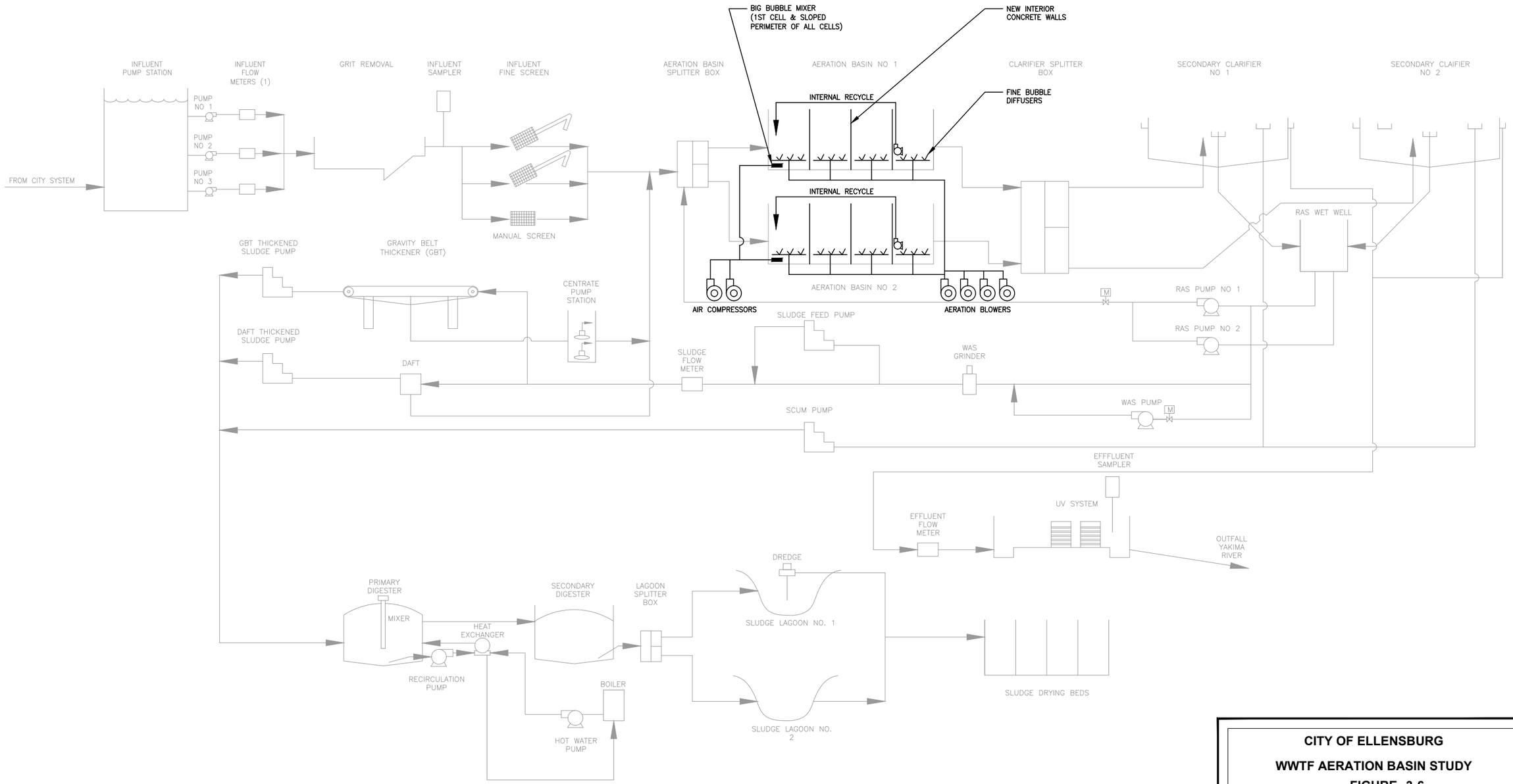
FIGURE 3-5

ALTERNATIVE 3: PROPOSED SITE PLAN

Gray & Osborne, Inc.

CONSULTING ENGINEERS

L:\ELLENSBURG\18015 AERATION BASIN STUDY\FIGURES\FIG 3-5-ALT-3.DWG



(1) INFLUENT FLOW METERS INSTALLED IN ELECTRICAL UPGRADE PHASE II PROJECT, 2018

CITY OF ELLENSBURG

WWTF AERATION BASIN STUDY

FIGURE 3-6

ALTERNATIVE 3
PROPOSED PROCESS FLOW DIAGRAM

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\18015 AERATION BASIN STUDY\FIGURES\FIG 3-6.DWG

TABLE 3-12

Alternative 3 Existing Basin with Diffusers
Activated Sludge Evaluation Operational Data

Criteria	Design Temperature (°C)	Aerobic SRT (day)	Total SRT (day)	MLSS(1) (mg/L)	AOR(2) (lb O_2/hr)	Air Rqmt. (scfm)
2016-17 Annual Average	15	5.8	7.7	1,220	213	2,555
Design Maximum Month w/Two Basins	10	9.4	9.4	3,510	661	8,080
Design Maximum Month w/Three Basins	10	9.4	12.5	3,120	624	6,970

(1) MLSS calculated as: [WAS mass flow (lb/d)] * SRT (d)/[Tank volume (mil. gal.) * 8.34].
(2) AOR = Actual oxygen requirement, including a 33 percent diurnal peaking factor.

In Table 3-13, the design criteria for Alternative 3 are provided.

TABLE 3-13

Alternative 3 Existing Basins with Diffusers
Aeration Basin Design Data

Parameter	Design Data – Initial Phase	Design Data – Future Phase
Aeration Basin Structure		
Quantity	2	3
Dimensions	129 feet L x 129 feet W x12 feet SWD (floors are sloped at outer edges)	129 feet L x 129 feet W x12 feet SWD (new basin without sloped floor)
Volume, each	1.26 MG	1.26 MG
Volume, total	2.52 MG	3.77 MG
Quantity of Cell in Series	4	4
Fine-Bubble Diffusers		
Type	9” Dia. Disks	9” Dia. Disks
Standard Oxygen Requirement (SOR), lbs/hour		
Cell 1	339	0
Cell 2	222	225
Cell 3	164	145
Cell 4	118	115
Oxygen Transfer Efficiency (OTE)	19%	19%

TABLE 3-13 – (continued)

Alternative 3 Existing Basins with Diffusers
Aeration Basin Design Data

Parameter	Design Data – Initial Phase	Design Data – Future Phase
Max. Airflow/Disk at Max. Design Max. Month Load	3.0 (Cell 1)	2.0
Quantity of Disks/Cell		
Cell 1	539	539
Cell 2	539	539
Cell 3	347	347
Cell 4	275	275
Big-Bubble Mixer System		
Quantity of Compressors	2	
Compressor Size, each	20 hp	
Internal Recycle Pump		
Quantity per Basin	1	1
Total Quantity	2	3
Type	Submersible Axial Flow	
Motor Type	Submersible, VFD	
Motor Size	12 hp	
Capacity	6,350 gpm at 2.5 ft TDH	
Aeration Blowers		
Quantity of Blowers	4 (3 duty, 1 standby)	
Capacity	2,615 scfm at 6.5 psig	

A number of different blower technologies were evaluated as part of this Study, as described previously under Alternative 2.

Three blowers will be provided to meet the air demand for the maximum month design criteria, and a fourth blower will be provided as a standby unit. The air supply provided in the initial phase will be sufficient for the design maximum month design criteria of 10,000 lbs/day BOD_5, although in the initial phase all four cells in each basin will need to be aerobic to distribute the air. The existing Maintenance Building would be retrofitted to accommodate the four new aeration blowers and the air compressors for the big bubble mixing system.

Table 3-14 compares the design criteria and electricity consumption for each type of blower. Based on this analysis, the electrical systems should be sized for four 150-hp blowers. A decision on blower type can be made during the design process.

TABLE 3-14

Alternative 3 Existing Basins with Diffusers
Design Data for Blower Alternatives

Parameter	PD Blowers	PD/Screw Hybrid Blowers	Turbo Single-Stage Centrifugal Blowers		Multi-Stage Centrifugal Blowers
			PM Motor	Belt-Driven	
Blower Design Capacity	3 @ 2,695 scfm at 6.5 psig (plus redundant unit)				
Minimum Air Demand (scfm)	1,745 scfm				
Minimum Blower Output (scfm)	356	785	1,449	640	1,075
Blower Motor Size	150	125	150	150 hp (stacked 75 hp units)	125
Total Electricity Consumption at Design Capacity (kW)	293	276	267	288	274
Total Electricity Consumption at Recent Annual Average (kW)	92	86	85	86	85
Equipment Cost for Four Blowers	$380,000	$448,000	$420,000	$400,000	$470,000
Annual Electrical Cost at Recent Annual Average(1)	$45,100	$42,300	$41,700	$42,300	$41,500
Annual Maintenance Cost(1)	$5,700	$6,700	$6,300	$6,000	$7,100

(1) Cost in 2018 dollars. Average electrical cost = $0.068/kWh. Annual equipment maintenance cost is estimated as 1.5 percent of the equipment cost.

Alternative 3 would have the same electrical distribution requirements as Alternative 1, as the total power consumption exceeds the capacity of the current Chlorine Building service and MCC. The electrical cost estimate for Alternative 3 includes a new electrical service to the Maintenance Building, a new adequately-sized MCC in the Maintenance Building and a new standby generator.

In Table 3-15, a preliminary project cost estimate for the initial phase of Alternative 3 is provided in 2018 dollars. In Table 3-16, a preliminary project cost estimate for the future phase of Alternative 3, constructing a third aeration basin, is provided in 2018 dollars.

TABLE 3-15

Alternative 3 Existing Basins with Diffusers (Initial Phase)
Preliminary Project Cost Estimate (2018 Dollars)

No.	Item	Quantity	Unit Price	Amount
1	Mobilization/Demobilization	1 LS	$295,000	$295,000
2	Sitework	1 LS	$50,000	$50,000
3	Aeration Basin Interior Walls with Catwalks	2 EA	$565,000	$1,130,000
4	Fine Bubble Diffusers	2 EA	$82,000	$164,000
5	Internal Recycle Pumps	2 EA	$56,000	$112,000
6	Aeration Blowers	4 EA	$154,000	$616,000
7	Big-Bubble Mixing System	1 EA	$408,000	$408,000
8	Modify Maintenance Building	1 LS	$20,000	$20,000
9	Painting	1 LS	$40,000	$40,000
10	Mechanical/Yard Piping/Vaults/Etc.	1 LS	$490,000	$490,000
11	Electrical and Instrumentation (Incl. New Electrical Service and MCC)	1 LS	$1,573,000	$1,573,000

Subtotal $4,898,000
Construction Contingency (20%) $980,000
Subtotal $5,878,000
Washington State Sales Tax (8%) $470,000
Total Estimated Construction Cost $6,348,000
Engineering, Administrative & Legal Services (25%) $1,587,000
TOTAL ESTIMATED PROJECT COST $7,940,000

TABLE 3-16

Alternative 3 Existing Basins with Diffusers (Final Phase)
Preliminary Project Cost Estimate (2018 Dollars)

No.	Item	Quantity	Unit Price	Amount
1	Mobilization/Demobilization	1 LS	$160,000	$160,000
2	Sitework	1 LS	$100,000	$100,000
3	Aeration Basin Splitter Box Modifications	1 LS	$30,000	$30,000
4	New Aeration Basin with Interior Walls and Access Bridges	1 EA	$1,650,000	$1,650,000
5	Fine Bubble Diffusers	1 EA	$82,000	$82,000
6	Internal Recycle Pumps	1 EA	$56,000	$56,000
7	Big-Bubble Mixing System	1 EA	$204,000	$204,000
8	Painting	1 LS	$10,000	$10,000
9	Mechanical/Yard Piping/Vaults/Etc.	1 LS	$265,000	$265,000
10	Electrical and Instrumentation	1 LS	$80,000	$80,000

Subtotal $2,637,000
Construction Contingency (20%) $527,000
Subtotal $3,164,000
Washington State Sales Tax (8%).....$253,000
Total Estimated Construction Cost.....$3,417,000
Engineering, Administrative & Legal Services (25%) $854,000
Total Estimated Project Cost.....$4,270,000

Annual operation and maintenance (O&M) costs have been estimated for Alternative 3 at current annual average loading and the design annual average loading (for 2037). Both estimates are presented in Table 3-17 in 2018 dollars. The 2037 O&M cost estimate includes the third aeration basin constructed in the final phase.

The membrane disc material on fine-bubble diffusers has an average expected service life of 8 years. The annual O&M cost estimate includes an allowance to save for replacement of all install diffuser disc membranes every 8 years.

TABLE 3-17

Alternative 3 Existing Basins with Diffusers
Annual O&M Cost Estimates (2018 Dollars)

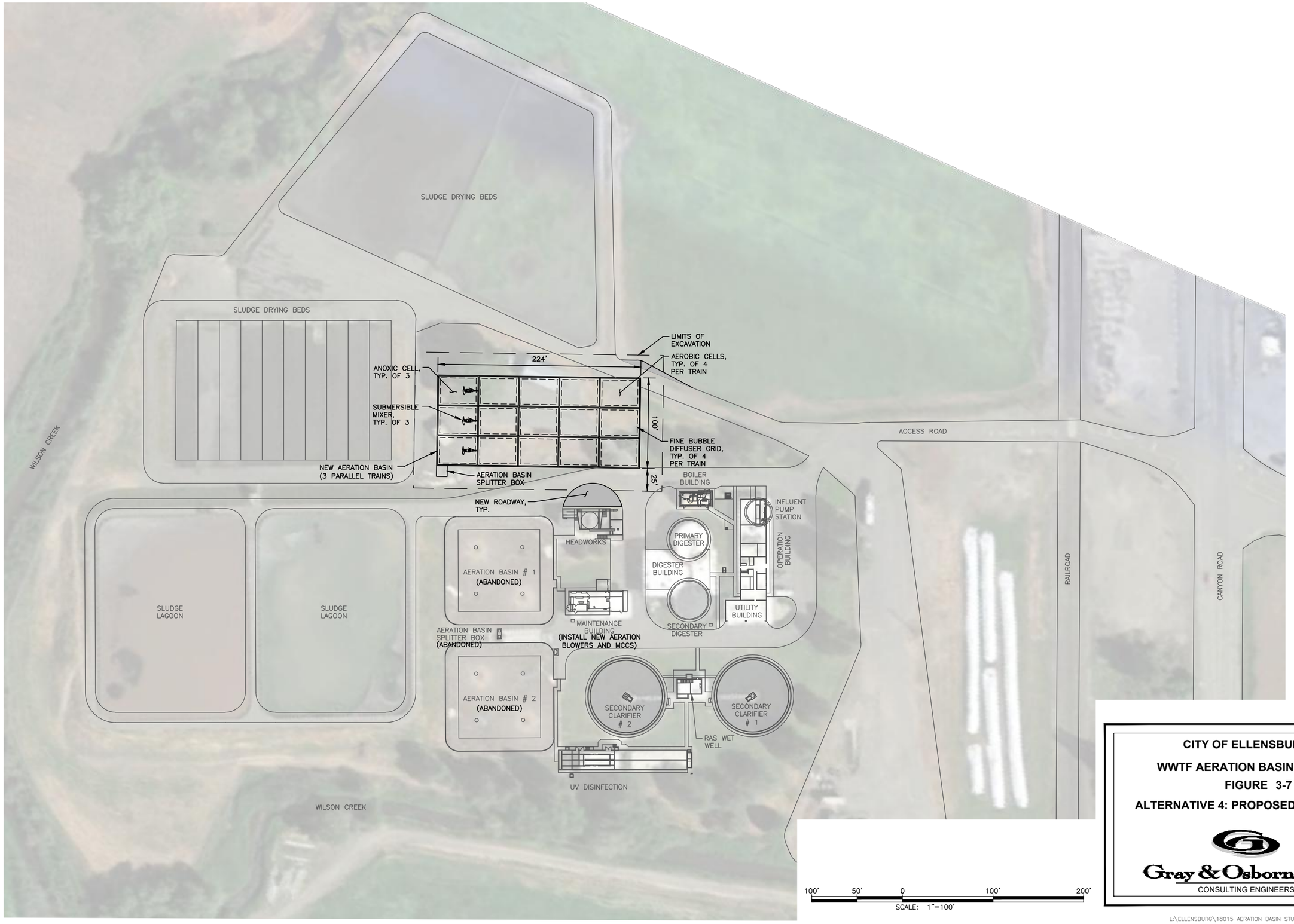
Item	Unit Price	Unit	Quantity	Unit	Cost
Initial Year					
Electrical Power	$0.068	kWh	1,290,290	kWh	$88,000
Maintenance and Repair	1.5%	Equip. Cost	$1,156,000	$	$17,000
Diffuser Membrane Replacement Fund	$6	disc	425	discs/year	$3,000
Total					**$108,000**
Design Year (2037)					
Electrical Power	$0.068	kWh	2,005,514	kWh	$136,000
Maintenance and Repair	1.5%	Equip. Cost	$1,416,000	$	$21,000
Diffuser Membrane Replacement Fund	$6	disc	638	discs/year	$4,000
Total					**$161,000**

ALTERNATIVE 4: NEW AERATION BASIN

In Alternative 4, a new concrete, plug-flow aeration basin structure would be constructed onsite, the existing aeration basins would be abandoned, and the aeration basins cells would be mixed and aerated by a grid of fine-bubble diffuser disks. In Figure 3-7 a proposed site plan is presented for this alternative and in Figure 3-8 a proposed process flow diagram is presented. The new Aeration Basin would be located north of the existing Aeration Basin 1.

Alternative 4 consists of the following components:

- New concrete aeration basin splitter box for the three parallel trains.
- New concrete, plug-flow aeration basin structure with three parallel trains and 20-foot sidewater depth.
- Each train would consist of five cells in series (equally sized at 20 percent of total volume), the first cell anoxic followed by four aerobic cells.
- Submersible mixer installed in the anoxic cell in each train to provide mixing (three mixers total).
- Fine-bubble diffusers installed on the floor area of each aerobic cell.
- Catwalks along the top of the interior walls between trains, and around the perimeter, for access to the mixer, diffusers and instrumentation.
- An internal recycle pump in the final aerobic cell in each train (three pumps total).



100' 50' 0 100' 200'

SCALE: 1"=100'

CITY OF ELLENSBURG

WWTF AERATION BASIN STUDY

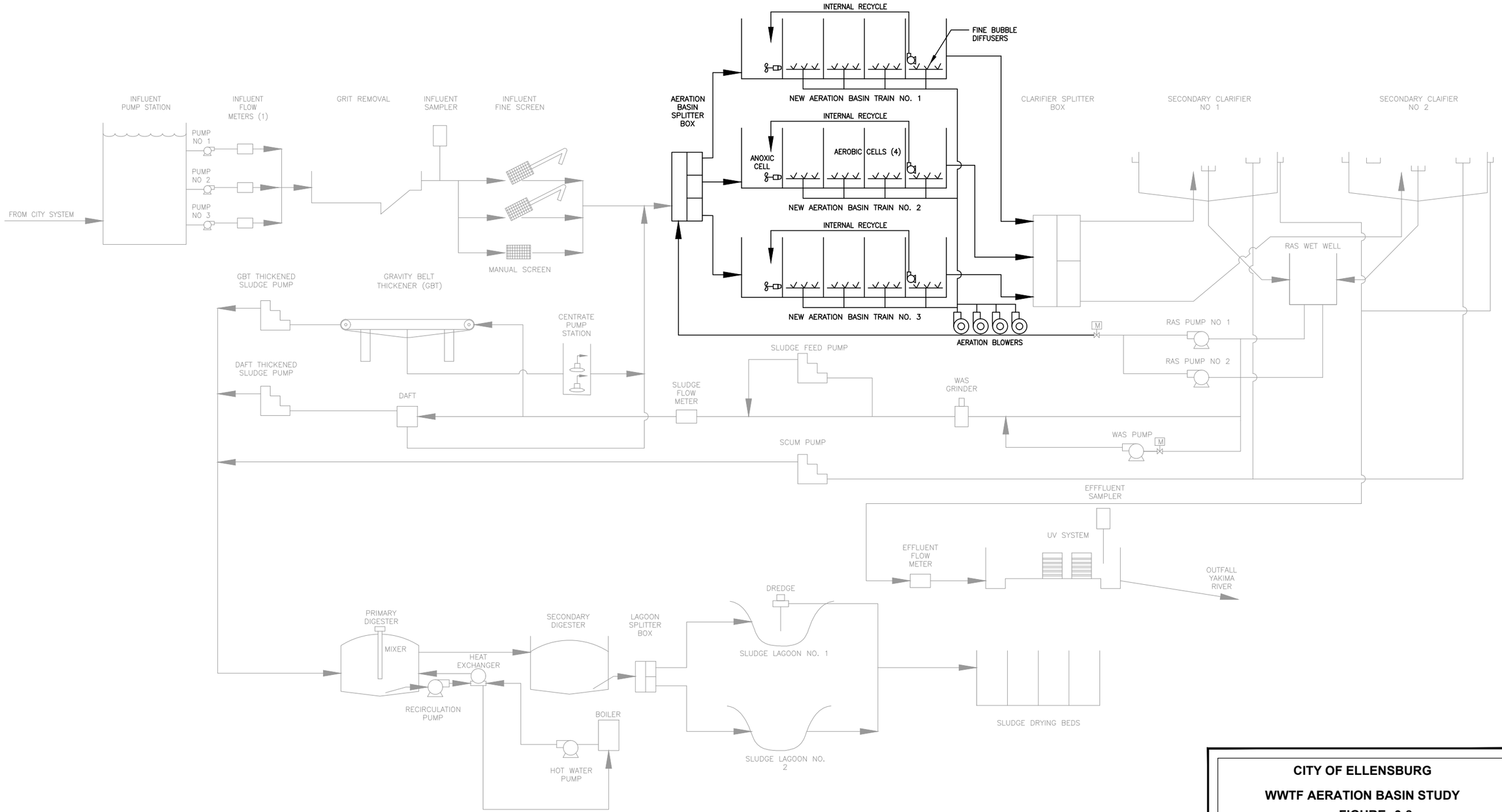
FIGURE 3-7

ALTERNATIVE 4: PROPOSED SITE PLAN

Gray & Osborne, Inc.

CONSULTING ENGINEERS

L:\ELLENSBURG\18015 AERATION BASIN STUDY\FIGURES\FIG 3-7-ALT-4.DWG



(1) INFLUENT FLOW METERS INSTALLED IN ELECTRICAL UPGRADE PHASE II PROJECT, 2018

CITY OF ELLENSBURG

WWTF AERATION BASIN STUDY

FIGURE 3-8

ALTERNATIVE 4
PROPOSED PROCESS FLOW DIAGRAM

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\18015 AERATION BASIN STUDY\FIGURES\FIG 3-8.DWG

- Four aeration blowers and a new Motor Control Center installed in the existing Maintenance Building.

An advantage of Alternative 4 is that it can be constructed while the two existing aeration basins remain in service.

In fine bubble diffusion systems, the oxygen transfer efficiency is directly proportional to the water depth. Therefore, the new aeration basin would have a water depth of 20 feet for greater transfer efficiency and lower airflow requirements than with modification of the existing 12-foot deep aeration basins. The diffusion system would consist of a grid of air piping and membrane diffusers placed on the basin floor to deliver the air in the form of fine bubbles. Compressed air would be delivered to the diffusers using blowers and air distribution piping. In this alternative, the tanks would have flat floors and vertical walls to eliminate concerns with mixing and aeration in the sloped areas that exist with Alternative 3.

The new aeration basin would be sized to provide sufficient volume for nitrification at the design maximum month loading of 10,000 lbs/day BOD_5 in four aerobic cells in series. The first cell would be an anoxic cell, with a submersible mixer to keep the solids well mixed and suspended. A submersible axial flow pump will recycle nitrified activated sludge from the fourth (final) aerobic cell to the first (anoxic) cell to promote denitrification. Each cell would be equally sized, so the anoxic volume would be 20 percent of the total aeration basin volume. This anoxic volume is sufficient to produce an effluent nitrate of 3.0 mg/L when an internal recycle ratio of 3.25Q is provided (6,000 gpm/train at the design maximum month flow).

In Table 3-18, the process operational data for Alternative 4 are provided. At the annual average wastewater temperature of 15 degrees C, an aerobic SRT of 5.8 days is sufficient for nitrification but a longer aerobic SRT of 9.4 days is proposed, with an MLSS concentration of 2,040 mg/L, because sufficient volume is available and more stable nitrification will result.

For maximum month loading conditions, the design minimum temperature of 10 degrees C and the aerobic SRT of 9.4 days were used in the evaluation, with a resulting MLSS concentration of 3,525 mg/L.

TABLE 3-18

Alternative 4 New Aeration Basin Activated Sludge Evaluation Operational Data

Criteria	Design Temperature (°C)	Aerobic SRT (day)	Total SRT (day)	MLSS(1) (mg/L)	AOR(2) (lb O_2/hr)	Air Rqmt. (scfm)
2016-17 Annual Average	15	9.4	11.8	2,040	243	1,590
Design Maximum Month	10	9.4	11.8	3,525	616	3,810

(1) MLSS calculated as: [WAS mass flow (lb/d)] * SRT (d)/[Tank volume (mil. gal.) * 8.34].
(2) AOR = Actual oxygen requirement, including a 33 percent diurnal peaking factor.

In Table 3-19, the design criteria for Alternative 4 are provided.

TABLE 3-19

Alternative 4 New Aeration Basin
Aeration Basin Design Data

Parameter	Design Data
Aeration Basin Structure	
Quantity	1
Quantity of Parallel Trains	3
Volume, Total	3.126 MG
Volume, each Train	1.042 MG
Quantity of Cell in Series/Train	5 (1 anoxic, 4 aerobic)
Dimensions per Cell/Train	44 feet L x 32 feet W x 20 feet SWD
Fine-Bubble Diffusers	
Type	9" Dia. Disks
Standard Oxygen Requirement (SOR) per Train, lbs/hour	
Cell 1 (Anoxic)	0
Cell 2	178
Cell 3	115
Cell 4	90
Cell 5	74
Oxygen Transfer Efficiency (OTE)	33%
Max. Airflow/Disk at Max. Design Max. Month Load	2.0
Quantity of Disks/Cell	
Cell 1 (Anoxic)	0
Cell 2	248
Cell 3	159
Cell 4	125

TABLE 3-19 – (continued)

Alternative 4 New Aeration Basin
Aeration Basin Design Data

Parameter	Design Data
Cell 5	103
Submersible Mixer (Anoxic Cell)	
Quantity per Train	1
Total Quantity	3
Type	Submersible Gear-Driven
Motor Type	Submersible, Constant Speed
Motor Size	6 hp
Internal Recycle Pump	
Quantity per Train	1
Total Quantity	3
Type	Submersible Axial Flow
Motor Type	Submersible, VFD
Motor Size	12 hp
Capacity	6,000 gpm at 2.5 ft TDH
Aeration Blowers	
Quantity of Blowers	4 (3 duty, 1 standby)
Capacity	1,270 scfm at 9.8 psig

A number of different blower technologies were evaluated as part of this Study, as described previously under Alternative 2. The airflow requirements for Alternative 4 are significantly lower than the other alternatives, due to the higher oxygen transfer efficiency of fine-bubble diffusers are greater basin depths. However, the blower backpressure is also greater (9.8 psi versus 6.5 psi for the 12-foot deep existing basins), which results in less electricity savings than airflow savings.

Three blowers will be provided to meet the air demand for the maximum month design criteria, and a fourth blower will be provided as a standby unit. The existing Maintenance Building would be retrofitted to accommodate the four new aeration blowers.

Table 3-20 compares the design criteria and electricity consumption for each type of blower. Based on this analysis, the electrical systems should be sized for four 100-hp blowers. A decision on blower type can be made during the design process.

TABLE 3-20

Alternative 4 New Aeration Basin
Design Data for Blower Alternatives

Parameter	PD Blowers	PD/Screw Hybrid Blowers	Turbo Single-Stage Centrifugal Blowers		Multi-Stage Centrifugal Blowers
			PM Motor	Belt-Driven	
Blower Design Capacity	3 @ 1,270 scfm at 9.8 psig (plus redundant unit)				
Minimum Blower Output (scfm)	405	322	707	575	555
Blower Motor Size (hp)	100	75	75	100	125
Total Electricity Consumption at Design Capacity (kW)	206	164	173	194	259
Total Electricity Consumption at Recent Annual Average (kW)	90	70	77	78	100
Equipment Cost for Four Blowers	$248,000	$224,000	$300,000	$255,000	$366,000
Annual Electrical Cost at Recent Annual Average(1)	$44,200	$34,000	$38,000	$38,000	$49,200
Annual Maintenance Cost(1)	$3,700	$3,400	$4,500	$3,800	$5,500

(1) Cost in 2018 dollars. Average electrical cost = $0.068/kWh. Annual equipment maintenance cost is estimated as 1.5 percent of the equipment cost.

The electrical load with Alternative 4 is within the 800A capacity of the existing electrical feeder to the Chlorine Building MCC. This existing MCC 1 would be replaced as part of any of these alternatives, as replacement is recommended in the *City of Ellensburg WWTP Electrical Distribution and SCADA Study* (Conley Engineering, 2015). The existing motor protection thermal overloads trip in the summer due to heat (steel doors in close proximity to the face of the existing MCC) and the space they are installed in does not have proper ventilation or HVAC. (The Chlorine Building is also known as the Maintenance Building.)

This option is compatible with the electrical work being done at the Influent Pump Station and the proposed power distribution designs as put forth in the Electrical Study, and would provide sufficient standby generator capacity.

The electrical cost estimate for Alternative 1 includes a new MCC in the Maintenance Building.

In Table 3-21, a preliminary project cost estimate for Alternative 4 is provided in 2018 dollars.

TABLE 3-21

Alternative 4 New Aeration Basin
Preliminary Project Cost Estimate (2018 Dollars)

No.	Item	Quantity	Unit Price	Amount
1	Mobilization/Demobilization	1 LS	$430,000	$430,000
2	Sitework	1 LS	$100,000	$100,000
3	New Aeration Basin Splitter Box	1 LS	$100,000	$100,000
4	New Aeration Basin Structure with Catwalks	1 EA	$3,800,000	$3,800,000
5	Anoxic Submersible Mixer	3 EA	$59,000	$177,000
6	Fine Bubble Diffusers	3 EA	$67,000	$201,000
7	Internal Recycle Pumps	3 EA	$56,000	$168,000
8	Aeration Blowers	4 EA	$91,000	$364,000
9	Modify Maintenance Building	1 LS	$20,000	$20,000
10	Painting	1 LS	$50,000	$50,000
11	Mechanical/Yard Piping/Vaults/Etc.	1 LS	$720,000	$720,000
12	Electrical and Instrumentation (Incl. New MCC)	1 LS	$1,055,000	$1,055,000

Subtotal $7,185,000
Construction Contingency (20%) $1,437,000
Subtotal $8,622,000
Washington State Sales Tax (8%).....$690,000
Total Estimated Construction Cost.....$9,312,000
Engineering, Administrative & Legal Services (25%) $2,328,000
TOTAL ESTIMATED PROJECT COST $11,640,000

Annual operation and maintenance (O&M) costs have been estimated for Alternative 4 at current annual average loading and the design annual average loading (for 2037). Both estimates are presented in Table 3-22 in 2018 dollars.

The membrane disc material on fine-bubble diffusers has an average expected service life of 8 years. The annual O&M cost estimate includes an allowance to save for replacement of all install diffuser disc membranes every 8 years.

TABLE 3-22

Alternative 4 New Aeration Basin
Annual O&M Cost Estimates (2018 Dollars)

Item	Unit Price	Unit	Quantity	Unit	Cost
Initial Year					
Electrical Power	$0.068	kWh	998,188	kWh	$68,000
Maintenance and Repair	1.5%	Equip. Cost	$709,000	$	$11,000
Diffuser Membrane Replacement Fund	$6	disc	238	discs/year	$1,000
Total					**$80,000**
Design Year (2037)					
Electrical Power	$0.068	kWh	1,331,068	kWh	$91,000
Maintenance and Repair	1.5%	Equip. Cost	$709,000	$	$11,000
Diffuser Membrane Replacement Fund	$6	disc	238	discs/year	$1,000
Total					**$103,000**

CONCLUSION

Four alternatives have been developed for the long-term capital plan for the Ellensburg WWTF aeration basins.

In Chapter 4 the alternatives will be compared on a numerical and qualitative basis, and a recommended alternative selected. Selection of an alternative, and the associated aeration electrical demand, is important for the ongoing electrical distribution and MCC equipment replacement projects.

CHAPTER 4

COMPARISON AND SELECTION OF ALTERNATIVES

INTRODUCTION

In this chapter, four aeration basin treatment alternatives at the Ellensburg Wastewater Treatment Facility (WWTF) that were developed in Chapter 3 are compared with regard to capital, operating and life cycle costs; and non-monetary factors including risk, environmental benefits, and public/siting/aesthetic concerns. Recommendations are provided at the end of the chapter. Selection of an alternative, and the associated aeration electrical demand, is important for the ongoing electrical distribution and MCC equipment replacement projects.

The reliability, redundancy, constructability, phasing opportunities, capital costs and operations and maintenance (O&M) costs of each alternative will be evaluated.

The following four alternatives compared in this Chapter are:

- Alternative 1, Existing Basins with Surface Aerators: No change to process except add more floating surface aerators.

- Alternative 2, Existing Basins with Invent Mixers: Compartmentalize existing basins into 4 cells each, install Invent mixers for mixing and aeration, with blowers; construct third basin in future.

- Alternative 3, Existing Basins with Diffusers: Compartmentalize existing basins into 4 cells each, install fine-bubble diffusers and blowers; construct third basin in future.

- Alternative 4, New Aeration Basin: Construct a new plug-flow, three-train aeration basin, with diffusers and blowers.

NON-MONETARY COMPARISON

In this section, the aeration basin alternatives are compared with regard to non-monetary considerations, including:

1. Reliability;
2. Redundancy;
3. Long-term operations risk;
4. Constructability;
5. Treatment capability during construction;

6. Ease of operation & maintenance;
7. Treatment quality, both with the current permit and with potential future treatment requirements; and
8. Whether a new electrical service will be required.

Table 4-1 summarizes the qualitative evaluation of the four alternatives. For each alternative, a score is provided in the matrix, with 4 being the highest (best) score and 1 being the lowest (worst) score. The alternative with the highest total score is recommended on a qualitative basis. The scores are based on the descriptions of each alternative in Chapter 3.

TABLE 4-1

Non-Monetary Comparison of Aeration Basin Alternatives(1)

Criteria	Alt. 1: Existing Basins w/Surface Aerators	Alt. 2: Existing Basins w/Invent Mixers	Alt. 3: Existing Basins w/Diffusers	Alt. 4: New Aeration Basin
Reliability	4	3	3	4
Redundancy	4	2	3	4
Long-term Operations Risk	1	2	2	4
Constructability	4	2	3	3
Treatment Capability during Construction	3	1	1	4
Ease of Operation & Maintenance	1	3	3	4
Treatment Quality – Current Permit	2	4	4	4
Treatment Quality – Future Permits	2	4	4	4
New Electrical Service Required	1	1	1	4
TOTAL	**22**	**22**	**24**	**35**

(1) 4 is the highest (best) score and 1 is the lowest (worst) score.

Alternative 1 is the low capital cost option, which allows the City to minimally meet the requirements of the current NPDES effluent permit, without providing capacity for denitrification or other potential future treatment requirements. Alternatives 2 through 4 include greater capital investment, and are designed to provide denitrification even at the maximum design capacity.

There are process-related benefits to diffused aeration. Mechanical aerators such as surface aerators are known to cause floc shear and degrade solids settling performance in the secondary clarifiers. When the floc is broken, the suspended solids do not settle rapidly, resulting in reduced hydraulic and solids loading capacity in the clarifiers. Mechanical aerators also cause cooling of the wastewater due to the heat loss when the water is thrown in the air. When the wastewater temperature decreases, the biological activity in the aeration basin is reduced and treatment performance is reduced.

Generally, surface aerators are more difficult and less desirable to operate and maintain because they are installed outdoors and are exposed to the weather, they are noisy, and the wastewater splashing creates aerosols which present an operator health and safety issue. Fine-bubble air diffusion has the advantage that it does not cause floc shear and, therefore, clarifier performance is more reliable. Diffused aeration also does not lower the temperature of the wastewater; since the compressed air has an elevated temperature and therefore does not have the cooling effect experienced with mechanical aerators.

Therefore Alternatives 3 and 4 are recommended from a process standpoint, and Alternative 4 scores the highest when all qualitative factors are considered.

COST COMPARISON

Tables 4-2 and 4-3 below provides a summary of estimated capital, annual operation and maintenance, and life cycle costs for the four alternatives. The capital and annual operation and maintenance costs were presented in more detail in Chapter 3. The capital costs in Table 4-2 are total project costs that include construction, 20 percent contingency, sales tax, engineering, construction administration and legal services.

Annual operation and maintenance (O&M) costs have been estimated for each alternative, both at current annual average loading and the design annual average loading (for 2037). Both estimates are presented in 2018 dollars. The 2037 O&M cost estimate includes the third aeration basin constructed in the final phase. Labor costs are not included in O&M cost estimates as the total WWTF labor requirement does not differ significantly between any of the considered alternatives.

The electricity price of $0.068/kWh is based on a review of summer 2018 City electrical billing records for the wastewater treatment plant. Annual maintenance and repair costs are estimated at 1.5 percent of the installed equipment cost, while equipment replacement allowances are included for certain equipment items with moderate service lives, such as floating surface aerators and fine bubble diffuser membranes.

Twenty-year and forty-year life cycle costs are presented in Table 4-3, which are the net present value of capital and annual operational costs during the specified period, assuming an annual inflation rate of 3 percent, a discount rate of 2.5 percent. The forty-

year life cycle costs include an equipment replacement project in the second 20-year period.

TABLE 4-2

Comparison of Capital Costs

Alternative	Capital Cost - Initial Phase ($2018)	Capital Cost - Final Phase ($2018)	Total Capital Costs ($2018)
Alternative 1: Existing Basins with Surface Aerators	$3,510,000	$0	$3,510,000
Alternative 2: Existing Basins with Invent Mixers	$10,010,000	$4,950,000	$14,960,000
Alternative 3: Existing Basins with Diffusers	$7,940,000	$4,270,000	$12,210,000
Alternative 4: New Aeration Basin	$11,640,000	$0	$11,640,000

TABLE 4-3

Comparison of Annual Operation and Maintenance and Life Cycle Costs

Alternative	Annual O&M Cost Estimate - Initial Year ($2018)	Annual O&M Cost Estimate - 2037 ($2018)	20-year Lifecycle Cost (2017 – 2037)	40-year Lifecycle Cost (2017 – 2057)(1)
Alternative 1: Existing Basins with Surface Aerators	$242,000	$392,000	$9,853,000	$20,961,000
Alternative 2: Existing Basins with Invent Mixers	$266,000	$397,000	$21,568,000	$36,759,000
Alternative 3: Existing Basins with Diffusers	$108,000	$161,000	$14,851,000	$22,321,000
Alternative 4: New Aeration Basin	$80,000	$103,000	$13,219,000	$18,058,000

(1) 40-year lifecycle cost includes a refurbishment project in the second 20-year period.

Per Table 4-2, Alternative 1, Existing Basins with Surface Aerators, has the lowest capital costs by a wide margin. However, it has significantly higher annual O&M cost over the lifetime of the equipment compared to the alternatives with diffused aeration (Alternatives 3 and 4). With the reduction in O&M cost, the diffused aeration options narrow the gap with Alternative 1 in the 20-year life cycle cost. On a 40-year basis, Alternative 4, New Aeration Basin, has the lowest life cycle cost, due to the accelerating

impact of Alternative 1's high electricity cost due to inflation, and with more time to benefit from the high-efficiency operations of Alternative 4.

SUMMARY AND RECOMMENDATIONS

The City could select Alternative 1, which is designated as the low capital cost option, and potentially have lower costs during the next 20 years, while minimally meeting the requirements of the current NPDES effluent permit. Implementing Alternatives 2 through 4 provide additional capacity for denitrification or other potential future treatment requirements. Among these alternatives, Alternative 4 has clear benefits in terms of lower capital cost, process stability and long-term low-cost operations. The existing aeration basins are already more than 40 years old, and we cannot be certain that they will remain functional without major structural rehabilitation or replacement over the next 40 years. Alternative 4 constructs new concrete aeration basins that will last for at least 75 years.

Based on the evaluation in this Amendment, summarized in this chapter, Alternative 4, New Aeration Basin, is recommended for implementation. Alternative 4 has been found to have significantly lower operational costs and many process benefits over the long term, including the lowest 40-year life cycle cost.

IMPLEMENTATION

We recommend that Alternative 4 be implemented in stages, due to the time required to design and develop a funding package for a construction project of this size. The existing Chlorine Building Motor Control Center (MCC 1) would be replaced as recommended in the *City of Ellensburg WWTP Electrical Distribution and SCADA Study* (Conley Engineering, 2015). A new electrical feeder from the existing service switchgear is recommended, routed around the north side of the WWTF, to power the new MCC, so that the new electrical loads can be brought online without disrupting the existing feeder and MCC. This electrical project is recommended to be constructed in 2019, as the MCC powering these existing aerators has already experienced failures.

We recommend that two additional floating surface aerators, one in each aeration basin, be installed as part of the electrical upgrade project to supplement the existing eight aerators. One aerator is redundant/standby, so nine aerators would be available to meet the aeration demand.

Based on the loading curve developed in Chapter 2, the projected 2019 maximum month loading will require nine aerators to meet the oxygen demand at a 72 percent aeration cycle time, and therefore the additional aerators should be installed by then. These additional aerators will extend the period when the WWTP can continue to denitrify while influent loadings increase, through the 2021 maximum month loading. After 2021, the nine aerators will need to be operated 100 percent to satisfy the aeration demand. In

2024, it is projected that the aeration demand at the maximum month loading will exceed the capacity of the nine aerators operating full-time. By this time, it is recommended that the new aeration basin (Alternative 4) be constructed and placed in operation. The time sequence is summarized below:

- 2019: Capacity to denitrify at maximum month loading is exceeded. Should install aerators 9 and 10.
- 2021: Need to operate nine aerators at 100 percent to meet maximum month aeration demand. Can operate at 72 percent aeration cycles and denitrify at annual average loading.
- 2023: Construction of the new aeration basin should commence, at the latest.
- 2024: Aeration capacity, even at 100 percent aerator time, is exceeded at the projected maximum month loading. Can operate at 72 percent aeration cycles and denitrify at annual average loading. The new aeration basin should be brought on line.

Table 4-4 provide a capital cost estimate for the short-term project to replace the Chlorine Building MCC and install an additional floating aerator in each aeration basin.

TABLE 4-4

Aeration Basin Short-term Electrical Project
Preliminary Project Cost Estimate (2018 Dollars)

No.	Item	Quantity	Unit Price	Amount
1	Mobilization/Demobilization	1 LS	$75,000	$75,000
2	Floating Surface Aerators	2 EA	$40,000	$80,000
3	New Floating Surface Aerators Electrical	1 LS	$75,000	$75,000
4	Electrical and Instrumentation (Incl. New Feeding and MCC)	1 LS	$915,000	$915,000

Subtotal $1,145,000
Construction Contingency (20%) $229,000
Subtotal $1,374,000
Washington State Sales Tax (8%) $110,000
Total Estimated Construction Cost $1,484,000
Engineering, Administrative & Legal Services (25%) $371,000
TOTAL ESTIMATED PROJECT COST $1,860,000

Appendix D WWTF Flows and Loads Report, 2023

DRAFT

Kennedy Jenks

32001 32nd Ave South
Suite 100
Federal Way, WA 98001
253-835-6400

DRAFT

Wastewater Treatment Facility Flows and Loads Report

22 December 2022

Prepared for

City of Ellensburg
501 N Anderson St.
Ellensburg, WA 98926

KJ Project No. 2297006*02

Table of Contents

List of Tables ..... *ii*

List of Figures ..... *iii*

List of Appendices ..... *iii*

Section 1: Introduction 1-1

1.1 Purpose and Scope 1-1
1.2 Previous Planning Documents 1-1

Section 2: Service Area and Population 2-1

2.1 Study Area 2-1
2.2 Population Projections 2-2
2.3 Central Washington University 2-3

Section 3: Flow and Load Evaluation 3-1

3.1 Historical WWTF Flows and Loads 3-1
3.1.1 Existing Wastewater Flows 3-1
3.1.2 Existing Wastewater Loads 3-4
3.1.3 Twin City Foods and Iron Horse Brewery 3-7
3.2 Projected Wastewater Flows and Loads 3-9
3.2.1 Flows 3-9
3.2.2 Loads 3-10
3.2.3 Regulatory Requirements 3-11

Section 4: Summary 4-1

References i

List of Tables

Table 2-1: Ellensburg WWTF Service Area Population Projections 2022-2042 2-3
Table 3-1: Historical WWTF Influent Flow Summary 3-3
Table 3-2: Ellensburg WWTF Influent Flow Peaking Factors 2016-2021 3-3
Table 3-3: Ellensburg WWTF Influent Load Summary 2016-2021 3-7
Table 3-4: Ellensburg WWTF Wastewater Load Peaking Factors 2016-2021 3-7
Table 3-5: TCF Discharge Limits (Permit No. ST0005507) 3-8
Table 3-6: IHB Discharge Limits (Permit No. ST00501278) 3-8
Table 3-7: IHB Discharge Data 2017 - 2021 3-8

Table of Contents (cont'd)

Table 3-8: City of Ellensburg Population and WWTF AADWF Flow Projection 2022-2042 3-10
Table 3-9: Ellensburg WWTF Projected Influent Wastewater Flows 2022-2042 3-10
Table 3-10: Ellensburg WWTF Projected Influent Wastewater BOD and TSS 3-11
Table 3-11: Ellensburg WWTF Projected Influent TKN Loads 2022-2042.....3-11
Table 3-12: Ellensburg WWTF Existing NPDES Permit Influent Limitations.....3-11
Table 4-1: Summary of Ellensburg WWTF Influent Flows and Loads Design 4-1

List of Figures

Figure 2-1: Service Area Map with UGA 2-2
Figure 3-1: Ellensburg WWTF Influent Flow 2016 - 2022 3-2
Figure 3-2: Ellensburg WWTF Influent BOD Load 2016 - 2022 3-5
Figure 3-3: Ellensburg WWTF Influent TSS Load 2016 – 2022 3-6
Figure 3-4: Projected Influent AAF and MMF 3-12
Figure 3-5: Projected Influent MDF and PIF.....3-13
Figure 3-6: Projected Influent BOD Load 3-13
Figure 3-7: Projected Influent TSS Load 3-14

List of Appendices

A Twin City Foods NPDES Permit
B Iron Horse Brewery NPDES Permit
C Ellensburg WWTF NPDES Permit

Section 1: Introduction

The City of Ellensburg (City) is located in central Kittitas County just east of the Cascade Range along Interstate 90 and is home to Central Washington University (CWU). The City owns and operates the Ellensburg Wastewater Treatment Facility (WWTF) which operates under National Pollution Discharge Elimination System (NPDES) permit number WA0024341. The City is experiencing growth pressures and has begun development of a General Sewer Plan (GSP) to identify and prioritize their wastewater collection and treatment needs for the next twenty years (2022-2042). Additionally, the City is concurrently evaluating improvement options for its aeration system which was a need identified in a 2017 WWTF report. The wastewater flows and loads assessment detailed in this report forms the basis of both the GSP effort and the alternatives evaluation for the aeration system improvements (ASI).

1.1 Purpose and Scope

The basis for the GSP and ASI efforts is the wastewater influent flows and loads assessment which will define existing and project future hydraulic and biological process needs for the City's WWTF. The projections will also inform the City of the potential timeline, extent, and type of ASI needed. During the development of the City's previous wastewater planning document in 2015, an electrical failure at the WWTF, temporarily limited the WWTF's aeration system's capabilities, by limiting the electrical supply capacity to their floating aerators. The electrical limitations required staggering and cycling of their floating aerators to limit the number of units online at any one time. While the switchgear failure was subsequently repaired, the aerations system's reliability and process capacity became a huge concern for the City. A 2018 report, which was prompted by the failure and evaluated ASI alternatives, identified the need for additional aeration system tankage within the next 20 years. This conclusion prompted the City to embark on an update to their GSP to identify all other WWTF needs for the next 20 years. However, due to the City's continued concern over the reliability and process capacity of the aeration system, the City has chosen to develop the GSP and ASI concurrently.

To execute these tasks concurrently, the flows and loads have been developed and detailed in this plan for review and comment by Ecology ahead of development and submission of the final GSP. Receiving early comments from Ecology on the flows and loads will allow the City to processed with the GSP and ASI with confidence.

1.2 Previous Planning Documents

The City has several recent reports which were used in the development of the flows and loads assessment. It includes:

1. **2015 WWTF Engineering Report:**
   The City developed a WWTF Engineering Report in 2015, which was submitted to and approved by Ecology, and was a 20 year plan for both the WWTF and the City's collection system. It included flows and loads projection, evaluation of existing facilities, identification of WWTF and collection system improvements, and a financing plan.

2. **2018 Aeration Basin Study**
   During the development of the 2015 WWTF Engineering Report, a main switchboard failure at the WWTF, which temporarily crippled the aeration system and led to an emergency repair, highlighted concerns about the WWTF's electrical system and aeration system capacity. Due to these concerns, the City developed a WWTF Aeration Basin Study in 2018 which identified and evaluated four (4) different ASI which included modifications to the existing aeration basins as well as construction of new aeration basins.

3. **2021 Comprehensive Plan**
   The City developed a 20 year comprehensive planning document for all City infrastructure which details the city limits, population, and urban growth area (UGA) as well as identifying growth rates for the City and UGA. It was initially developed in 2017 and has been updated in 2018, 2019 and 2021.

Section 2: Service Area and Population

This chapter summarizes the study area and the current and projected populations for the WWTF service area for the project planning period of 2022 to 2042. The information is based upon information from the City's 2021 Comprehensive Plan as well as data from the Washington State Office of Financial Management.

2.1 Study Area

The City encompasses approximately 7.6 square miles within its City limits and an additional 7.1 square miles within its UGA. Sewer service is confined to within both of these areas. Figure 2- shows the City limits, UGA, and zoning. As per City officials the total combined extents of the existing City limits and the UGA are not anticipated to increase during the planning period (2022-2042). Changes to the City limits are anticipated to be limited to incorporation of existing UGA.

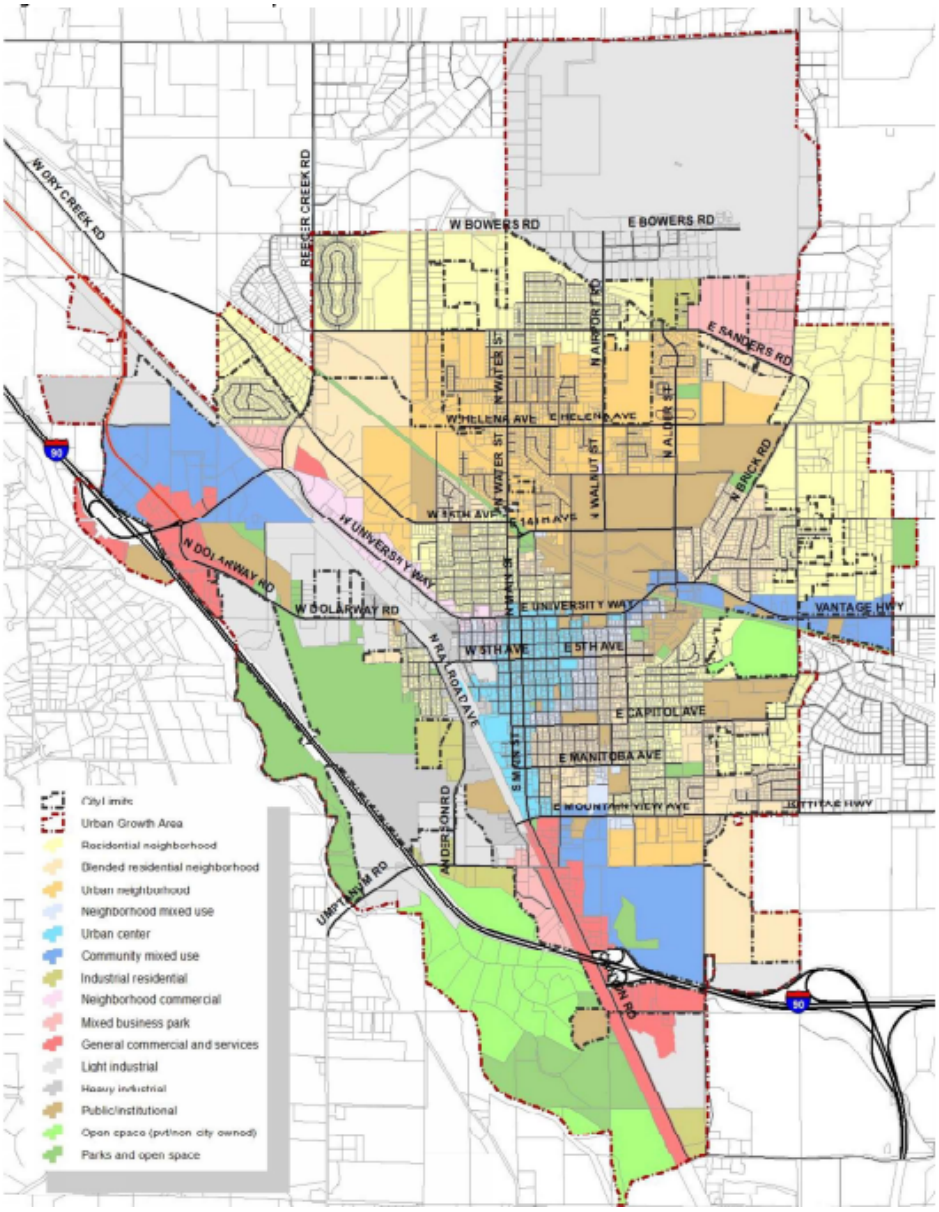


Figure 2-1: Service Area Map with UGA

2.2 Population Projections

As per the City's 2021 Comprehensive Plan, the City utilizes population projections developed by the Washington State Office of Financial Management (OFM). The City use the OFM data as a basis for their planning purposes. According to the data, the City had a population of 20,797 in 2020 and an estimated population of 20,940 for 2022. In addition to the population within the City limits, there are an estimated population of 861 served by the WWTF within the UGA.

In terms of growth, the OFM provides low, medium, and high projections. The City forecasts an annual growth rate of 2.0% for both the City and the UGA for the planning period, which falls within OFM's projection ranges. Population forecasts for the planning period is detailed in **Table 2-**.

Table 2-1: Ellensburg WWTF Service Area Population Projections 2022-2042

	Population	
Year	**City Limits**	**Service Area**
2022	20,940	21,761
2032	25,526	26,507
2042	31,116	32,312

2.3 Central Washington University

CWU is a major economic, social, and cultural influence for the City. The WWTF serves CWU's nearly 10,000 students. As per CWU's 2019-2029 Capital Master Plan, CWU anticipates increasing the campus student population to 12,000 in the next few years. As per their website, as of the fall of 2022 CWU has a student body of 10,327 of which 2,800 live on campus with the remainder living predominantly in the City or UGA. While the students themselves are not considered City residents, their off-campus residences are connected sewer customers. Likewise, the on-campus students and the rest of the CWU campus is considered a commercial connection to the WWTF. There is no single point of connection between CWU and the City and therefore their flows are not metered, but rather calculated based upon potable water consumption. CWU's growth plans are coordinated with the City and are referenced in the City's 2021 Comprehensive Plan.

Section 3: Flow and Load Evaluation

This Chapter summarizes wastewater characteristics for the Ellensburg WWTF, including:

- Historical WWTF flows and loads;
- Projected 2042 flows and loads; and

Flow and load projections are compared with the conditions in the current NPDES permit and used as design criteria for capacity evaluation and recommended facility improvements. The influent wastewater characterization is based on the discharge monitoring reports (DMRs) and WWTF operating data provided for a six-year period from 2016 to 2021 along with additional sampling data from a10 day wastewater sampling event in June 2022 by the City.

3.1 Historical WWTF Flows and Loads

3.1.1 Existing Wastewater Flows

The DMRs were provided for the period January 2016 through December 2021This period includes periods of above and below average rainfall as well as pre-COVD 19 pandemic (2016-2019) years. Figure 3-1 presents the daily influent flow with its running 30-day average flow in millions of gallons per day (MGD). The annual average dry weather flow (AADWF), annual average flow (AAF) and maximum month flow (MMF) estimated each year are also presented. Following are several observations related to the historical influent flows:

- For the study period, AAF peaked in 2016-2017 and has since remained consistent.
- The City's average rainfall is 8.9 inches and was above average in 2016-2017 and below average from 2018-2021.
- MMF peaked in 2016-2017 and was lower in the following years. It was typically observed in late spring in each year.
- As shown in Table 3-, which presents the base flow (BF) as well as various flow averages and annual rainfall totals, the peak AAF and MMF correlate to the high rainfall total experienced in 2016 and 2017. Through discussions with the City, it is understood that inflow and infiltration (I&I) play a major role in WWTF influent flows during periods of wet weather as well as during the spring snowmelt.

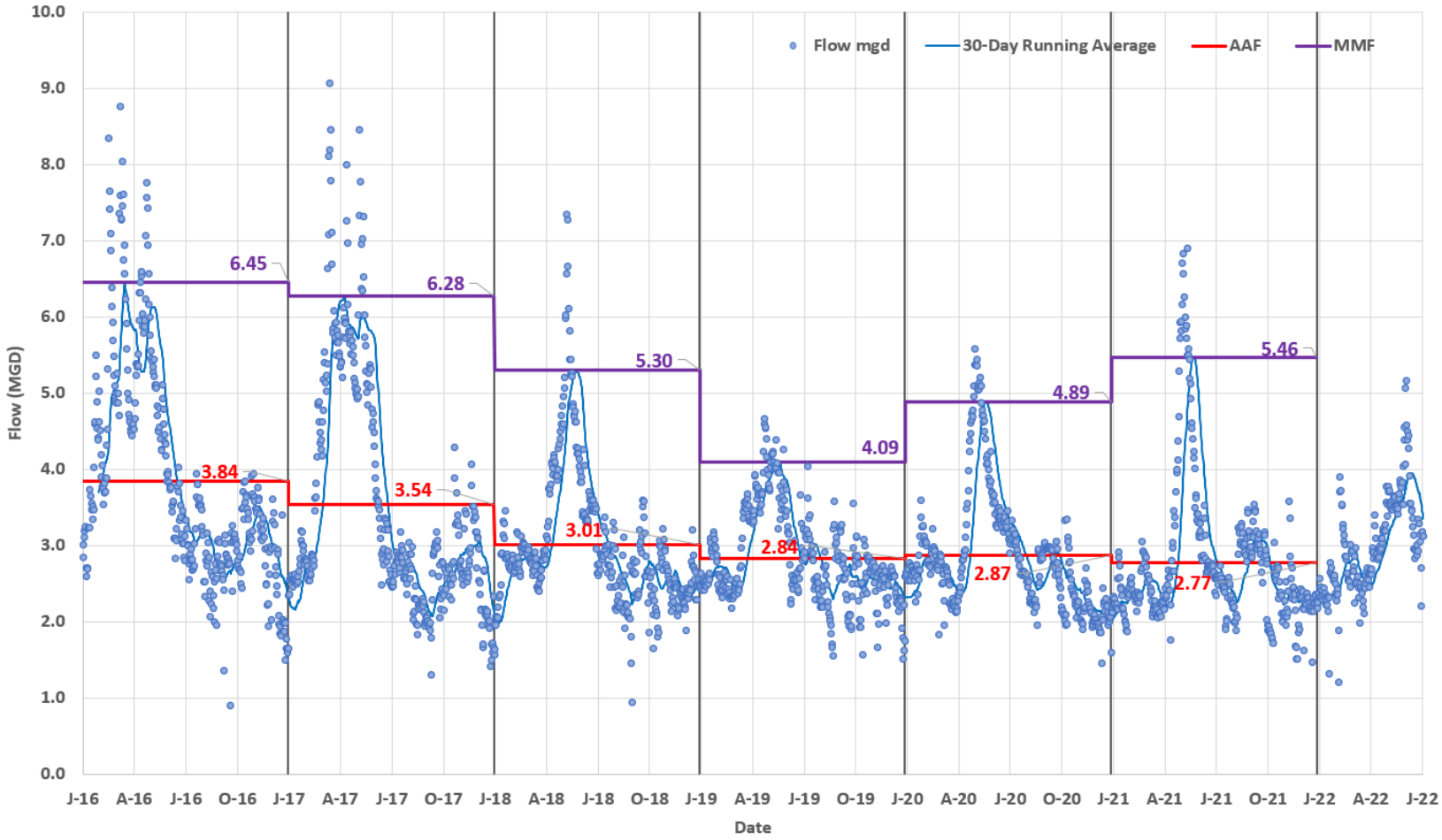


Figure 3-1: Ellensburg WWTF Influent Flow 2016 - 2022

Table 3-1: Historical WWTF Influent Flow Summary

Parameter	2016	2017	2018	2019	2020	2021	Average
Annual Average Dry Weather Flow[1] (AADWF), MGD	2.31	2.07	1.96	2.29	2.02	2.03	2.11
Annual Average Flow (AAF), MGD	3.84	3.54	3.01	2.84	2.87	2.77	3.14
Maximum Month Flow[2] (MMF), MGD	6.45	6.28	5.30	4.09	4.89	5.46	5.41
Maximum Day Flow (MDF), MGD	8.76	9.06	7.34	4.66	5.58	6.89	7.05
Peak Hour Flow[3] (PHF), MGD	12.9[3]	12.9[3]	NA	NA	NA	NA	NA
Annual Rainfall[4], inches	12.23	11.83	6.85	8.65	5.80	5.80	NA

Notes:
1. Minimum 30-day running average flow reported for the year
2. Maximum 30-day running average flow reported for the year
3. Highest peak hour flow rate in 2016 and 2017 reported in the *2018 WWTF Aeration Basin Study* (2018 Study) by Gray & Osborne, Inc. No peak hour flow rate was recorded after 2017.
4. Rainfall data provided for Yakima airport station in Washington from National Oceanic Atmospheric Administration's Climate Data Online

While the AAF and MMF flows have varied during the study period, the AADWF at the WWTF was remained relatively constant. These flows are indicative of a fairly constant service area population during the study period. Likewise, although the MMF and maximum day flow (MDF) has increased in the last 3 years, the MMF and MDF in 2021 were still less than those observed in 2016. The annual rainfall has reduced more substantially in recent years that may have reduced the I/I flows. City staff noted that the City has been implementing a sewer pipe relining program for over 10 years, which is tasked with attenuating I&I in the system. These improvements, coupled with the reduced rainfall are two major factors in the relatively lower increase in MMF and MDF in recent years.

Flow peaking factors were estimated for each year from the historical flows using the ratios of various flow conditions such as AAF/AADWF and MMF/AFAF, etc., as shown in Table 3-.

Table 3-2: Ellensburg WWTF Influent Flow Peaking Factors 2016-2021

Peaking Factors	2016	2017	2018	2019	2020	2021	Design Peaking Factors
AAF/AADWF	1.66	1.71	1.54	1.24	1.42	1.37	1.49
MMF/AAF	1.68	1.78	1.76	1.44	1.71	1.97	1.97
MDF/AAF	2.28	2.56	2.44	1.64	1.95	2.48	2.23
PHF/AAF	3.36	3.65	NA	NA	NA	NA	3.50

The average of the study period's six flow peaking factors was selected as the flow peaking factor to develop design flows except that for the MMF and the peak instantaneous flow (PIF). For the MMF, the maximum value from the six flow peaking factors was selected to establish the design MMF which is the most critical design flow in the secondary treatment capacity. For the PIF, two flow peaking factors were used to project the design PIF. The average (3.50) of the two peak hour flow (PHF)/AAF historical peaking factors was used to estimate PIF corresponding to 2022 AAF.

Another peaking factor, estimated using the following formula provided in the Criteria for Sewage Works by Washington Department of Ecology (2008), was applied to estimate the PIF for the portion of AAF increased from 2022 AAF to the projected year:

$$\text{Peaking Factor} = (18+\sqrt{P}) / (4+\sqrt{P}),\ P = \text{population in thousands}$$

3.1.2 Existing Wastewater Loads

Figure 3-2 and Figure 3-3 present the influent biochemical oxygen demand (BOD) load and total suspended solids (TSS) load respectively in terms of pounds per day (PPD) for the WWTF. The daily influent loads with its running 30-day average and the annual average load (AAL) and maximum month load (MML) estimated for each year are also presented in these figures. Several observations related to the influent wastewater loads are listed in the following:

- Both the AA BOD load and AA TSS load have been relatively constant for the past 6 years.
- The MM TSS load was typically observed late spring which seems to have more correlation to the MMF whereas the MM BOD load was observed in not only the late spring but in winter months as well.
- The average monthly BOD and TSS loads were typically low during the middle of summer months, which is probably related to the reduction in residential students during the summer months. A notable exception to this was the 2020 Covid pandemic year.

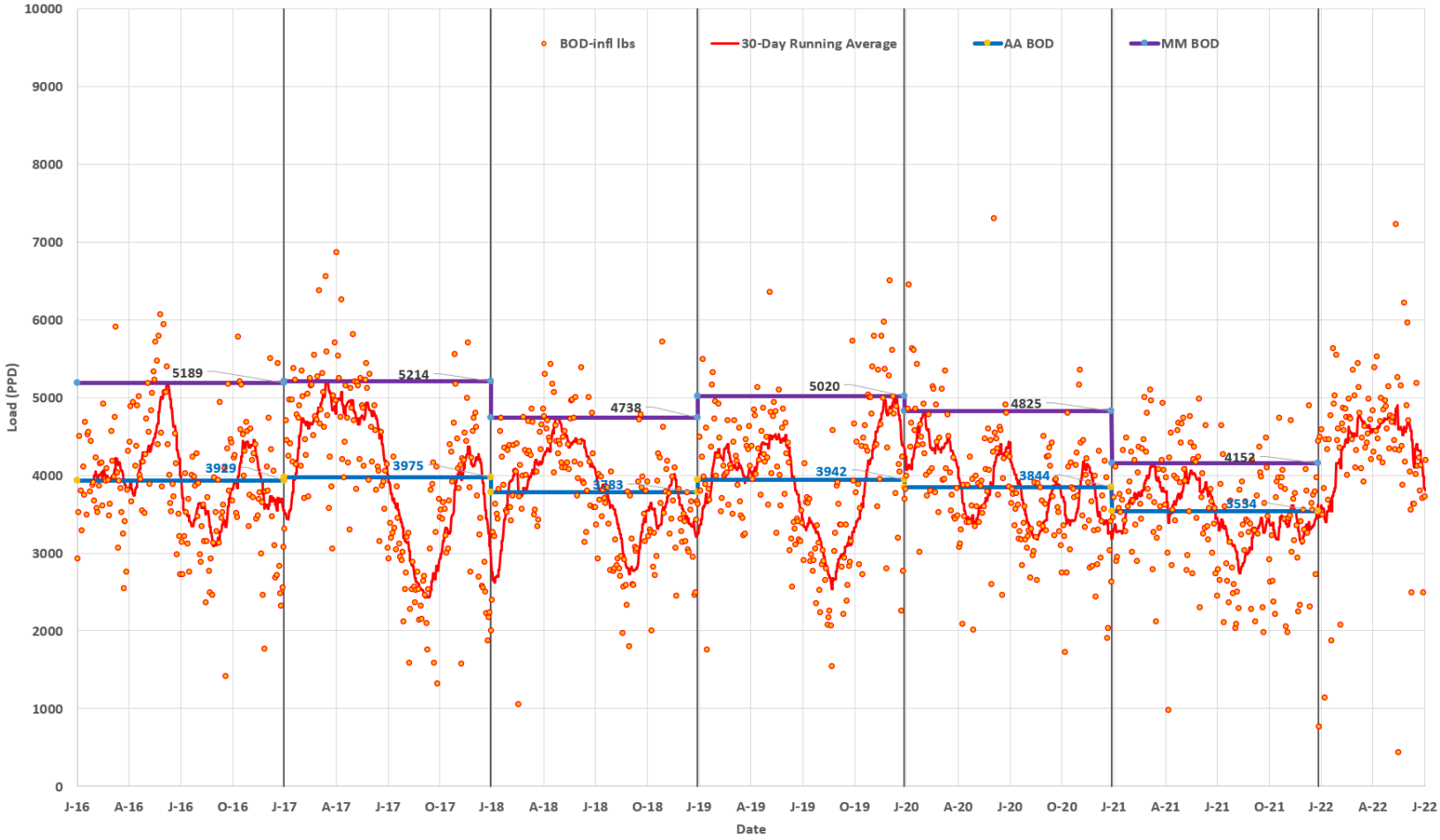


Figure 3-2: Ellensburg WWTF Influent BOD Load 2016 - 2022

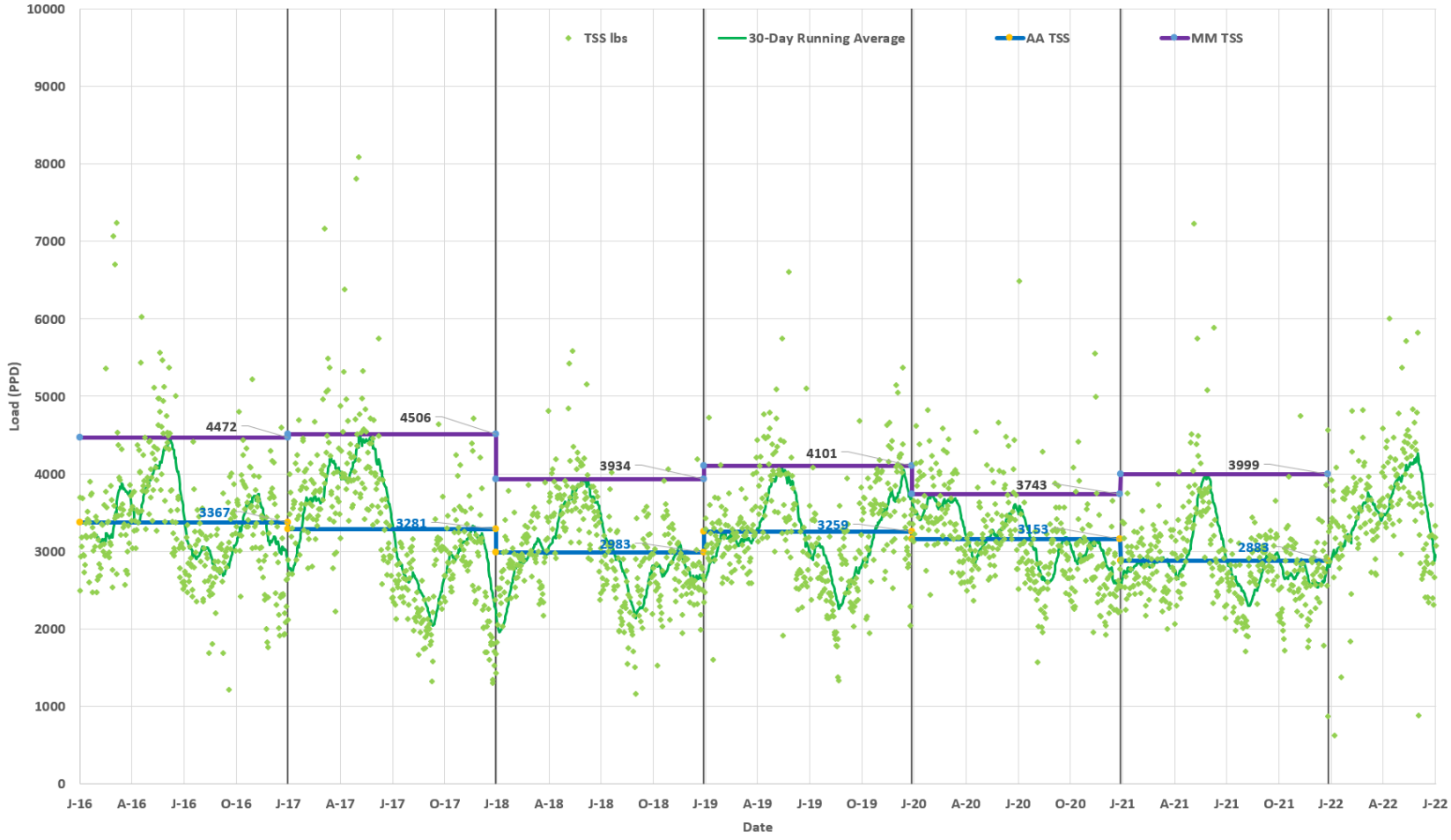


Figure 3-3: Ellensburg WWTF Influent TSS Load 2016 – 2022

Table 3- summarizes the influent waste BOD and TSS loads each year along with the maximum day load (MDL). The average annual BOD and TSS generation rates [in terms of pounds per day per capita (PPDC)] are also provided for each year.

Table 3-3: Ellensburg WWTF Influent Load Summary 2016-2021

Loads	2016	2017	2018	2019	2020	2021
Average Annual BOD Load (AA BODL), PPD	3,929	3,975	3,783	3,942	3,844	3,534
Maximum Month BOD Load (MM BODL), PPD	5,189	5,214	4,738	5,020	4,825	4,152
Maximum Day BOD Load (MD BODL), PPD	6,072	6,873	5,721	6,507	7,303	5,101
Average Annual TSS Load (AA TSSL), PPD	3,367	3,281	2,983	3,259	3,153	2,883
Maximum Month TSS Load (MM TSSL), PPD	4,472	4,506	3,934	4,101	3,743	3,999
Maximum Day TSS Load (MD TSSL), PPD	7,234	8,091	5,585	6,602	6,487	7,229
Average Annual BOD Load per Capita, PPDC	0.20	0.20	0.18	0.19	0.18	0.17
Average Annual TSS Load per Capita, PPDC	0.17	0.16	0.15	0.16	0.15	0.14

The historical average annual BOD generation rates varied from 0.17 to 0.20 PPDC whereas those for TSS varied from 0.14 to 0.17 PPDC. The highest BOD and TSS generation rates were used to project the average annual BOD and TSS loads later. Load peaking factors were estimated based on these loads for each year. Table 3- presents the load peaking factors estimated for each year with the design peaking factors selected to establish design loads.

Table 3-4: Ellensburg WWTF Wastewater Load Peaking Factors 2016-2021

Peaking Factors	2016	2017	2018	2019	2020	2021	Design Peaking Factors
BOD Peaking Factors							
MML/AAL	1.32	1.31	1.25	1.27	1.25	1.17	1.32
MDL/AAL	1.55	1.73	1.51	1.65	1.90	1.44	1.63
TSS Peaking Factors							
MML/AAL	1.33	1.37	1.32	1.26	1.19	1.39	1.39
MDL/AAL	2.15	2.47	1.87	2.03	2.06	2.51	2.18

The historical maximum load peaking factor was selected as the design peaking factor to establish the design MML. The MML is the most critical design load condition that the secondary process should treat to meet the required discharge water quality. Therefore, a more conservative peaking factor was selected for design. For the maximum day load (MDL), the average of the six load peaking factors was selected as the design peaking factor.

3.1.3 Twin City Foods and Iron Horse Brewery

The flow and load from two industrial dischargers, Twin City Foods (TCF) and Iron Horse Brewery (IHB) were analyzed separately and are not correlated to the City's population.

TCF is a local frozen vegetable packing facility that was established in 1965 and is one of the largest businesses in Ellensburg. TCF repacks processed product brought to the facility to consumer size packaging and discharges wastewaters generated by washing and conveyance of vegetables. The facility is mainly operated from May through October and the activities for the

remainder of the year are reduced. Per NPDES Permit No. ST-5507 (see Appendix A), TCF is permitted to discharge its wastewater to the City's collection system November through March of each year when it produces minimal wastewater. For the remainder of the year, TCF discharges to sprayfields. Table 3-5 presents the discharge limits for the flow, BOD, TSS and pH to the City's WWTF per NPDES Permit.

Table 3-5: TCF Discharge Limits (Permit No. ST0005507)

Parameter	Average Monthly	Maximum Daily
Flow	Not applicable	100,000 gpd
BOD5	2,043 mg/L	3,957 mg/L
TSS	250 mg/L	445 mg/L
Residual Chlorine	Not applicable	0.05 mg/L
pH	5.5 (Daily minimum) to 9.0 (Daily Maximum)	

IHB is another local industrial user that discharges wastewater from brewing activities to the City's collection system year round. The wastewater collected at IHB is pretreated for pH neutralization before discharging to the collection system. The discharge limits for flow, BOD5, TSS and pH are established in the contract between the City and IHB executed on 1 November 2019 and presented in Table 3-. The Contract is located as the appendix to the Permit ST0501278 (see Appendix B).

Table 3-6: IHB Discharge Limits (Permit No. ST00501278)

Parameter	Average Monthly	Maximum Daily
Flow	8,000 gpd	13,000 gpd
BOD5	19,000 mg/L	25,000 mg/L
TSS	5,000 mg/L	8,000 mg/L
pH	≥ 5.5 and < 9	

The historical DMR data were obtained for these two industrial users for the period of 2017 to 2021 and a summary of the effluent data is presented in Table 3-.

Table 3-7: IHB Discharge Data 2017 - 2021

Parameter	2017	2018	2019	2020	2021	Average
TCF+IHB Combined Wastewater						
Flow, gpd	13,629	14,606	13,727	15,212	15,285	14,500
BOD, PPD	471	435	491	430	429	450
TSS, PPD	97	133	68	77	115	100
TCF Effluent						
Flow, gpd	33,943	32,403	39,866	42,490	42,037	38,100
BOD, PPD	244	127	226	172	74	170
TSS, PPD	34	13	15	23	27	20
IHB Effluent						
Flow, gpd	4,246	3,889	4,398	3,719	3,698	4,000
BOD, PPD	500	379	558	446	389	450
TSS, PPD	99	54	62	92	72	80

TCF effluent contains less BOD and TSS loads as compared to those in the IHB effluent although its flow was high. The combined flows and loads from the two industries were relatively constant. Because the AADWF occurs during the summer when TCF is not discharging to the WWTF and because IHB's DMRs record daily flows and loads, these two flow streams can easily be separated from the rest of the WWTF's influent flows and loads at any point during the year. By separating out TCF and IHB, the population projections will only be applied to the appropriate portions of the WWTF influent. The average of the combined flows and waste loads from 5 years were added in the projection of AAFs and AALs as described later.

3.2 Projected Wastewater Flows and Loads

The populations, base flows, and the average annual BOD and TSS loads were used to project the influent wastewater AAFs and AALs over a 20-year planning horizon through 2042. The historical peaking factors selected as the design peaking factors were used to project the MMFs, MDFs, PIFs, MMLs, and MDLs corresponding the average values.

3.2.1 Flows

The 2015 WWTF Engineering Report contained an analysis of potable water consumption which was used as a proxy for WWTF influent flow generation. The analysis included calculating per capita water consumption rates (53 gpd per capita) and equivalent residential units (ERU) based upon City data during non-irrigation periods of the year. By factoring in that the average household contained 2.3 residents and using the assumption that 90% of the water consumed became wastewater, the average ERU generated 122 gpd of wastewater (AADWF). This calculation was revisited using 2016-2021 data which yielded a lower result (99 gpd/ERU).

A 2014 study by King County (*Updated Planning Assumptions for Wastewater Flow Forecasting July 2014*, King County) calculated water consumption rate for inside Seattle and outside Seattle were established to be 46 and 54 gpd per capita respectively. The 53 gpd per capita calculated in the 2015 report is in line with these calculations and is a more conservative planning number than the more recent calculation and therefore is used for the projections.

By applying the known population number and average per capita wastewater influent generation, the size of the WWTF influent flow (in MGD) can be determined. Likewise, by subtracting the residential flow from the AADWF, the remaining flow is from commercial connections to include CWU (Table 3-8).

As per the 2021 Comprehensive Plan, commercial and residential flows are anticipated to grow at the same rate (2%) and therefore maintain the same relative ratios. Therefore, the base flow at the WWTF was assumed to be increased proportionally to sewer service population. Table 3- summarizes projection for the base flow, residential flow and commercial flow and the corresponding equivalent residential units (ERU).

Table 3-8: City of Ellensburg Population and WWTF AADWF Flow Projection 2022-2042

Year	Sewered Population	AADWF MGD	Residential Flow[1] MGD	Commercial Flow[2] MGD
Historical Average[3]	20,606	2.10	1.09	1.02
2022	20,940	2.23	1.15	1.08
2032	25,526	2.72	1.41	1.31
2042	31,116	3.31	1.71	1.60

Notes:
1. Residential flow estimated assuming 53 gpdc.
2. Commercial flow estimated by subtracting Residential flow from Annual Average Dry Weather Flow.
3. Average from 2016 through 2021.

Design flows are projected through the planning period by relating historical base flow to the corresponding average annual flow and the design flow peaking factors estimated for the maximum month flow, maximum day flow and the peak instantaneous flow. The projected design flows are summarized in Table 3- below.

Table 3-9: Ellensburg WWTF Projected Influent Wastewater Flows 2022-2042

Flows	Peaking Factors	2022	2032	2042
AADWF, MGD	N/A	2.2	2.7	3.3
AAF[1], MGD	1.49	3.3	4.1	4.9
MMF[2], MGD	1.97	6.6	8.0	9.7
MDF[3] , MGD	2.23	7.4	9.0	11.0
PIF[4] , MGD	3.50, 2.53, 2.45	11.7	13.5	15.6

Notes:
1. AAF = AADWF x peaking factor of AAF/BF+0.015 MGD (Historical AAF from TCF+IHB from Table 3-7).
2. MMF = AAF x peaking factor of MMF/AAF.
3. MDF = AAF x peaking factor of MDF/AAF.
4. PIF = 2022 AAF x 3.50 (Historical peaking factor of PHF/AAF) + Added AAF x Population based peaking factor (2.53 for 2032 and 2.45 for 2042).

3.2.2 Loads

The highest BOD and TSS generation rates estimated from the historical data were 0.20 and 0.17 PPDC respectively, which are comparable to typical per capita TSS and BOD loading of 0.2 lbs/day. The AAL was estimated based on these generation rates and the population with the addition of the historical average load from the TCF and IHB. The MML and the MDL were estimated by applying the design load peaking factors to the AAL. The projected waste loads are presented in Table 3-10 below.

Table 3-10: Ellensburg WWTF Projected Influent Wastewater BOD and TSS Loads 2022-2042

Loads	Peaking Factors	2022	2032	2042
AA BODL(1), PPD	N/A	4,800	5,800	6,900
AA TSSL(2), PPD	N/A	3,800	4,600	5,600
MM BODL, PPD	1.32	6,300	7,700	9,100
MM TSSL, PPD	1.39	5,300	6,400	7,800
MD BODL, PPD	1.63	7,800	9,500	11,200
MD TSSL, PPD	2.18	8,300	10,000	12,200

Notes:
1. AA BOD Load = 0.20 ppdc x population + historical AA BODL of TCF and IHB (450 ppd).
2. AA TSS Load = 0.17 ppdc x population + historical AA TSSL of TCF and IHB (100 ppd).
3. MM BOD Load = peaking factor of MM BODL/AA BODL x AA BODL.
4. MM TSS Load = peaking factor of MM TSS/AA TSSL x AA TSSL.
5. MD BOD Load = peaking factor of MD BODL/AA BODL x AA BODL.
6. MD TSS Load = peaking factor of MD TSS/AA TSSL x AA TSSL.

WWTF staff completed an extensive sampling and testing program for 10 consecutive days, from 7 June 2022 through 16 June 2022. The sampling and testing event included influent flow, chemical oxygen demand (COD), BOD, total Kjeldahl nitrogen (TKN), ammonia, and TSS among other parameters. The results were used establish a wastewater flow characterization for the WWTF. From the received and analyzed data, the ratio of the average annual TKN to the average annual influent BOD is estimated to be 0.19 in the sampling analysis and was used to project influent TKN loads as presented in Table 3-11.

Table 3-11: Ellensburg WWTF Projected Influent TKN Loads 2022-2042

Loads	2022	2032	2042
AA TKNL, PPD	910	1,100	1,310
MM TKNL, PPD	1,200	1,460	1,730
MD TKNL, PPD	1,480	1,810	2,130

3.2.3 Regulatory Requirements

The current NPDES permit (Permit No. WA0024341, see Appendix C) for the WWTF was issued in November 2018 and will expire in December 2023. Influent limits from the current NPDES permit are summarized in Table 3-12.

Table 3-12: Ellensburg WWTF Existing NPDES Permit Influent Limitations

Parameter	Influent Permit Limit
Maximum Month Design Flow	8.0 MGD
Peak Instantaneous Design Flow	15 MGD
BOD_5 for Maximum Month	10,000 lbs/day
TSS for Maximum Month	8,000 lbs/day

Updated flow and load projections were compared with actual historical data, as presented on Figure 3-4 through Figure 3-7. The projections indicate that the WWTF will reach its permitted influent flow capacity within the next 10 years while its permitted influent BOD and TSS limits will be reached outside of the 2022-2042 planning period.

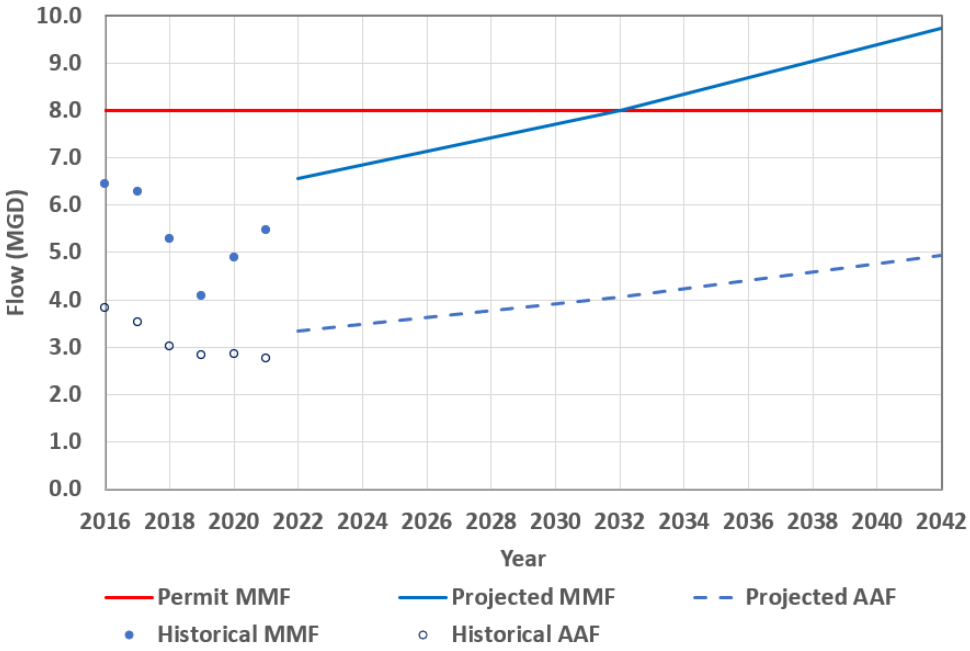


Figure 3-4: Projected Influent AAF and MMF

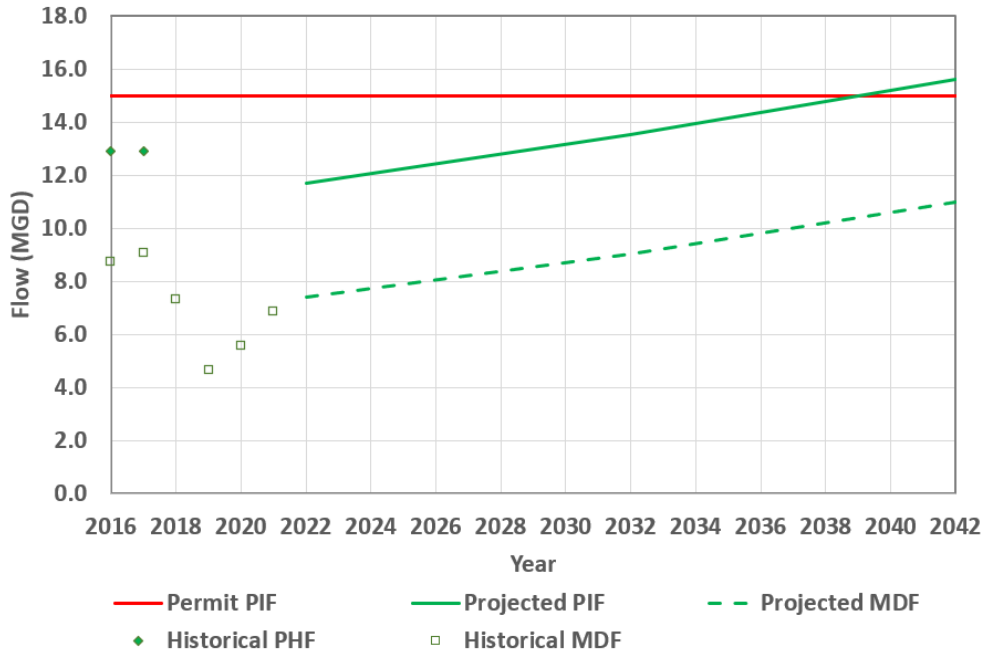


Figure 3-5: Projected Influent MDF and PIF

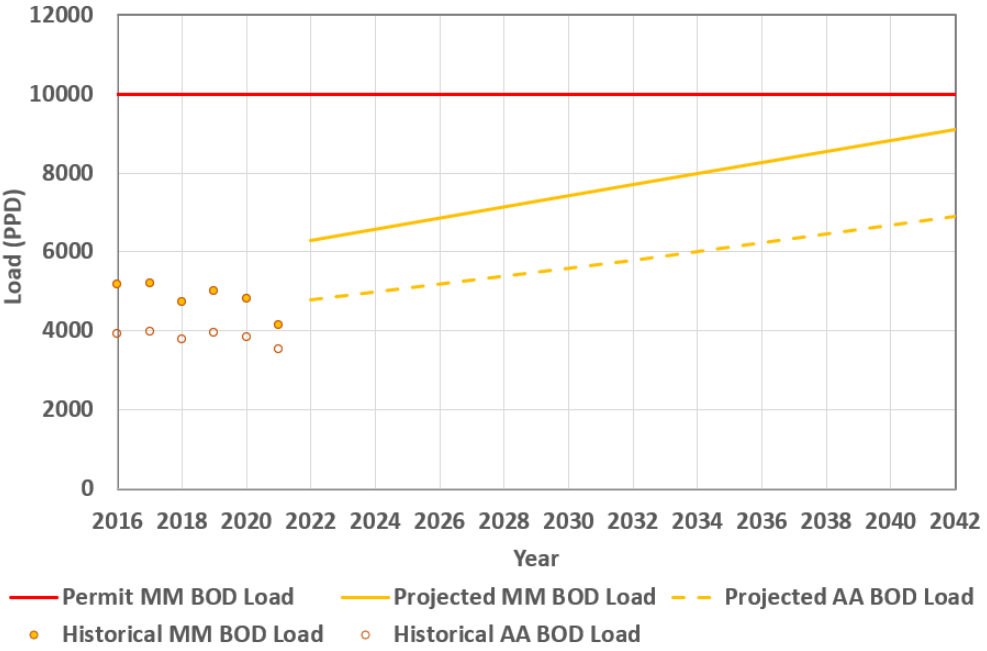


Figure 3-6: Projected Influent BOD Load

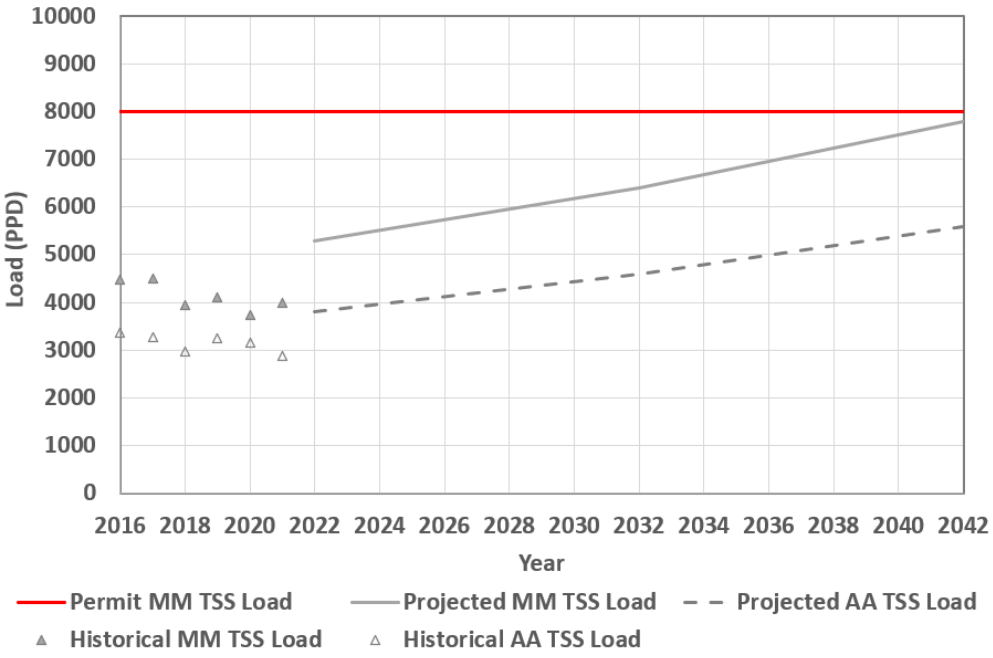


Figure 3-7: Projected Influent TSS Load

Section 4: Summary

The City is forecasted to grow both residentially and commercially at 2.0% annually for the 2022-2042 planning period. With consideration to anticipated flows from the City's two significant industrial users, TCF and IHB, and by incorporating peaking factors based upon daily WWTF influent flow data from 2016 to 2021, the flows and loads to the WWTF can be forecasted for 2042. As per Table 3-12, the maximum month flow for 2042 is greater than the current plant permitted influent flow of 8.0 MGD. Likewise, the BOD and TSS, are forecasted to be just below current permitted values of 10,000 ppd and 8,000 ppd respectively.

The projected influent conditions were compared with the influent conditions allowed in the current permit and the design criteria were selected using the greater value of the two conditions. The design criteria are summarized in Table 4-1 and will be used the basis of both the GSP effort and the alternatives evaluation for the ASI.

Table 4-1: Summary of Ellensburg WWTF Influent Flows and Loads Design Criteria 2022-2042

Parameter	Value
Average Annual Flow	4.9 MGD
Maximum Month Flow	9.7 MGD
Maximum Day Flow	11.0 MGD
Peak Instantaneous Flow	15.6 MGD
Average Annual BOD Load(2)	7,600 PPD
Maximum Month BOD Load	10,000 PPD
Average Annual TSS Load(2)	5,700 PPD
Maximum Month TSS Load	8,000 PPD
Average Annual TKN Load(1)	1,400 PPD
Maximum Month TKN Load(1)	1,900 PPD

Notes:
1. The TKN to BOD ratio of 0.19 applied to BOD Load.
2. The design load peaking factor of 1.32 for BOD and that of 1.39 for TSS applied to MM BOD load and MM TSS load, respectively.

References

Berk, Fehr & Peers, 2021. City of Ellensburg Comprehensive Plan. January 2021

Central Washington University, 2019 2019-2029 Capital Master Plan, August 2020

Gray & Osborne, Inc. 2015. City of Ellensburg Wastewater Treatment Facility Engineering Report. April 2015.

Gray & Osborne, Inc. 2018. City of Ellensburg WWTF Aeration Basin Study. October 2018

Appendix A: Twin City Foods Permit

Issuance Date: May 30, 2012
Effective Date: July 1, 2012
Expiration Date: June 30, 2017

State Waste Discharge Permit Number ST0005507

State of Washington
DEPARTMENT OF ECOLOGY
Olympia, Washington 98504-7600

Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902

In compliance with the provisions of the
State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington, as amended,
is authorized to discharge wastewater in accordance with the special and general conditions which follow.

TWIN CITY FOODS, INC.
ELLENSBURG - PO BOX 478, ELLENSBURG, WA 98926
STANWOOD - PO BOX 699, STANWOOD, WA 98292

Facility Location: 501 West Fourth Street Ellensburg, WA 98926	Discharge Location: Legal Description : Sections 11, 12, 13, & 14 Range 18 E. W.M., Township 17N
Treatment Type: Sprayfield Industry Type: Processed Frozen Vegetables	SIC Code:2037 NAICS Code: 311411
POTW Receiving Discharge: City of Ellensburg	Significant Industrial User: Yes Categorical Industry: Frozen corn 40CFR 407.7

Charles McKinney
Section Manager
Water Quality Program
Central Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals ***4***

Special Conditions ***5***

S1. Discharge limits **5**
S1.A. Interim Effluent limits 5
S1.B. Final Effluent Limits 6
S1.C. Municipal sewer system discharges 6

S2. Monitoring requirements **7**
S2.A. Irrigation wastewater monitoring 7
S2.B. Winter Discharge to the Ellensburg Wastewater Treatment Plant 8
S2.C. Ground water monitoring 8
S2.E. Soil monitoring 9
S2.F. Crop monitoring 11
S2.G. Sampling and analytical procedures 11
S2.H. Flow measurement, field measurement and continuous monitoring devices 12
S2.I. Laboratory accreditation 12
S.2.J. Request for reduction in monitoring 13

S3. Reporting and recordkeeping requirements **13**
S3.A. Reporting 13
S3.B. Records retention 14
S3.C. Recording of results 15
S3.D. Additional monitoring by the Permittee 15
S3.E. Reporting permit violations 15
S3.F. Dangerous waste discharge notification 17
S3.G. Spill notification 17
S3.H. Other reporting 17
S3.I. Maintaining a copy of this permit 18

S4. Operation and maintenance **18**
S4.A. Operations and maintenance (O&M) manual 18
S4.B. Bypass procedures 20
S4.C. Irrigation land application best management practices 22

S5. Solid wastes **23**
S5.A. Solid waste handling 23
S5.B. Leachate 23
S5.C. Solid waste control plan 23

S6. Application for permit renewal or modification for facility changes **24**

S7. Compliance schedule **24**

S8. Spill plan **25**
S8.A. Spill control plan submittals and requirements 25
S8.B. Spill control plan components 25

S9. Irrigation and crop management plan 25
S9.A. Annual Summary of Farm Operations for Previous Year 26
S9.B. Cropping and irrigation Schedule for Upcoming Year 26
GENERAL CONDITIONS ***27***
G1. Signatory requirements 27
G2. Right of entry 28
G3. Permit actions 28
G4. Reporting a cause for modification 28
G5. Plan review required 29
G6. Compliance with other laws and statutes 29
G7. Transfer of this permit 29
G8. Reduced production for compliance 29
G9. Removed substances 29
G10. Payment of fees 30
G11. Penalties for violating permit conditions 30
G12. Duty to provide information 30
G13. Duty to comply 30
APPENDIX A ***31***

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	Discharge Monitoring Report	Monthly	**August 15, 2012**
S3.E	Reporting Permit Violations	As necessary	
S3.F	Other Reporting	As necessary	
S4.A.a.1.	Operations and Maintenance Manual Update	1/permit cycle	**October 1, 2014**
S4.A.c.	Treatment System Operating Plan	1/permit cycle	**June 30, 2016**
S5.C	Solid Waste Control Plan Update	As needed	
S6	Application for Permit renewal	1/permit cycle	**June 30, 2016**
S7. 1.	Schedule of Compliance - AKART alternatives engineering report	1/permit cycle	**October 1, 2012**
S7. 4.	Completion of lined treatment and storage lagoon construction	1/permit cycle	**February 1, 2014**
S8	Spill Control Plan	As needed	
S9	Irrigation and Crop Management Plan	1/year	**May 15th of each year**
G1	Notice of Change in Authorization	As necessary	
G4	Permit Application for Substantive Changes to the Discharge	As necessary	
G5	Engineering Report for Construction or Modification Activities	As necessary	
G7	Notice of Permit Transfer	As necessary	
G8	Payment of Fees	As assessed	
G10	Duty to Provide Information	As necessary	

Special Conditions

S1. Discharge limits

S1.A. Interim Effluent limits

All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a concentration in excess of, that authorized by this permit shall constitute a violation of the terms and conditions of this permit.

Beginning on **July 1, 2012** the Permittee is authorized to discharge wastewater by applying it to land via spray irrigation at permitted rates on the following designated irrigation lands:

Approximately 150 acres located immediately south of the city of Ellensburg, south of Interstate 90, west of Canyon Road, and east of the Yakima River, and the S½ of Section 11, W½ of Section 13, and the NE¼ of Section 14, Township 17 N, Range 18 E. W. M.

The irrigation season runs from April through October, annually. In the event the Permittee finds it necessary to irrigate outside the normal irrigation season, the Permittee shall request approval from Ecology, in writing, at least 5 business days in advance of the proposed discharge.

The Permittee will submit engineering report and plans and specifications to construct a lined treatment and storage lagoon as referenced in Permit Section S7. The Permittee will construct the lagoon by **February 1, 2014**.

Total nutrient loadings applied to the irrigation lands shall not exceed the crop requirements as determined by the Permittee's Crop Management Plan, Condition S7.B. In addition, **hydraulic loading of the sprayfield must not exceed an annual total of 155.1 million gallons applied at the rate not to exceed the monthly amount contained in the table below:**

Location: The S½ of Section 11, W½ of Section 13, and the NE¼ of Section 14, Township 17 N, Range 18 E. W. M			
MONTH	**GALLONS per MONTH**	**MONTH**	**GALLONS per MONTH**
April	**20,000,000**	**August**	**38,800,000**
May	**21,800,000**	**September**	**29,000,000**
June	**20,000,000**	**October**	**13,000,000**
July	**12,500,000**	**TOTAL**	**155,100,000**

S1.B. Final Effluent Limits

The final wastewater application limitation schedule to the sprayfield will be established via administrative order following the completion of the sprayfield wastewater storage lagoon at the permitted location.

MONTH	GALLONS per MONTH	MONTH	GALLONS per MONTH
April	**20,000,000**	**August**	**38,800,000**
May	**21,800,000**	**September**	**29,000,000**
June	**20,000,000**	**October**	**13,000,000**
July	**12,500,000**	**TOTAL**	**155,100,000**

S1.C. Municipal sewer system discharges

During the period beginning on **July 1, 2012** and lasting through **June 30, 2017**, the Permittee is authorized to discharge to the City of Ellensburg Publicly Owned Treatment Works (POTW) sewer system subject to the following limits:

Pea brine water is also trucked to the Ellensburg POTW sludge drying beds at the POTW.

The performance based limits are contained in the table below.

Performance Based Effluent Limits: Discharge to the Ellensburg POTW November 1st to April 30th of each year Latitude 46° 13' 00" N Longitude -120° 32' 30" W		
Parameter	**Average Monthly [a]**	**Maximum Daily [b]**
Flow	Not applicable	100,000 gallons per day
BOD_5	2,043 mg/L	3,957 mg/L
TSS	250 mg/L	445 mg/L
Residual Chlorine	Not applicable	0.05 mg/L
	Daily minimum	**Daily Maximum**
pH	5.5	9.0

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.
b	Maximum daily effluent limit means the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. For other units of measurement, the daily discharge is the average measurement of the pollutant over the day. This does not apply to pH.

S2. Monitoring requirements

S2.A. Irrigation wastewater monitoring

The Permittee must sample at a location that best represents the discharge pumped and applied to the sprayfield. The sampling point for the irrigated wastewater is at the sprayfield sump after the wastewater has passed through the final rotating screen. The Permittee must report results in the annual Irrigation and Crop Plan; Section S9.

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.

Parameter	Units & Speciation	Laboratory Method	Sampling Frequency	Sample Type
Flow	million gallons/day (mgd)	NA	Daily	Meter
Flow	Total million gallons per month	NA	Monthly	Meter
pH	Standard Units	NA	Daily	Meter
Conductivity	µmhos/cm	NA	Daily	Meter
Soluble BOD_5	mg/L	SM 5210 B	Weekly	Composite grab
Soluble BOD_5	lbs/day	SM 5210 B	Weekly	Composite grab
Total Kjeldahl Nitrogen (TKN as N)	mg/L	SM 4500-N Org B/C	Weekly	Composite grab
Nitrate-Nitrite Nitrogen	mg/L	NA	Weekly	Composite grab
NH_3 Nitrogen	mg/L	NA	Weekly	Composite grab
Total-P (as P)	mg/L	NA	Weekly	Composite grab
Total Dissolved Solids (TDS)	mg/L	NA	Weekly	Composite grab
Potassium	mg/L	NA	Weekly	Composite grab
Chloride	mg/L	NA	Weekly	Composite grab
Sulfate	mg/L	NA	Weekly	Composite grab
Sodium	mg/L	EPA 200.7	Weekly	Composite grab

S2.B. Winter Discharge to the Ellensburg Wastewater Treatment Plant

The Permittee must monitor the discharge to the Wastewater Treatment Plant.

Parameter	Units & Speciation	Laboratory Method	Sampling Frequency	Sample Type
BOD_5	mg/L	SM 5210 B	2/month	composite grab
TSS	mg/L	SM2540-D	2/month	composite grab
Chlorine (total residual)	mg/L	SM 4500 CI G	2/month	composite grab
pH	standard units		continuous	meter
Flow	gallons per day		daily	meter

S2.C. Ground water monitoring

The Permittee must monitor the ground water at monitoring wells one (1), and three (3) through six (6), 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.

Parameter	Units & Speciation	Laboratory Method	Sampling Frequency	Sample Type
Ferrous Iron	Present /Absent	Qualitative Field Test	Monthly	Field Measurement
Iron (Total)	mg/L	EPA 200.7	Monthly	Grab
pH	Standard Units		Monthly	Grab
Conductivity	Micromho/cm	SM 2510 B (EPA 120.1)	Monthly	Grab
Measured Depth to Ground Water	Feet (nearest 0.01 ft)		Monthly	Field Measurement
Temperature	Degrees C		Monthly	Field Measurement
Chloride	mg/L	SM 4110B	Monthly	
Total Dissolved Solids	mg/L	SM2540 C	Monthly	
Volatile Dissolved Solids	mg/L	SM2540 D	Monthly	
Nitrate-Nitrite Nitrogen	mg/L as N		Monthly	
Total Kjeldahl Nitrogen (TKN)	mg/L as N	SM 4500-N Org B/C	Monthly	
Fecal coliform	CPU/100ml		Monthly	
Manganese (Total)	mg/L	EPA 200.7	2/Year	
Alkalinity	mg/L as CaCO3	SM 2320-B	2/year	
Sulfate	mg/L	SM4110-B	2/year	
Calcium (Total)	mg/L	EPA 200.7	2/year	
Potassium (Total)	mg/L	EPA 200.7	2/year	
Magnesium (Total)	mg/L	EPA 200.7	2/year	
Sodium (Total)	mg/L	EPA 200.7	2/year	
Total Organic Halogens (TOX)	mg/L		Annually	Grab

S2.E. Soil monitoring

The Permittee must monitor soil on the irrigation lands as follows; the Permittee must:

1. Monitor by April 15th of each year of the permit.

2. Locate sampling sites so they represent each irrigation site or as identified in the crop management plan.

3. Locate sampling sites in the same vicinity each year if possible.

4. Submit results annually with the Irrigation and Crop Management Plan.

5. Composite a minimum of four (4) core samples at the six depth increments as defined in the table below (or until auger refusal).

6. Collect samples at a time that best represents soil conditions at the beginning the crop-growing season.

7. Measure ferrous iron as described in the table below and as follows; the Permittee must:

    a. Test on a weekly basis or immediately prior to application if the application cycle is longer than seven days.

    b. Collect samples from any areas, which show indications of ponding of wastewater or poor plant growth, which might be associated with saturated soils.

    c. Collect 6 additional samples from other generally low areas of the sprayfield.

    d. Include a brief summary of the results of these tests with the monthly discharge monitoring report (DMR).

    e. Locate on a sketch map the locations of any samples which indicate the presence of ferrous iron and describe the corrective actions taken in the report.

The Permittee must monitor the soils in the sprayfields according to the following schedule:

Parameter	Units & Speciation	Sample Point	Depth Increments [a]
Exchangeable Sodium Percentage	%	Each field	1-6
Cation Exchange Capacity	meq/100g	Each field	1-6
Organic Matter	%	Each field	1-6
Moisture Content	%	Each field	1-6
Total Kjeldahl Nitrogen (TKN)	mg/Kg as N	Each field	1-6
Nitrate-Nitrite Nitrogen	mg/Kg as N	Each field	1-6
NH_3 Nitrogen	mg/Kg as N	Each field	1-6
Phosphorus (Total)	mg/Kg	Each field	1-6
Conductivity	micromhos/cm	Each field	1-6
Ferrous Iron [b]	Presence or absence	Low areas in sprayfield	1-6
Sodium (Total)	meq/100g	Each field	1-6
Calcium (Total)	meq/100g	Each field	1-6
Magnesium (Total)	meq/100g	Each field	1-6
Potassium (Total)	mg/Kg	Each field	1-6
Sulfate	mg/Kg as S	Each field	1-6
pH	Standard Units	Each field	1-6

[a]Depth increment (ft.) vs. Depth (inches) for composite samples:

Increment 1	0 -12 inches
Increment 2	12-24 inches
Increment 3	24-36 inches
Increment 4	36-48 inches
Increment 5	48-60 inches
Increment 6	60-72 inches

[b]The Permittee must test surficial soils weekly (to 6 inch depth) for the presence or absence of ferrous iron using the 1000 mg/liter 2-2' dipyridyl indicator solution, (*Field Techniques for Measuring Wetland Soil Parameters,* Faulkner, et. al., May-June, 1989).

S2.F. Crop monitoring

The Permittee must:

1. Monitor the crops for the parameters listed below on each field once per harvest.
2. Comprise composite samples of at least ten (10) random samples collected from each center-pivot field, and from the hand-line fields.
3. Submit results annually with the Irrigation and Crop Management Plan.

Parameter	Units, Speciation, & Measurement Basis
Crop Production	dry tons/acre
Moisture Content	%
Crude Protein	%
Total Kjeldahl Nitrogen	%
Nitrate-Nitrite Nitrogen	mg/Kg as N (dry weight)
Phosphorus	%
Solids (Total Fixed) (Ash Weight)	mg/Kg as N (dry weight)
Sodium	mg/Kg as N (dry weight)
Magnesium	mg/Kg as N (dry weight)
Potassium	mg/Kg as N (dry weight)
Calcium	mg/Kg as N (dry weight)

S2.G. 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, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets and maintenance-related conditions affecting effluent quality.

Ground water sampling must conform to the latest protocols in the *Implementation Guidance for the Ground Water Quality Standards*, (Ecology 2005).

Sampling and analytical methods used to meet the water and wastewater monitoring requirements specified in this permit must conform to the latest revision of the following rules and documents unless otherwise specified in this permit or approved in writing by the Department of Ecology (Ecology).

- Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136
- Standard Methods for the Examination of Water and Wastewater (APHA)

The Permittee must conduct and report all soil analysis in accordance with the Western States Laboratory Plant, Soil and Water Analysis Manual, Soil, Plant And Water Reference Methods for The Western Region, 2nd Edition, 2003. You can find more information at:
http://cropandsoil.oregonstate.edu/wera103/soil_methods

S2.H. 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 and the manufacturer's recommendation for that type of device.
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. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
5. Calibrate these devices at the frequency recommended by the manufacturer.
6. Maintain calibration records for at least three years.

S2.I. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology 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.

Crops and soils data are process control parameters, which do not require preparation by an accredited laboratory. However, the Permittee must obtain this data from a reputable agricultural test lab that is an active participant in a nationally recognized agricultural laboratory proficiency testing program.

S.2.J. 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 recordkeeping requirements

The Permittee must monitor and report in accordance with the following conditions. The falsification of information submitted to Ecology constitutes a violation of the terms and conditions of this permit.

S3.A. Reporting

The first monitoring period begins on **July 1, 2012**. The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on a Discharge Monitoring Report (DMR) form provided, or otherwise approved, by Ecology. Include a summary listing daily results for the parameters tabulated in Special Condition S2, including MDLs and QLs (when applicable). If submitting DMRs electronically, report a value for each day sampling occurred and for the summary values (when applicable) included on the form.

2. Submit the form as required with the words "no discharge" entered in place of the monitoring results, if the facility did not discharge during a given monitoring period. If submitting DMRs electronically, you must enter “no discharge” for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate.

3. Report the test method, DL, and QL on the discharge monitoring report or in the required report, if the Permittee used an alternative method not specified in the permit and as allowed in Appendix A.

4. Ensure that DMR forms are **postmarked or received** by Ecology no later than the dates specified below, unless otherwise specified in this permit. If submitting DMRs electronically, submit the DMR no later than the dates specified below, unless otherwise specified in this permit.

5. 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 for the previous calendar year. The annual sampling period is the calendar year.

   c. Submit **semiannual DMRs**, unless otherwise specified in the permit, by July 15 and January 15 of each year. Semiannual sampling periods are January through June, and July through December.

6. Submit reports to Ecology online using Ecology's electronic DMR submittal forms or send reports to Ecology at:

   Central Regional Office
   15 West Yakima Avenue, Suite 200
   Yakima, WA 98902

S3.B. 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.

The Permittee must retain all records pertaining to the monitoring of sludge for a minimum of five years.

S3.C. 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.D. Additional monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by 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.

S3.E. 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 the Department of Ecology and the Department of Health, Drinking Water Program (at the numbers listed below), all:

- Overflows or leaks of transmission or irrigation pipelines that discharge to a waterbody used as a source of drinking or irrigation water.

Central Regional Office	509-575-2490
Department of Health,	800-521-0323 (business hours)
Drinking Water Program	877-481-4901 (after business hours)
Kittitas Health District	509 962 7515 after hours emergency 911

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. The Permittee must report:

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 S4.B., "Bypass Procedures").
3. Any upset that causes an exceedance of an effluent limit in the permit. 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.
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.
6. Any leak or failure of the wastewater transmission pipeline or irrigation pipeline distribution system.
7. When a monitoring well exceeds an enforcement limit for the same parameter in two consecutive sampling events.

c. Report within five days

The Permittee must also provide a written submission within five days of the time that the Permittee becomes aware of any event it must report under subparts a or b, above. The written submission must contain:

1. A description of the noncompliance and its cause.
2. Maps, drawings, aerial photographs, or pictures to show the location and cause(s) of the non-compliance.
3. The period of noncompliance, including exact dates and times.
4. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
5. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

6. 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.

f. Report submittal

The Permittee must submit reports to the address listed in S3A.

S3.F. Dangerous waste discharge notification

The Permittee must notify the publicly owned treatment works (POTW) and Ecology in writing of the intent to discharge into the POTW any substance designated as a dangerous waste in accordance with the provisions of WAC 173-303-070. It must make this notification at least 90 days prior to the date that it proposes to initiate the discharge. The Permittee must not discharge this substance until authorized by Ecology and the POTW. It must also comply with the notification requirements of Special Condition S8 and General Condition G4.

S3.G. Spill notification

The Permittee must notify the POTW immediately (as soon as discovered) of all discharges that could cause problems to the POTW, such as process spills and unauthorized discharges (including slug discharges

S3.H. Other reporting

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280. You can obtain further instructions at the following website: http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm .

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.I. 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. Operation and maintenance

The Permittee must, at all times, properly operate and maintain all facilities or 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 includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a Permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

S4.A. Operations and maintenance (O&M) manual

a. O&M manual submittal and requirements

The Permittee must:

1. Update the O&M Manual that meets the requirements of 173-240-150 WAC and **submit it to Ecology for approval by October 1, 2014**. The Permittee must submit a paper copy and an electronic copy (preferably in a portable document format (PDF)).
2. Review the O&M Manual at lease annually.
3. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF).
4. Keep the approved O&M Manual at the permitted facility.
5. 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 include:

1. Emergency procedures for plant shutdown and cleanup in the event of a wastewater system upset or failure including pipeline leaks.

2. Irrigation system operational controls and procedures.
3. Wastewater system maintenance procedures that contribute to the generation of wastewater.
4. 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.)
5. Treatment plant process control monitoring schedule.
6. Wastewater sampling protocols and procedures for compliance with the sampling and reporting requirements in the wastewater discharge permit.
7. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.
8. Protocols and procedures for ground water monitoring network, vadose zone, and soil sampling and testing.
9. Protocols and procedures for double-lined evaporation pond leak system, sampling and testing
10. The allowable flow, biological oxygen demand (BOD) load, total suspended solids (TSS) load, pH range, and monitoring requirements are to be established in a contract between the City of Ellensburg and TCF. In addition, the handling and disposal of pea brine water containing concentrated sodium chloride shall be established in the contract.

c. Treatment System Operating Plan

The Permittee must summarize the following information in the initial chapter of the O&M Manual entitled the "Treatment System Operating Plan." For the purposes of this permit, a Treatment System Operating Plan (TSOP) is a concise summary of specifically defined elements of the O&M Manual.

The Permittee must submit an updated Treatment System Operating Plan to Ecology by **June 30, 2016**. The Permittee must update and submit this plan, as necessary, to include requirements for any major modifications of the treatment system.

The TSOP must not conflict with the O&M Manual and must include the following information:

1. A baseline operating condition, which describes the operating parameters and procedures, used to meet the effluent limits of S1 at the production levels used in developing these limits.
2. In the event of production rates, which are below the baseline levels used to establish these limits, the plan must describe the operating procedures

and conditions needed to maintain design treatment efficiency. The monitoring and reporting must be described in the plan.

3. In the event of an upset, due to plant maintenance activities, severe stormwater events, start ups or shut downs, or other causes, the plan must describe the operating procedures and conditions employed to mitigate the upset. The monitoring and reporting must be described in the plan.
4. A description of any regularly scheduled maintenance or repair activities at the facility which would affect the volume or character of the wastes discharged to the wastewater treatment system and a plan for monitoring and treating/controlling the discharge of maintenance-related materials (such as cleaners, degreasers, solvents, etc.).

S4.B. 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 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.

- Stopping production.
- 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 or preventative maintenance), or transport of untreated wastes to another treatment facility.

c. The Permittee has properly notified Ecology of the bypass as required in Condition S3.E 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 preparation of the engineering report or facilities plan and plans and specifications and must include these 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.

S4.C. Irrigation land application best management practices

The Permittee must:

1. Operate the sprayfield system to protect the existing and future beneficial uses of the groundwater, and not cause a violation of the groundwater standards.
2. Not allow spray irrigation practices to result in runoff of wastewater to any surface waters of the state or to any land not owned by or under its control.
3. Use recognized good practices, and all available and reasonable procedures to control odors from the land application system.
4. Implement measures to reduce odors to a reasonable minimum when notified by Ecology.
5. Not apply wastewater to the irrigation lands in quantities that:

   a. Significantly reduce or destroy the long-term infiltration rate of the soil.
   b. Would cause long-term anaerobic conditions in the soil.
   c. Would cause ponding of wastewater and produce objectionable odors or support insects or vectors.
   d. Would cause leaching losses of constituents of concern beyond the treatment zone or in excess of the approved design. Constituents of concern are constituents in the wastewater, partial decomposition products, or soil constituents that would alter ground water quality in amounts that would affect current and future beneficial uses.

6. Maintain all irrigation agreements for lands not owned for the duration of the permit cycle. Any reduction in irrigation lands by termination of any irrigation agreements may result in permit modification or revocation.
7. Immediately inform Ecology in writing of any proposed changes to existing irrigation agreements.
8. Maintain a viable and healthy cover crop on all fields that receive wastewater.
9. Use supplemental water or precipitation to meet the leaching requirement to control soil salinity.
10. Adjust irrigation plans during high precipitation events to minimize percolate losses.

S5. Solid wastes

S5.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.

S5.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.

S5.C. Solid waste control plan

The Permittee must submit all proposed revisions or modifications to the solid waste control plan to Ecology for review and approval at least 30 days prior to implementation. Once approved, the Permittee must comply with any plan modifications. The Permittee must submit an update of the solid waste control plan as needed.

b. Solid Waste Control Plan Content

The solid waste control plan must:

1. Follow Ecology's guidance for preparing a solid waste control plan (www.ecy.wa.gov/biblio/0710024.html) and address all solid wastes generated by the Permittee.

2. Include at a minimum a description, source, generation rate, and disposal methods of these solid wastes.

3. Not conflict with local or state solid waste regulations.

S6. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit by **June 30, 2016**. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF).

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.

S7. Compliance schedule

By the dates tabulated below, the Permittee must complete the following tasks and submit a report describing, at a minimum:

- Whether it completed the task and, if not, the date on which it expects to complete the task.

- The reasons for delay and the steps it is taking to return the project to the established schedule.

	Tasks	Date Due
1.	Submit an engineering report with AKART alternatives to Ecology for review and approval.	October 1, 2012
2.	Submit approvable plans and specifications including AKART with construction schedule to Ecology	May 1, 2013
3.	Submit an Operation and Maintenance Manual for the planned treatment facility for review and approval.	October 1, 2014
4.	Complete installation of wastewater lagoon.	February 1, 2014

S8. Spill plan

S8.A. Spill control plan submittals and requirements

The Permittee must:

1. Submit to Ecology an update to the existing spill control plan as needed. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF).
2. Review the plan at least annually and update the spill plan as needed.
3. Send changes to the plan to Ecology.
4. Follow the plan and any supplements throughout the term of the permit.

S8.B. Spill control plan components

The spill control plan must include the following:

1. A list of all oil and petroleum products and other materials used and/or stored on-site, which when spilled, or otherwise released into the environment, designate as Dangerous Waste (DW) or Extremely Hazardous Waste (EHW) by the procedures set forth in WAC 173-303-070. Include other materials used and/or stored on-site which may become pollutants or cause pollution upon reaching state's waters.
2. A description of preventive measures and facilities (including an overall facility plot showing drainage patterns) which prevent, contain, or treat spills of these materials.
3. A description of the reporting system the Permittee will use to alert responsible managers and legal authorities in the event of a spill.
4. A description of operator training to implement the plan.

The Permittee may submit plans and manuals required by 40 CFR Part 112, contingency plans required by Chapter 173-303 WAC, or other plans required by other agencies, which meet the intent of this section.

S9. Irrigation and crop management plan

The Permittee must submit an Irrigation and Crop Management Plan **annually by May 15th of each year** for Ecology review. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF).The plan must be prepared by a soil scientist and must generally conform to the Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems, Ecology 1993.

The Irrigation and Crop Management Plan must include an annual summary of farm operations for the previous year and a cropping and irrigation schedule for the upcoming year as described in the sections below.

S9.A. Annual Summary of Farm Operations for Previous Year

The annual summary must include:

1. For each crop grown, the total acreage and quantity harvested.
2. Calculated balances for nutrients, salts, TDS, or other design limiting parameters. The calculations must include crop consumptive use, wastewater loadings of nutrients, salts, TDS or other design limiting parameters, contributions from commercial fertilizers applied, and supplemental water.
3. A **water balance** including the following calculations:

    a. Irrigation system efficiency and application uniformity
    b. The quantity of supplemental irrigation water and wastewater applied
    c. Crop consumptive use
    d. Water stored in the soil profile outside the normal growing season
    e. Salt leaching requirements
    f. The leaching fraction for each field

4. A comparison of the actual total net nitrogen, water, fixed dissolved solids, (other parameters) loads, and the leaching fractions for each field to the estimated values presented in the previous year's Irrigation and Crop Plan.
5. A summary and evaluation of the **soil testing results**.
6. A summary and evaluation of the **crop testing results**.

S9.B. Cropping and irrigation Schedule for Upcoming Year

This schedule must include:

1. Crop Management information including:

    a. The proposed acreage for each crop
    b. Cultivation and harvesting requirements
    c. Expected crop yields
    d. Methods for establishing a crop
    e. Proposed schedule for herbicide, pesticide, and fertilizer application

2. Irrigation Management information including:

    a. The frequency and timing of wastewater and supplemental irrigation water application (including harvest and non-harvest periods)

b. Recommended rest cycles for wastewater application where organic or hydraulic loading is of concern
c. An estimation of the leaching requirement for each field and the plan to meet the requirement

3. The estimated annual total net nitrogen and water load capacity, and the fixed dissolved solids and BOD_5 load to each field based on the estimated wastewater discharge and planned crop rotation.

GENERAL CONDITIONS

G1. Signatory requirements

All applications, reports, or information submitted to Ecology must be signed as follows:

1. All permit applications must be signed by either a principal executive officer or ranking elected official.
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 the person described above and is submitted to Ecology at the time of authorization, and
    b. The authorization specifies either a named individual or any individual occupying a named position.

3. Changes to authorization. If an authorization under paragraph B.2. above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization 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 entry

Representatives of Ecology have the right to enter at all reasonable times in or upon any property, public or for the purpose of inspecting and investigating conditions relating to the pollution or the possible pollution of any waters of the state. Reasonable times include normal business hours; hours during which production, treatment, or discharge occurs; or times when Ecology suspects a violation requiring immediate inspection. Representatives of Ecology must be allowed to have access to, and copy at reasonable cost, any records required to be kept under terms and conditions of the permit; to inspect any monitoring equipment or method required in the permit; and to sample the discharge, waste treatment processes, or internal waste streams.

G3. Permit actions

This permit is subject to modification, suspension, or termination, in whole or in part by Ecology for any of the following causes:

1. Violation of any permit term or condition;
2. Obtaining a permit by misrepresentation or failure to disclose all relevant facts;
3. A material change in quantity or type of waste disposal;
4. A material change in the condition of the waters of the state; or
5. Nonpayment of fees assessed pursuant to RCW 90.48.465.

Ecology may also modify this permit, including the schedule of compliance or other conditions, if it determines good and valid cause exists, including promulgation or revisions of regulations or new information.

G4. Reporting a cause for modification

The Permittee must submit a new application at least 60 days before it wants to discharge more of any pollutant, a new pollutant, or more flow than allowed under this permit. The Permittee should use the State Waste Discharge Permit application, and submit required plans at the same time. Required plans include an Engineering Report, Plans and Specifications, and an Operations and Maintenance manual, (see Chapter 173-240 WAC). Ecology may waive these plan requirements for small changes, so contact Ecology if they do not appear necessary. The Permittee must obtain the written concurrence of the receiving POTW on the application before submitting it to Ecology. The Permittee must continue to comply with the existing permit until it is modified or reissued. Submitting a notice of dangerous waste discharge (to comply with Pretreatment or Dangerous Waste rules) triggers this requirement as well.

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 should be submitted at least 180 days prior to the planned start of construction. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in the permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

This permit is automatically transferred to a new owner or operator if:

1. A written agreement between the old and new owner or operator containing a specific date for transfer of permit responsibility, coverage, and liability is submitted to Ecology;
2. A copy of the permit is provided to the new owner and;
3. Ecology does not notify the Permittee of the need to modify the permit.

Unless this permit is automatically transferred according to Section A. above, this permit may be transferred only if it is modified to identify the new Permittee and to incorporate such other requirements as determined necessary by Ecology.

G8. Reduced production for compliance

The Permittee must control production or discharge to the extent necessary to maintain compliance with the terms and conditions of this permit upon reduction of efficiency, loss, or failure of its treatment facility until the treatment capacity 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 for 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 effluent stream for discharge.

G10. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology. Ecology may revoke this permit if the permit fees established under Chapter 173-224 WAC are not paid.

G11. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is guilty of a crime, and upon conviction thereof will be punished by a fine of up to ten thousand dollars 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 incurs, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars 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 a separate and distinct violation.

G12. 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.

G13. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of chapter 90.48 RCW and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

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.

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.

CONVENTIONAL PARAMETERS

Pollutant & CAS No. ***(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
Chemical Oxygen Demand	SM5220-D		10 mg/L
Total Organic Carbon	SM5310-B/C/D		1 mg/L
Total Suspended Solids	SM2540-D		5 mg/L
Total Ammonia (as N)	SM4500-NH3- GH		20
Flow	Calibrated device		
Dissolved oxygen	SM4500-OC/OG		0.2 mg/L
Temperature (max. 7-day avg.)	Analog recorder or Use micro-recording devices known as thermistors		0.2º C
pH	SM4500-H^+ B	N/A	N/A

NONCONVENTIONAL PARAMETERS

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL) [2]** ***µg/L unless specified***
Total Alkalinity	SM2320-B		5 mg/L as CaCO3
Chlorine, Total Residual	SM4500 Cl G		50.0
Color	SM2120 B/C/E		10 color units
Fecal Coliform	SM 9221D/E,9222	N/A	N/A
Fluoride (16984-48-8)	SM4500-F E	25	100
Nitrate-Nitrite (as N)	SM4500-NO3-E/F/H		100
Nitrogen, Total Kjeldahl (as N)	SM4500-NH3-C/E/FG		300
Ortho-Phosphate (PO_4 as P)	SM4500- PE/PF	3	10
Phosphorus, Total (as P)	SM4500-PE/PF	3	10
Oil and Grease (HEM)	1664A	1,400	5,000
Salinity	SM2520-B		3 PSS
Settleable Solids	SM2540 -F		100
Sulfate (as mg/L SO_4)	SM4110-B		200
Sulfide (as mg/L S)	SM4500-S^2F/D/E/G		200
Sulfite (as mg/L SO_3)	SM4500-SO3B		2000
Total Coliform	SM 9221B, 9222B, 9223B	N/A	N/A
Total dissolved solids	SM2540 C		20 mg/L
Total Hardness	SM2340B		200 as CaCO3
Aluminum, Total (7429-90-5)	200.8	2.0	10
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
Cobalt, Total (7440-48-4)	200.8	0.05	0.25
Iron, Total (7439-89-6)	200.7	12.5	50
Magnesium, Total (7439-95-4)	200.7	10	50
Molybdenum, Total (7439-98-7)	200.8	0.1	0.5
Manganese, Total (7439-96-5)	200.8	0.1	0.5
NWTPH Dx	Ecology NWTPH Dx	250	250
NWTPH Gx	Ecology NWTPH Gx	250	250
Tin, Total (7440-31-5)	200.8	0.3	1.5
Titanium, Total (7440-32-6)	200.8	0.5	2.5

PRIORITY POLLUTANTS

Pollutant & CAS No. ***(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 (7440-36-0)	200.8	0.3	1.0
Arsenic, Total (7440-38-2)	200.8	0.1	0.5
Beryllium, Total (7440-41-7)	200.8	0.1	0.5
Cadmium, Total (7440-43-9)	200.8	0.05	0.25
Chromium (hex) dissolved (18540-29-9)	SM3500-Cr EC	0.3	1.2
Chromium, Total (7440-47-3)	200.8	0.2	1.0
Copper, Total (7440-50-8)	200.8	0.4	2.0
Lead, Total (7439-92-1)	200.8	0.1	0.5
Mercury, Total (7439-97-6)	1631E	0.0002	0.0005
Nickel, Total (7440-02-0)	200.8	0.1	0.5
Selenium, Total (7782-49-2)	200.8	1.0	1.0
Silver, Total (7440-22-4)	200.8	0.04	0.2
Thallium, Total (7440-28-0)	200.8	0.09	0.36
Zinc, Total (7440-66-6)	200.8	0.5	2.5
Cyanide, Total (57-12-5)	335.4	5	10
Cyanide, Weak Acid Dissociable	SM4500-CN I	5	10
Cyanide, Free Amenable to Chlorination (Available Cyanide)	SM4500-CN G	5	10
Phenols, Total	EPA 420.1		50

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
ACID COMPOUNDS			
2-Chlorophenol (95-57-8)	625	1.0	2.0
2,4-Dichlorophenol (120-83-2)	625	0.5	1.0
2,4-Dimethylphenol (105-67-9)	625	0.5	1.0
4,6-dinitro-o-cresol (534-52-1) (2-methyl-4,6,-dinitrophenol)	625/1625B	1.0	2.0
2,4 dinitrophenol (51-28-5)	625	1.0	2.0
2-Nitrophenol (88-75-5)	625	0.5	1.0
4-nitrophenol (100-02-7)	625	0.5	1.0
Parachlorometa cresol (59-50-7) (4-chloro-3-methylphenol)	625	1.0	2.0
Pentachlorophenol (87-86-5)	625	0.5	1.0
Phenol (108-95-2)	625	2.0	4.0
2,4,6-Trichlorophenol (88-06-2)	625	2.0	4.0

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
VOLATILE COMPOUNDS			
Acrolein (107-02-8)	624	5	10
Acrylonitrile (107-13-1)	624	1.0	2.0
Benzene (71-43-2)	624	1.0	2.0
Bromoform (75-25-2)	624	1.0	2.0
Carbon tetrachloride (56-23-5)	624/601 or SM6230B	1.0	2.0
Chlorobenzene (108-90-7)	624	1.0	2.0
Chloroethane (75-00-3)	624/601	1.0	2.0
2-Chloroethylvinyl Ether (110-75-8)	624	1.0	2.0
Chloroform (67-66-3)	624 or SM6210B	1.0	2.0
Dibromochloromethane (124-48-1)	624	1.0	2.0
1,2-Dichlorobenzene (95-50-1)	624	1.9	7.6
1,3-Dichlorobenzene (541-73-1)	624	1.9	7.6
1,4-Dichlorobenzene (106-46-7)	624	4.4	17.6
Dichlorobromomethane (75-27-4)	624	1.0	2.0
1,1-Dichloroethane (75-34-3)	624	1.0	2.0
1,2-Dichloroethane (107-06-2)	624	1.0	2.0
1,1-Dichloroethylene (75-35-4)	624	1.0	2.0
1,2-Dichloropropane (78-87-5)	624	1.0	2.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) (542-75-6)[3]	624	1.0	2.0
Ethylbenzene (100-41-4)	624	1.0	2.0
Methyl bromide (74-83-9) (Bromomethane)	624/601	5.0	10.0
Methyl chloride (74-87-3) (Chloromethane)	624	1.0	2.0
Methylene chloride (75-09-2)	624	5.0	10.0
1,1,2,2-Tetrachloroethane (79-34-5)	624	1.9	2.0
Tetrachloroethylene (127-18-4)	624	1.0	2.0
Toluene (108-88-3)	624	1.0	2.0
1,2-Trans-Dichloroethylene (156-60-5) (Ethylene dichloride)	624	1.0	2.0
1,1,1-Trichloroethane (71-55-6)	624	1.0	2.0
1,1,2-Trichloroethane (79-00-5)	624	1.0	2.0
Trichloroethylene (79-01-6)	624	1.0	2.0
Vinyl chloride (75-01-4)	624/SM6200B	1.0	2.0

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. *(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 (83-32-9)	625	0.2	0.4
Acenaphthylene (208-96-8)	625	0.3	0.6
Anthracene (120-12-7)	625	0.3	0.6
Benzidine (92-87-5)	625	12	24
Benzyl butyl phthalate (85-68-7)	625	0.3	0.6
Benzo(*a*)anthracene (56-55-3)	625	0.3	0.6
Benzo(b)fluoranthene (3,4-benzofluoranthene) (205-99-2)[4]	610/625	0.8	1.6
Benzo(j)fluoranthene (205-82-3)[4]	625	0.5	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) (207-08-9)[4]	610/625	0.8	1.6
Benzo(r,s,t)pentaphene (189-55-9)	625	0.5	1.0
Benzo(*a*)pyrene (50-32-8)	610/625	0.5	1.0
Benzo(*ghi*)Perylene (191-24-2)	610/625	0.5	1.0
Bis(*2-chloroethoxy)*methane (111-91-1)	625	5.3	21.2
Bis(*2-chloroethyl*)ether (111-44-4)	611/625	0.3	1.0
Bis(*2-chloroisopropyl*)ether (39638-32-9)	625	0.3	0.6
Bis(*2-ethylhexyl*)phthalate (117-81-7)	625	0.1	0.5
4-Bromophenyl phenyl ether (101-55-3)	625	0.2	0.4
2-Chloronaphthalene (91-58-7)	625	0.3	0.6
4-Chlorophenyl phenyl ether (7005-72-3)	625	0.3	0.5
Chrysene (218-01-9)	610/625	0.3	0.6
Dibenzo (a,j)acridine (224-42-0)	610M/625M	2.5	10.0
Dibenzo (a,h)acridine (226-36-8)	610M/625M	2.5	10.0
Dibenzo(a-*h*)anthracene (53-70-3)(1,2,5,6-dibenzanthracene)	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 (91-94-1)	605/625	0.5	1.0
Diethyl phthalate (84-66-2)	625	1.9	7.6

Pollutant & CAS No. *(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)			
Dimethyl phthalate (131-11-3)	625	1.6	6.4
Di-n-butyl phthalate (84-74-2)	625	0.5	1.0
2,4-dinitrotoluene (121-14-2)	609/625	0.2	0.4
2,6-dinitrotoluene (606-20-2)	609/625	0.2	0.4
Di-n-octyl phthalate (117-84-0)	625	0.3	0.6
1,2-Diphenylhydrazine (*as Azobenzene*) (122-66-7)	1625B	5.0	20
Fluoranthene (206-44-0)	625	0.3	0.6
Fluorene (86-73-7)	625	0.3	0.6
Hexachlorobenzene (118-74-1)	612/625	0.3	0.6
Hexachlorobutadiene (87-68-3)	625	0.5	1.0
Hexachlorocyclopentadiene (77-47-4)	1625B/625	0.5	1.0
Hexachloroethane (67-72-1)	625	0.5	1.0
Indeno(*1,2,3-cd*)Pyrene (193-39-5)	610/625	0.5	1.0
Isophorone (78-59-1)	625	0.5	1.0
3-Methyl cholanthrene (56-49-5)	625	2.0	8.0
Naphthalene (91-20-3)	625	0.3	0.6
Nitrobenzene (98-95-3)	625	0.5	1.0
N-Nitrosodimethylamine (62-75-9)	607/625	2.0	4.0
N-Nitrosodi-n-propylamine (621-64-7)	607/625	0.5	1.0
N-Nitrosodiphenylamine (86-30-6)	625	0.5	1.0
Perylene (198-55-0)	625	1.9	7.6
Phenanthrene (85-01-8)	625	0.3	0.6
Pyrene (129-00-0)	625	0.3	0.6
1,2,4-Trichlorobenzene (120-82-1)	625	0.3	0.6

Pollutant & CAS No. *(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 (176-40-16)	1613B	1.3 pg/L	5 pg/L

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
PESTICIDES/PCBs			
Aldrin (309-00-2)	608	0.025	0.05
alpha-BHC (319-84-6)	608	0.025	0.05
beta-BHC (319-85-7)	608	0.025	0.05
gamma-BHC (58-89-9)	608	0.025	0.05
delta-BHC (319-86-8)	608	0.025	0.05
Chlordane (57-74-9) [5]	608	0.025	0.05
4,4'-DDT (50-29-3)	608	0.025	0.05
4,4'-DDE (72-55-9)	608	0.025	0.05[10]
4,4' DDD (72-54-8)	608	0.025	0.05
Dieldrin (60-57-1)	608	0.025	0.05
alpha-Endosulfan (959-98-8)	608	0.025	0.05
beta-Endosulfan (33213-65-9)	608	0.025	0.05
Endosulfan Sulfate (1031-07-8)	608	0.025	0.05
Endrin (72-20-8)	608	0.025	0.05
Endrin Aldehyde (7421-93-4)	608	0.025	0.05
Heptachlor (76-44-8)	608	0.025	0.05
Heptachlor Epoxide (1024-57-3)	608	0.025	0.05
PCB-1242 (53469-21-9) [6]	608	0.25	0.5
PCB-1254 (11097-69-1)	608	0.25	0.5
PCB-1221 (11104-28-2)	608	0.25	0.5
PCB-1232 (11141-16-5)	608	0.25	0.5
PCB-1248 (12672-29-6)	608	0.25	0.5
PCB-1260 (11096-82-5)	608	0.13	0.5
PCB-1016 (12674-11-2) [6]	608	0.13	0.5
Toxaphene (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, or 5) x 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. 1, 3-dichloroproylene (mixed isomers) You may report this parameter as two separate parameters: cis-1, 3-dichlorpropropene (10061-01-5) and trans-1, 3-dichloropropene (10061-02-6).

4. Total Benzofluoranthenes - Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.

5. 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.

6. PCB 1016 & PCB 1242 – You may report these two PCB compounds as one parameter called PCB 1016/1242.

Appendix B: Iron Horse Brewery Permit

Issuance Date: September 26, 2019
Effective Date: November 1, 2019
Expiration Date: October 31, 2024

State Waste Discharge Permit Number ST0501278

State of Washington
DEPARTMENT OF ECOLOGY
Central Regional 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, as amended,

Iron Horse Brewery
1621 Vantage Highway
Ellensburg, WA 98926

is authorized to discharge wastewater in accordance with the special and general conditions which follow.

Facility Location: 1621 Vantage Highway, Ellensburg, WA 98926 Contact at facility: Gregory Parker 509-607-0545	SIC Code: 2082 NAICS Code: 312120
Industry Type: Brewery POTW Receiving Discharge: Ellensburg Publicly-Owned Treatment Works	Significant Industrial User: Yes 40 CFR 403.5 Pretreatment Requirements

David B. Bowen
Section Manager
Water Quality Program
Central Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals ***4***

Special Conditions ***5***

S1. Discharge limits **5**

S2. Monitoring requirements **6**

S2.A. Monitoring requirements 6
S2.B. Sampling and analytical procedures 6
S2.C. Flow measurement and continuous monitoring devices 7
S2.D. Laboratory accreditation 7
S2.E. Request for reduction in monitoring 7

S3. Reporting and recording requirements **8**

S3.A. Discharge monitoring reports 8
S3.B. Permit Submittals and Schedules 9
S3.C. Records retention 10
S3.D. Recording of results 10
S3.E. Additional monitoring by the Permittee 10
S3.F. Reporting permit violations 10
S3.G. Other reporting 12
S3.H. Maintaining a copy of this permit 12
S3.I. Dangerous waste discharge notification 13
S3.J. Spill notification 13

S4. Operation and maintenance **13**

S4.A. Operations and maintenance manual 13
S4.B. Bypass procedures 14
S4.C. Best management practices\pollution prevention program 16

S5. Prohibited discharges **17**

S5.A. General prohibitions 17
S5.B. Specific prohibitions 17
S5.C. Prohibited unless approved 17

S6. Dilution prohibited **18**

S7. Solid waste disposal **18**

S7.A. Solid waste handling 18
S7.B. Leachate 18
S7.C. Solid waste control plan 18

S8. Application for permit renewal or modification for facility changes **19**

S9. Spill control plan **19**

A. Spill control plan submittals and requirements 19
B. Spill control plan components 20

S10. Slug discharge control plan 20

General Conditions 21

G1. Signatory requirements 21

G2. Right of entry 22

G3. Permit actions 22

G4. Reporting a cause for modification 23

G5. Plan review required 23

G6. Compliance with other laws and statutes 23

G7. Transfer of this permit 23

G8. Reduced production for compliance 24

G9. Removed substances 24

G10. Payment of fees 24

G11. Penalties for violating permit conditions 24

G12. Duty to provide information 24

G13. Duty to comply 25

Appendix A—List Of Pollutants With Analytical Methods, Detection Limits And Quantitation Levels 26

Appendix B—Industrial User Contract 44

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	Discharge Monitoring Report (DMR)	Monthly	**December 15, 2019**
S3.F	Reporting Permit Violations	As necessary	
S4.A.	Operation and Maintenance Manual	1/permit cycle	**May 1, 2020**
S4.A.	O&M Manual Update or Review Confirmation Letter	Annually	**May 1, 2021**
S4.B	Reporting Bypasses	As necessary	
S4.C.	Best Management Practices/Pollution Prevention Plan	1/permit cycle	**May 31, 2024**
S7.C.	Solid Waste Control Plan	1/permit cycle	**October 31, 2023**
S8.	Application for Permit Renewal	1/permit cycle	**October 31, 2023**
S9.	Spill Plan	1/permit cycle	**January 1, 2022**
S10.	Slug Discharge Control Plan	1/permit cycle	**January 1, 2022**
G1.	Notice of Change in Authorization	As necessary	
G4.	Permit Application for Substantive Changes to the Discharge	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	

Special Conditions

S1. Discharge 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 concentration in excess of, that authorized by this permit violates the terms and conditions of this permit.

A discharge of any pollutant in excess of local limits established by the contract negotiated between the facility and the Ellensburg POTW violates the terms and conditions of this permit. The effluent allocations in the contract constitute the enforceable limits of this permit. Those limits are contained in Appendix A of the Operations and Maintenance (O&M) Manual. This permit anticipates that the facility and the Ellensburg POTW will renegotiate the user contract during the course of this permit.

Upon establishment of a new industrial user contract, the facility must submit the contract within 10 working days to Ecology for approval. Upon approval, the contract will be incorporated into the O&M Manual as an amendment to Appendix A and the limitations established in the new contract will become the enforceable limits of this permit.

A copy of the current industrial user contract (Schedule A) is located in Appendix B of this permit.

S2. Monitoring requirements

S2.A. Monitoring requirements

The Permittee must monitor in accordance with the following schedule and the requirements specified in Appendix A.

Parameter	Units	Sampling Frequency	Sample Type
(1) Final Wastewater Effluent			
Flow	gallons/day (gpd)	Daily	Metered/Recorded
Biochemical Oxygen Demand (BOD_5)	mg/L	2/month (Once every 2 weeks)	Grab [a]
Total Suspended Solids (TSS)	mg/L	2/month (Once every 2 weeks)	Grab
pH Maximum	Standard Units	Daily	Continuous [b]
pH Minimum	Standard Units	Daily	Continuous

a	Grab means an individual sample collected over a fifteen (15) minute, or less, period.
b	Continuous means uninterrupted except for brief lengths of time for calibration, power failure, or unanticipated equipment repair or maintenance. The Permittee must sample daily when continuous monitoring is not possible.

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, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions affecting effluent quality.

Sampling and analytical methods used to meet the water and wastewater monitoring requirements specified in this permit must conform to the latest revision of the following rules and documents unless otherwise specified in this permit or approved in writing by Ecology.

- Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136
- Standard Methods for the Examination of Water and Wastewater (APHA)

S2.C. Flow measurement and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow 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. 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.
4. Establish a calibration frequency for each device or instrument in the O&M manual that conforms to the frequency recommended by the manufacturer.
5. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
6. Maintain calibration records for at least three years.

S2.D. Laboratory accreditation

The Permittee must ensure that all monitoring required by Ecology for permit specified parameters are analyzed 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.

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 **November 1, 2019** (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. 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.
5. 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.

6. 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.

7. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.

8. 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.

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.

When another permit condition requires submittal of a paper (hard-copy) report, the Permittee must ensure that it is postmarked or received by Ecology no later than the dates specified by this permit. Send these paper reports to Ecology at:

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 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 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 report any noncompliance that may endanger health or the environment immediately to the Department of Ecology's Regional Office 24-hr. number listed below:

Central Regional Office 509-575-2490

b. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology within 24 hours from the time they become 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 S4.B., “Bypass Procedures”).
3. Any upset that causes an exceedance of an effluent limit in the permit. 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.
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Appendix B 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. This requirement does not include industrial process wastewater overflows to impermeable surfaces which are collected and routed to the treatment works.

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.

S3.I. Dangerous waste discharge notification

The Permittee must notify the publicly owned treatment works (POTW) and Ecology in writing of the intent to discharge into the POTW any substance designated as a dangerous waste in accordance with the provisions of WAC 173-303-070. It must make this notification at least 90 days prior to the date that it proposes to initiate the discharge. The Permittee must not discharge this substance until authorized by Ecology and the POTW. It must also comply with the notification requirements of Special Condition S8 and General Condition G4.

S3.J. Spill notification

The Permittee must notify the POTW immediately (as soon as discovered) of all discharges that could cause problems to the POTW, such as process spills and unauthorized discharges (including slug discharges).

S4. Operation and maintenance

The Permittee must, at all times, properly operate and maintain all facilities or 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 includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a Permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

S4.A. Operations and maintenance manual

a. O&M manual submittal and requirements

The Permittee must:

1. Prepare an Operations and Maintenance (O&M) Manual that meets the requirements of WAC 173-240-150 and submit it to Ecology for approval by May 1, 2020.
2. Review the O&M Manual at least annually and confirm this review by letter to Ecology by May 1 of each year.
3. Submit to Ecology for review substantial changes or updates to the O&M Manual whenever it incorporates them into the manual.
4. Keep the approved O&M Manual at the permitted facility.
5. Follow the instructions and procedures of this manual.

b. O&M manual components

In addition to the requirements of WAC 173-240-150, the O&M manual must include:

1. Emergency procedures for plant shutdown and cleanup in event of wastewater system upset, spill, failure, or demand by the publicly owned treatment works (POTW) treating the discharge.
2. Wastewater system maintenance procedures that contribute to the generation of process wastewater.
3. 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.)
4. Wastewater sampling protocols and procedures for compliance with the sampling and reporting requirements in the wastewater discharge permit.
5. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.
6. Treatment plant process control monitoring schedule.
7. As an appendix, the most recent Industrial User Contract with the City of Ellensburg
8. As appendices, the Solid Waste Control Plan, Spill Plan, and Slug Discharge Control Plan, if applicable.

S4.B. 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 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.
      - Stopping production.
      - 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. The Permittee has properly notified Ecology of the bypass as required in Condition S3.E 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.

S4.C. Best management practices\pollution prevention program

Any activity which is associated with the industrial manufacturing or treatment process is subject to BMP's. The facility must evaluate all aspects of operation and develop a plan for pollution prevention by **May 31, 2024**. At a minimum the facility shall evaluate the following areas: material storage areas, waste storage areas, loading/unloading areas, stormwater management features, outfall areas, facility run-on/run-off.

S5. Prohibited discharges

The Permittee must comply with these General and Specific Prohibitions.

S5.A. General prohibitions

The Permittee must not introduce into the POTW pollutant(s), which cause Pass Through or Interference.

S5.B. Specific prohibitions

In addition, the Permittee must not introduce the following into the POTW:

1. 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 60 degrees C (140 degrees F) using the test methods specified in 40 CFR 261.21
2. Solid or viscous pollutants in amounts, which will cause obstruction to the flow in the POTW resulting in interference
3. Any pollutant (including oxygen-demanding pollutants (BOD_5, etc.), released in a discharge at a flow rate and/or pollutant concentration that will cause interference with the POTW
4. Heat in amounts which will inhibit biological activity in the POTW resulting in interference, but in no case heat in such quantities that the temperature at the POTW treatment plant exceeds 40 degrees C (104 degrees F) unless the approval authority, upon request of the POTW, approves alternative temperature limits
5. Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through
6. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems
7. Any trucked or hauled pollutants, except at discharge points designated by the POTW
8. Pollutants that will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0 or greater than 11.0, unless the collection and treatment system is specifically designed to accommodate such discharges.

S5.C. Prohibited unless approved

Any of the following discharges are prohibited unless approved by Ecology under extraordinary circumstances (such as a lack of direct discharge

alternatives due to combined sewer service or a need to augment sewage flows due to septic conditions):

1. Noncontact cooling water in significant volumes
2. Storm water and other direct inflow sources
3. 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 discharge of dangerous wastes as defined in Chapter 173-303 WAC (Unless specifically authorized in this permit)

S6. Dilution prohibited

The Permittee must not dilute the wastewater discharge with stormwater or increase the use of potable water, process water, noncontact cooling water, or, in any way, attempt to dilute an effluent as a partial or complete substitute for adequate treatment to achieve compliance with the limits contained in this permit.

S7. Solid waste disposal

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.

S7.C. Solid waste control plan

a. Submittal requirements

The Permittee must:

1. Submit a solid waste control plan to Ecology by January 1, 2022.

2. Submit to Ecology any proposed revision or modification of the solid waste control plan for review and approval at least 30 days prior to implementation
3. Comply with the plan and any modifications.
4. Submit an update of the solid waste control plan by **October 31, 2023**.

b. Solid waste control plan content

The solid waste control plan must:

1. Follow Ecology's guidance for preparing a solid waste control plan (https://fortress.wa.gov/ecy/publications/documents/0710024.pdf) and address all solid wastes generated by the permittee.
2. Include at a minimum a description, source, generation rate, and disposal methods of these solid wastes.
3. Not conflict with local or state solid waste regulations.

S8. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit by **October 31, 2023**.

The Permittee must also submit a new application or addendum 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. Spill control plan

A. Spill control plan submittals and requirements

The Permittee must:

1. Submit to Ecology a spill control plan for the prevention, containment, and control of spills or unplanned releases of pollutants by **January 1, 2022**.
2. Review the plan at least annually and update the spill plan as needed.
3. Send changes to the plan to Ecology.
4. Follow the plan and any supplements throughout the term of the permit.

B. Spill control plan components

The spill control plan must include the following:

1. A list of all oil and petroleum products and other materials used and/or stored on-site, which when spilled, or otherwise released into the environment, designate as Dangerous Waste (DW) or Extremely Hazardous Waste (EHW) by the procedures set forth in WAC 173-303-070. Include other materials used and/or stored on-site, which may become pollutants or cause pollution upon reaching state's waters.
2. A description of preventive measures and facilities (including an overall facility plot showing drainage patterns) which prevent, contain, or treat spills of these materials.
3. A description of the reporting system the Permittee will use to alert responsible managers and legal authorities in the event of a spill.
4. A description of operator training to implement the plan.

The Permittee may submit plans and manuals required by 40 CFR Part 112, contingency plans required by Chapter 173-303 WAC, or other plans required by other agencies, which meet the intent of this section.

S10. Slug discharge control plan

a. Slug discharge control plan submittal and requirements

The Permittee must:

1. Prepare and submit to Ecology, by **January 1, 2022**, a plan to minimize the potential of slug discharges from the facility covered by this permit. The plan and any subsequent revisions become effective 30 days following submission.
2. Submit all revisions or updates of this plan to Ecology for review and approval.
3. Keep the current approved plan on the plant site and make it readily available to facility personnel.
4. Follow the approved plan and any approved supplements throughout the term of the permit.

b. Slug discharge control plan components

The slug discharge control plan must include the following information and procedures relating to the prevention of unauthorized slug discharges; it must include:

1. A description of a reporting system the Permittee will use to immediately notify facility management, the POTW operator, and appropriate state, federal, and local authorities of any slug discharges, and provisions to provide a written follow-up report within five days.
2. A description of operator training, equipment, and facilities (including overall facility plan) for preventing, containing, or treating slug discharges.
3. Procedures to prevent adverse impact from accidental spills including:
    a. Inspection and maintenance of storage areas
    b. Handling and transfer of materials
    c. Loading and unloading operations
    d. Control of plant site run-off
    e. Worker training
    f. Building of containment structures or equipment
    g. Measures for containing toxic organic pollutants (including solvents)
    h. Measures and equipment for emergency response
4. A list of all raw materials, products, chemicals, and hazardous materials used, processed, or stored at the facility; the normal quantity maintained on the premises for each listed material; and a map showing where they are located.
5. A description of discharge practices for batch and continuous processes under normal and non-routine circumstances.
6. A brief description of any unauthorized discharges which occurred during the 36-month period preceding the effective date of this permit and subsequent measures taken by Permittee to prevent or to reduce the possibility of further unauthorized discharges.
7. An implementation schedule including additional operator training and procurement and installation of equipment or facilities required to properly implement the plan.

General Conditions

G1. Signatory requirements

All applications, reports, or information submitted to Ecology must be signed as follows:

1. All permit applications must be signed by either a principal executive officer or ranking elected official.
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 the person described above and is submitted to Ecology at the time of authorization, and
b. The authorization specifies 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 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 entry

Representatives of Ecology have the right to enter at all reasonable times in or upon any property, public or private, for the purpose of inspecting and investigating conditions relating to the pollution or the possible pollution of any waters of the state. Reasonable times include normal business hours; hours during which production, treatment, or discharge occurs; or times when Ecology suspects a violation requiring immediate inspection. Representatives of Ecology must be allowed to have access to, and copy at reasonable cost, any records required to be kept under terms and conditions of the permit; to inspect any monitoring equipment or method required in the permit; and to sample the discharge, waste treatment processes, or internal waste streams.

G3. Permit actions

This permit is subject to modification, suspension, or termination, in whole or in part by Ecology for any of the following causes:

1. Violation of any permit term or condition;
2. Obtaining a permit by misrepresentation or failure to disclose all relevant facts;

3. A material change in quantity or type of waste disposal;
4. A material change in the condition of the waters of the state; or
5. Nonpayment of fees assessed pursuant to RCW 90.48.465.

Ecology may also modify this permit, including the schedule of compliance or other conditions, if it determines good and valid cause exists, including promulgation or revisions of regulations or new information.

G4. Reporting a cause for modification

The Permittee must submit a new application, or a supplement to the previous application, along with required engineering plans and reports, whenever a new or increased discharge or change in the nature of the discharge is anticipated which is not specifically authorized by this permit. This application must be submitted at least one hundred eighty (180) days prior to any proposed changes. Submission of this application does not relieve the Permittee of the duty to comply with the existing permit until it is modified or reissued.

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 should be submitted at least 180 days prior to the planned start of construction. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in the permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

This permit is automatically transferred to a new owner or operator if:

1. A written agreement between the old and new owner or operator containing a specific date for transfer of permit responsibility, coverage, and liability is submitted to Ecology;
2. A copy of the permit is provided to the new owner and;
3. Ecology does not notify the Permittee of the need to modify the permit.

Unless this permit is automatically transferred according to Section 1. above, this permit may be transferred only if it is modified to identify the new Permittee and to incorporate such other requirements as determined necessary by Ecology.

G8. Reduced production for compliance

The Permittee must control production or discharge to the extent necessary to maintain compliance with the terms and conditions of this permit upon reduction of efficiency, loss, or failure of its treatment facility until the treatment capacity 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 for 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 effluent stream for discharge.

G10. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology. Ecology may revoke this permit if the permit fees established under Chapter 173-224 WAC are not paid.

G11. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs is a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit incurs, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars 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 a separate and distinct violation.

G12. 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.

G13. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of chapter 90.48 RCW and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

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 CaCO3
Aluminum, Total	7429-90-5	200.8	2.0	10
Ammonia, Total (as N)		SM4500-NH3-B and C/D/E/G/H		20
Barium Total	7440-39-3	200.8	0.5	2.0

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
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
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 CaCO3
Iron, Total	7439-89-6	200.7	12.5	50
Magnesium, Total	7439-95-4	200.7	10	50

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
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-NO3- 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^2F/D/E/G		0.2 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
Sulfite (as mg/L SO_3)		SM4500-SO3B		2 mg/L
Temperature (max. 7-day avg.)		Analog recorder or Use micro-recording devices known as thermistors		0.2º 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

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					
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 C	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
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

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					
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	3.3	9.9
2,4-Dichlorophenol	31	120-83-2	625.1	2.7	8.1
2,4-Dimethylphenol	34	105-67-9	625.1	2.7	8.1
4,6-dinitro-o-cresol (2-methyl-4,6,-dinitrophenol)	60	534-52-1	625.1/1625B	24	72
2,4 dinitrophenol	59	51-28-5	625.1	42	126

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-Nitrophenol	57	88-75-5	625.1	3.6	10.8
4-Nitrophenol	58	100-02-7	625.1	2.4	7.2
Parachlorometa cresol (4-chloro-3-methylphenol)	22	59-50-7	625.1	3.0	9.0
Pentachlorophenol	64	87-86-5	625.1	3.6	10.8
Phenol	65	108-95-2	625.1	1.5	4.5
2,4,6-Trichlorophenol	21	88-06-2	625.1	2.7	8.1

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

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					
Benzene	4	71-43-2	624.1	4.4	13.2
Bromoform	47	75-25-2	624.1	4.7	14.1
Carbon tetrachloride	6	56-23-5	624.1/601 or SM6230B	2.8	8.4
Chlorobenzene	7	108-90-7	624.1	6.0	18.0
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	624.1 or SM6210B	1.6	4.8
Dibromochloromethane (chlordibromomethane)	51	124-48-1	624.1	3.1	9.3
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	2.2	6.6
1,1-Dichloroethane	13	75-34-3	624.1	4.7	14.1

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					
1,2-Dichloroethane	10	107-06-2	624.1	2.8	8.4
1,1-Dichloroethylene	29	75-35-4	624.1	2.8	8.4
1,2-Dichloropropane	32	78-87-5	624.1	6.0	18.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) [6]	33	542-75-6	624.1	5.0	15.0
Ethylbenzene	38	100-41-4	624.1	7.2	21.6
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	624.1	2.8	8.4
1,1,2,2-Tetrachloroethane	15	79-34-5	624.1	6.9	20.7
Tetrachloroethylene	85	127-18-4	624.1	4.1	12.3
Toluene	86	108-88-3	624.1	6.0	18.0
1,2-Trans-Dichloroethylene (Ethylene dichloride)	30	156-60-5	624.1	1.6	4.8
1,1,1-Trichloroethane	11	71-55-6	624.1	3.8	11.4

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					
1,1,2-Trichloroethane	14	79-00-5	624.1	5.0	15.0
Trichloroethylene	87	79-01-6	624.1	1.9	5.7
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	625.1	1.9	5.7
Acenaphthylene	77	208-96-8	625.1	3.5	10.5
Anthracene	78	120-12-7	625.1	1.9	5.7
Benzidine	5	92-87-5	625.1	44	132
Benzyl butyl phthalate	67	85-68-7	625.1	2.5	7.5
Benzo(*a*)anthracene	72	56-55-3	625.1	7.8	23.4

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(b)fluoranthene (3,4-benzofluoranthene) [7]	74	205-99-2	610/625.1	4.8	14.4
Benzo(j)fluoranthene [7]		**205-82-3**	625	0.5	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) [7]	75	207-08-9	610/625.1	2.5	7.5
Benzo(r,s,t)pentaphene		**189-55-9**	625	1.3	5.0
Benzo(*a*)pyrene	73	50-32-8	610/625.1	2.5	7.5
Benzo(*ghi*)Perylene	79	191-24-2	610/625.1	4.1	12.3
Bis(*2-chloroethoxy)*methane	43	111-91-1	625.1	5.3	15.9
Bis(*2-chloroethyl*)ether	18	111-44-4	611/625.1	5.7	17.1
Bis(*2-chloroisopropyl*)ether	42	39638-32-9	625	0.5	1.0
Bis(*2-ethylhexyl*)phthalate	66	117-81-7	625.1	2.5	7.5
4-Bromophenyl phenyl ether	41	101-55-3	625.1	1.9	5.7
2-Chloronaphthalene	20	91-58-7	625.1	1.9	5.7
4-Chlorophenyl phenyl ether	40	7005-72-3	625.1	4.2	12.6
Chrysene	76	218-01-9	610/625.1	2.5	7.5

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)					
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-*h*)anthracene (1,2,5,6-dibenzanthracene)	82	53-70-3	625.1	2.5	7.5
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	605/625.1	16.5	49.5
Diethyl phthalate	70	84-66-2	625.1	1.9	5.7
Dimethyl phthalate	71	131-11-3	625.1	1.6	4.8
Di-n-butyl phthalate	68	84-74-2	625.1	2.5	7.5
2,4-dinitrotoluene	35	121-14-2	609/625.1	5.7	17.1
2,6-dinitrotoluene	36	606-20-2	609/625.1	1.9	5.7
Di-n-octyl phthalate	69	117-84-0	625.1	2.5	7.5
1,2-Diphenylhydrazine (*as Azobenzene*)	37	122-66-7	1625B	5.0	20
Fluoranthene	39	206-44-0	625.1	2.2	6.6

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)					
Fluorene	80	86-73-7	625.1	1.9	5.7
Hexachlorobenzene	9	118-74-1	612/625.1	1.9	5.7
Hexachlorobutadiene	52	87-68-3	625.1	0.9	2.7
Hexachlorocyclopentadiene	53	77-47-4	1625B/625	2.0	4.0
Hexachloroethane	12	67-72-1	625.1	1.6	4.8
Indeno(*1,2,3-cd*)Pyrene	83	193-39-5	610/625.1	3.7	11.1
Isophorone	54	78-59-1	625.1	2.2	6.6
3-Methyl cholanthrene		**56-49-5**	625	2.0	8.0
Naphthalene	55	91-20-3	625.1	1.6	4.8
Nitrobenzene	56	98-95-3	625.1	1.9	5.7
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	1.0	2.0
Perylene		**198-55-0**	625	1.9	7.6

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)					
Phenanthrene	81	85-01-8	625.1	5.4	16.2
Pyrene	84	129-00-0	625.1	1.9	5.7
1,2,4-Trichlorobenzene	8	120-82-1	625.1	1.9	5.7

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	608.3	4.0 ng/L	12 ng/L
alpha-BHC	102	319-84-6	608.3	3.0 ng/L	9.0 ng/L
beta-BHC	103	319-85-7	608.3	6.0 ng/L	18 ng/L
gamma-BHC (Lindane)	104	58-89-9	608.3	4.0 ng/L	12 ng/L
delta-BHC	105	319-86-8	608.3	9.0 ng/L	27 ng/L
Chlordane [8]	91	57-74-9	608.3	14 ng/L	42 ng/L
4,4'-DDT	92	50-29-3	608.3	12 ng/L	36 ng/L
4,4'-DDE	93	72-55-9	608.3	4.0 ng/L	12 ng/L
4,4' DDD	94	72-54-8	608.3	11ng/L	33 ng/L
Dieldrin	90	60-57-1	608.3	2.0 ng/L	6.0 ng/L
alpha-Endosulfan	95	959-98-8	608.3	14 ng/L	42 ng/L
beta-Endosulfan	96	33213-65-9	608.3	4.0 ng/L	12 ng/L
Endosulfan Sulfate	97	1031-07-8	608.3	66 ng/L	198 ng/L
Endrin	98	72-20-8	608.3	6.0 ng/L	18 ng/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					
Endrin Aldehyde	99	7421-93-4	608.3	23 ng/L	70 ng/L
Heptachlor	100	76-44-8	608.3	3.0 ng/L	9.0 ng/L
Heptachlor Epoxide	101	1024-57-3	608.3	83 ng/L	249 ng/L
PCB-1242 [9]	106	53469-21-9	608.3	0.065	0.195
PCB-1254	107	11097-69-1	608.3	0.065	0.195
PCB-1221	108	11104-28-2	608.3	0.065	0.195
PCB-1232	109	11141-16-5	608.3	0.065	0.195
PCB-1248	110	12672-29-6	608.3	0.065	0.195
PCB-1260	111	11096-82-5	608.3	0.065	0.195
PCB-1016 [9]	112	12674-11-2	608.3	0.065	0.195
Toxaphene	113	8001-35-2	608.3	240 ng/L	720 ng/L

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, or 5) x 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 https://fortress.wa.gov/ecy/publications/documents/97602.pdf

5. NWTPH Gx - Northwest Total Petroleum Hydrocarbons Gasoline Extended Range – see https://fortress.wa.gov/ecy/publications/documents/97602.pdf

6. 1, 3-dichloroproylene (mixed isomers) You may report this parameter as two separate parameters: cis-1, 3-dichlorpropropene (10061-01-5) and trans-1, 3-dichloropropene (10061-02-6).

7. Total Benzofluoranthenes - Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.

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 14/42 ng/L.

9. PCB 1016 & PCB 1242 – You may report these two PCB compounds as one parameter called PCB 1016/1242.

Appendix B—Industrial User Contract

CITY OF ELLENSBURG
INDUSTRIAL WASTEWATER DISCHARGE AGREEMENT

In accordance with the provisions of city of Ellensburg City Code chapter 9.25.370

Iron Horse Brewery
1621 Vantage Highway
Ellensburg, WA 98926

Is hereby authorized to discharge industrial wastewater from the brewing activities at the above identified facility and through the discharge point identified herein in this agreement. Compliance with this agreement does not relieve Iron Horse Brewery of its obligation to comply with any applicable pretreatment regulations, standards, or requirements under local, state, and federal laws, including any such regulations, standards, or laws, that may become effective during the terms of this agreement.

Non-compliance with any term or condition of this agreement shall constitute a violation of the Ellensburg City Code, Section 9.25.370. All terms and definitions are the same as those found in Chapter 9.25 of the Ellensburg City Code. This agreement incorporates by reference all of the applicable provisions of the Ellensburg City Code, including but not limited to Section 9.25.370.

This agreement shall become effective on December 1, 2018, and shall expire on November 30, 2023, unless modified or terminated earlier.

Iron Horse Brewery and the City of Ellensburg will re-negotiate this agreement 90 days prior to expiration.

Authorization to Discharge
Capacity Limit

December 1, 2018 – November 30, 2023

In accordance with the provisions of City of Ellensburg City Code 9.25.370 PRETREATMENT OF SEWAGE

Industry name and site location: Iron Horse Brewery
Mailing Address: 1621 Vantage Highway
Ellensburg, WA 98926

is hereby authorized to discharge wastewater from the above-identified facility into the City of Ellensburg's collection system in accordance with the capacity limitations as set forth in this authorization.

Brewing Wastewater:

Iron Horse Brewery will be allowed to discharge the following:

Maximum Daily Discharge Limitations	Average Monthly Discharge Limitations
Total BOD = 25,000 mg/l	Total BOD = 19,000 mg/l
TSS = 8,000 mg/l	TSS = 5,000 mg/l
Flow = 13,000 gallons/day	Flow = 8,000 gallons/day
pH = > 5.5 and < 9.0	pH = > 5.5 and < 9.0

Iron Horse Brewery is strongly advised to limit their yeast discharge as this has a detrimental effect on the treatment plant bacteria.

Sampling and testing will be performed by Iron Horse Brewery consisting of Total BOD mg/L, TSS mg/L, and pH every two weeks. Flow and pH measurement will be taken daily. Sampling and testing schedules pertain to when Iron Horse Brewery is discharging to the City sewer.

All sample analysis for BOD and TSS will be performed by a Department of Ecology accredited Laboratory. Iron Horse Brewery personnel will perform the analysis for pH, and make any necessary adjustments to pH levels prior to discharge into the City sewer system. pH samples will be grab samples.

Composite samples will be taken by the City to randomly perform BOD, TSS, and pH in the Ellensburg wastewater laboratory. Random testing will be done at the City's expense. Discharges in excess of the above limitations will be reported to Iron Horse Brewery and the Department of Ecology.

Strength fees will be determined from tests performed by Iron Horse Brewery and the City of Ellensburg.

If at any time Iron Horse Brewery exceeds the limits, Iron Horse Brewery must apply for additional capacity at the City's WWTP if it is available, and is responsible for all costs involved.

This charge would be in addition to any **strong waste surcharge** applied to wastewater with a BOD and/or TSS concentration greater than 200 and 250 mg/L respectively.

All discharges authorized will be consistent with the terms and conditions of this agreement. The discharge of the listed pollutants at a level in excess of that authorized will constitute a violation if additional capacity is not applied for by Iron Horse Brewery upon notification by the City, and authorized by the City.

If additional capacity is not available to be allocated, Iron Horse Brewery must modify its process to accommodate the discharge capacity limits as outlined by this Agreement to Discharge.

Either party may request an amendment to this agreement due to changing circumstances. Requests for changes must be submitted in writing, a minimum of thirty days prior to any renegotiation.

All monitoring records will be maintained for a minimum of 3 years.

Iron Horse Brewery will allow the City of Ellensburg Representative to enter and inspect Iron Horse Brewery premises where a regulated facility or activity is located or conducted. The City representative will be allowed access to and copy, at reasonable time, any records that must be kept as conditions of this agreement The City may split samples or set a city sampler to compare sampling results.

The City may seek any or all of the remedies or penalties provided in the Ellensburg City Code, including recovery costs incurred by the City, in response to a violation of this agreement by Iron Horse Brewery.

Process discharge will enter into the City of Ellensburg's collection system through manhole number 68-172 only.

This authorization shall become effective upon issuance of a State discharge permit to Iron Horse Brewery from the Department of Ecology, and will remain effective until November 30, 2023, unless changes in the process or changes in the characteristics of the wastewater occur upon which either party may request amendment in accordance with the above provisions.

By:

CITY OF ELLENSBURG

RYAN LYYSKI, PUBLIC WORKS AND UTILITIES DIRECTOR

APPROVED AS TO FORM:

TERRY WEINER, CITY ATTORNEY

COMPANY

GREG PARKER
TITLE: GENERAL MANAGER

Issued: December 1, 2018

Appendix C: Ellensburg WWTF NPDES Permit

Issuance Date: November 9, 2018
Effective Date: January 1, 2019
Expiration Date: December 31, 2023

National Pollutant Discharge Elimination System
Waste Discharge Permit No. WA0024341

State of Washington
DEPARTMENT OF ECOLOGY
Central Regional Office

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 ELLENSBURG PUBLICLY-OWNED TREATMENT WORKS
2415 CANYON ROAD
ELLENSBURG, WA 98926

is authorized to discharge in accordance with the Special and General Conditions that follow.

Treatment Plant Location: Same as above

Receiving Water Body & I.D. No. (Outfall 001):
Yakima River, River Mile 151.6
ID# 1192269462537

Discharge Location:
Latitude: 46.961825
Longitude: -120.544572

Receiving Water Body I.D. No. (Outfall 002):
Wilson Creek
ID # 1204996469262
Outfall 002 to be used for emergency bypass only.

Discharge Location:
Latitude: 46.968119
Longitude: -120.538764

Treatment Type:
Class III, Activated Sludge, Complete Mix Aeration, Secondary Clarification, Ultraviolet Disinfection and Anaerobic Digestion.

David B Bowen

David B. Bowen
Section Manager, Water Quality Program
Central Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals ***5***

Special Conditions ***7***

S1. Discharge limits **7**
S1.A. Effluent limits 7
S1.B. Mixing zone authorization 8

S2. Monitoring requirements **9**
S2.A. Monitoring schedule 9
S2.B. Sampling and analytical procedures 12
S2.C. Flow measurement, field measurement, and continuous monitoring devices 12
S2.D. Laboratory accreditation 13
S2.E. Request for reduction in monitoring 14

S3. Reporting and recording requirements **14**
S3.A. Discharge monitoring reports 14
S3.B. Permit Submittals and Schedules 16
S3.C. Records retention 16
S3.D. Recording of results 17
S3.E. Additional monitoring by the Permittee 17
S3.F. Reporting permit violations 17
S3.G. Other reporting 19
S3.H. Maintaining a copy of this permit 19

S4. Facility loading **20**
S4.A. Design criteria 20
S4.B. Plans for maintaining adequate capacity 20
S4.C. Duty to mitigate 21
S4.D. Notification of new or altered sources 21
S4.E. Infiltration and inflow evaluation 21
S4.F. Wasteload assessment 22

S5. Operation and maintenance **22**
S5.A. Certified operator 22
S5.B. Operation and maintenance program 23
S5.C. Short-term reduction 23
S5.D. Electrical power failure 23
S5.E. Prevent connection of inflow 24
S5.F. Bypass procedures 24
S5.G. Operations and maintenance (O&M) manual 26

S6. Pretreatment **27**
S6.A. General requirements 27
S6.B. Duty to enforce discharge prohibitions 27
S6.C. Wastewater discharge permit required 28
S6.D. Identification and reporting of existing, new, and proposed industrial users 29

S6.E. Industrial user survey 29

S7. Solid wastes 29
S7.A. Solid waste handling 29
S7.B. Leachate 30

S8. Application for permit renewal or modification for facility changes 30

S9. Compliance schedule 30

S10. Combined sewer overflows 31
S10.A. Authorized combined sewer overflow (CSO) discharge locations 31
S10.B. Nine minimum controls 31
S10.C. Combined sewer overflow report 32
S10.D. Combined sewer overflow reduction plan amendment 33

S11. Acute toxicity 33
S11.A. Testing when there is no permit limit for acute toxicity 33
S11.B. Sampling and reporting requirements 34

S12. Chronic toxicity 35
S12.A. Testing when there is no permit limit for chronic toxicity 35
S12.B. Sampling and reporting requirements 35

General Conditions 36

G1. Signatory requirements 36

G2. Right of inspection and entry 38

G3. Permit actions 38

G4. Reporting planned changes 39

G5. Plan review required 40

G6. Compliance with other laws and statutes 40

G7. Transfer of this permit 40

G8. Reduced production for compliance 41

G9. Removed substances 41

G10. Duty to provide information 41

G11. Other requirements of 40 CFR 41

G12. Additional monitoring 41

G13. Payment of fees 41

G14. Penalties for violating permit conditions 41

G15. Upset 42

G16. Property rights 42

G17. Duty to comply 42

G18. Toxic pollutants 43

G19. Penalties for tampering 43

G20. Compliance schedules 43

G21. Service agreement review 43

Appendix A--List Of Pollutants With Analytical Methods, Detection Limits And Quantitation Levels 44

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	**Monthly** Discharge Monitoring Report (DMR)	Monthly	**February 15, 2019**
S3.A.4.b.	Single Sample Priority Pollutant Data DMR	Four consecutive quarters	**April 1st of each year**
S3.A.4.c.	Permit Renewal Application Monitoring Data	4/permit cycle	**April 15, 2019**
S3.F	Reporting Permit Violations	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	Annually	**October 1, 2019**
S4.F	Wasteload Assessment	1/permit cycle	**December 31, 2022**
S5.F	Bypass Notification	As necessary	
S5.Ga.1.	Operations and Maintenance Manual Update or Review Confirmation Letter	Annually	**January 15th of each year**
S6.B.4	Notify Ecology when Industrial Users violate discharge prohibitions	As necessary	
S6.C.2	Notify Ecology of any proposed discharger which may be a SIU	As necessary	
S6.D	Submit copies of Industrial User notifications letters	As necessary	
S6.E	Industrial User Survey Submittal	1/permit cycle	**January 15, 2020**
S8	Application for Permit Renewal	1/permit cycle	**December 31, 2022**
S9	Compliance schedule – Influent Flow Meter		**January 1, 2020**
S10.C	Combined Sewer Overflow	As necessary	
S10.D	Combined Sewer Overflow Plan Amendment		**January 1, 2020**
S11.A.4.	Acute Toxicity Effluent Test Results with Permit Renewal Application	1/permit cycle	**December 31, 2022**

Permit Section	Submittal	Frequency	First Submittal Date
S12.A.4.	Chronic Toxicity Effluent Test Results with Permit Renewal Application	1/permit cycle	**December 31, 2022**
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 **January 1, 2019**, the Permittee may discharge treated domestic wastewater to the Yakima River, and to Wilson Creek in emergencies, at the permitted location subject to compliance with the following limits:

Effluent Limits: Outfall 001 & Outfall 002 **Outfall 001 Latitude 46.5745 Longitude -120.5478** **Outfall 002 Latitude 46.9883 Longitude -120.5378**		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Biochemical Oxygen Demand (5-day) (BOD_5)	30 milligrams/liter (mg/L) 1,500 pounds/day (lbs/day) 85% removal of influent BOD_5	45 mg/L 2,250 lbs/day
Total Suspended Solids (TSS)	30 mg/L 1,200 lbs/day 85% removal of influent TSS	45 mg/L 1,800 lbs/day
Parameter	**Minimum**	**Maximum**
pH	6.0 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [c]	100/100 milliliter (mL)	200/100 mL
Parameter	**Average Monthly**	**Maximum Daily [d]**
Total Ammonia (as NH3-N)	NA	8.2 mg/L; 547 lbs/day

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	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
d	Maximum daily effluent limit is the highest allowable daily discharge. The daily discharge is the average discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. This does not apply to pH or temperature.

S1.B. Mixing zone authorization

The following paragraph defines the maximum boundaries or flow-volume restriction of the mixing zones:

The length of the chronic and acute mixing zones extends downstream no greater than 300.5 and 30.0 feet, respectively. The width of the chronic and acute mixing zones is no more than 36.2 feet and 25.1 feet, respectively.

Available Dilution (dilution factor)	
Acute Aquatic Life Criteria	7.4
Chronic Aquatic Life Criteria	20.1
Human Health Criteria - Carcinogen	131.4
Human Health Criteria - Non-carcinogen	44.0

S2. Monitoring requirements

S2.A. Monitoring schedule

The Permittee must monitor in accordance with the following schedule and the requirements specified in Appendix A.

Parameter	Units & Speciation	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	Continuous [a]	Measurement
Biochemical Oxygen Demand (BOD_5)	mg/L	3/week [b]	24-hr. composite [c]
Biochemical Oxygen Demand (BOD_5)	lbs/day	3/week	Calculation [d]
Total Suspended Solids (TSS)	mg/L	3/week	24-hr. composite
Total Suspended Solids (TSS)	lbs/day	3/week	Calculation
(2) Final wastewater effluent			
Final Wastewater Effluent means wastewater exiting 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, the Permittee must dechlorinate and reseed the sample.			
Flow	MGD	Continuous	Measurement
BOD_5	mg/L	3/week	24-hr. composite
BOD_5	lbs/day	3/week	Calculation
BOD_5	% Removal	monthly	Calculation [e]
TSS	mg/L	3/week	24-hr. composite
TSS	lbs/day	3/week	Calculation
TSS	% Removal	monthly	Calculation

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Total Ammonia	mg/L	1/week [f]	24-hr. composite
Total Ammonia	lbs/day	1/week	Calculation
Dissolved Oxygen	mg/L	Daily	Grab [g]
pH	Standard Units	5/week	Grab
Temperature [h]	° C	Continuous	Measurement
Fecal Coliform Bacteria	# colonies/ 100ml	3/week	Grab
Total Hardness	mg/L as $CaCO_3$	4/year [i]	24-hr. composite
(3) Whole effluent toxicity testing – final wastewater effluent			
Acute Toxicity Testing		Two quarters / Summer & Winter prior to re-application	24-hr. composite
(4) Whole effluent toxicity testing – final wastewater effluent			
Chronic Toxicity Testing		Two quarters / Spring & Fall prior to re-application	24-hr. composite
(5) Outfall 002 Combined Sewer Overflow to Wilson Creek (Emergencies Only)			
Flow	Total Gallons	1 per event	Calculation
BOD_5	mg/L	1 per event	Grab
TSS	mg/L	1 per event	Grab
Fecal Coliform Bacteria	# colonies/ 100ml	1 per event	Grab
(6) Permit renewal application requirements – final wastewater effluent			
The Permittee must record and report the wastewater treatment plant flow discharged on the day it collects the sample for priority pollutant testing with the discharge monitoring report.			
Total Residual Chlorine	mg/L	Once per year [j]	Grab
Total Kjeldahl Nitrogen	mg/L as N	Once per year [j]	24-Hour composite
Nitrate plus Nitrite	mg/L as N	Once per year [j]	24-Hour composite
Oil and Grease	mg/L	Once per year [j]	Grab

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Phosphorus (Total)	mg/L as P	Once per year [j]	24-Hour composite
Total Dissolved Solids	mg/L	Once per year [j]	24-Hour composite
Cyanide	micrograms/liter (µg/L)	Once per year [j]	Grab
Total Phenolic Compounds	µg/L	Once per year [j]	24-Hour composite
Total Lead	µg/L	Quarterly	24-Hour composite
Priority Pollutants (PP) – Total Metals	µg/L; nanograms(ng/L) for mercury	Four consecutive quarters [k] Same time as WET test samples are collected	24-Hour composite Grab for mercury
PP – Volatile Organic Compounds	µg/L	Four consecutive quarters Same time as WET test samples are collected	Grab
PP – Acid-extractable Compounds	µg/L	Four consecutive quarters Same time as WET test samples are collected	24-Hour composite
PP – Base-neutral Compounds	µg/L	Four consecutive quarters Same time as WET test samples are collected	24-Hour composite

a Continuous means without interruption throughout the operating and discharging hours of the Permittee's facility, except for infrequent shutdowns for maintenance.

b 3/week means three (3) times during each calendar 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 Calculation" 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 Calculate the Percent (%) removal of BOD and TSS using the following algorithm (concentrations in mg/L): (Average Monthly Influent Concentration - Average Monthly Effluent Concentration)/Average Monthly Influent Concentration.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
[f] 1/week means collected once each calendar week, on a rotational basis throughout the days of the week, and may exclude weekends and holidays.			
[g] Grab means an individual sample collected over a fifteen (15) minute, or less, period.			
[h] Temperature grab sampling must occur when the effluent is at or near its daily maximum temperature, which is usually in the late afternoon. If temperature is measured continuously, the Permittee must determine and report a daily maximum from half-hour measurements in a 24-hour period. To determine the daily average, use the temperature on the half-hour from the chart for the twenty-four (24) hour period and calculate the average of the values. Continuous monitoring instruments must achieve an accuracy of 0.2 degrees C and the Permittee must verify accuracy annually.			
[i] "4/year" means once each quarter of the year. The quarters are defined as January through March, April through June, July through September, and October through December.			
[j] Sampling events must rotate through the seasons; 1st quarter 2019, 2nd quarter 2020, 3rd quarter 2021, and 4th quarter 2022, and so on. Report in the month following the quarter.			
[k] Sampling events must rotate through the seasons; Concurrent with Whole Effluent Toxicity Testing			

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. Establish a calibration frequency for each device or instrument in the O&M manual that conforms to the frequency recommended by the manufacturer.
7. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
8. 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 **January 1, 2019** (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.

2. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.

3. 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.

4. 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 annually DMRs for priority pollutant test results by April 1st of each year.
c. Submit permit renewal application monitoring data in WQWebDMR as required in Special Condition S2.6 according to dates given in S2 footnote j and with permit application.

5. 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.

6. 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.

7. Report single analytical values between the detection level (DL) and the quantitation level (QL) by entering the estimated value, the code for estimated value/below quantitation limit (j) and any additional information in the comments. Submit a copy of the laboratory report as an attachment using WQWebDMR.

8. **Not** report zero for bacteria monitoring. Report as required by the laboratory method.

9. Calculate and report an arithmetic average value for each day for bacteria if multiple samples were taken in one day.

10. 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.

11. 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.

12. 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 detection value and the quantitation value for the sample analysis.
    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.

13. 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).

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.

When another permit condition requires submittal of a paper (hard-copy) report, the Permittee must ensure that it is postmarked or received by Ecology no later than the dates specified by this permit. Send these paper reports to Ecology at:

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 report any failure of the disinfection system or use of Outfall 002 to Wilson Creek immediately to Ecology's Regional Office 24 hour number listed below:

Central Regional Office	509-575-2490
Kittitas County Public Health	509-674-6902

The Permittee must immediately report to Ecology, the Department of Health, Drinking Water Program, and the Local Health Jurisdiction (at the numbers listed below), all:

- Failures of the disinfection system.

- Collection system overflows discharging to a water body that may be used for drinking water.
- Plant bypasses discharging to a water body used as a source of drinking water.
- Any other failures of the sewage system (pipe breaks, etc.)

Central Regional Office	509-575-2490
Department of Health,	800-521-0323 (business hours)
Drinking Water Program	877-481-4901 (after business hours)
Kittitas County Public Health	509-674-6902

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)	8 MGD
Peak Instantaneous Design Flow (PIDF)	15 MGD
BOD_5 Influent Loading for Maximum Month	10,000 lb/day
TSS Influent Loading for Maximum Month	8,000 lb/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: https://fortress.wa.gov/ecy/publications/SummaryPages/9703.html. The Permittee may use monitoring records to assess measurable infiltration and inflow.

2. 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.

3. The Permittee must submit a report summarizing the results of the evaluation and any recommendations for corrective actions by **October 1, 2019 and annually thereafter.**

S4.F. Wasteload assessment

The Permittee must conduct an annual assessment of its influent flow and waste load and submit a report to Ecology by **December 31, 2022**. 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. BOD_5 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. The Permittee must notify Ecology when the operator in charge

at the facility changes. It must provide the new operator's name and certification level and provide the name of the operator leaving the facility.

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

A bypass is the intentional diversion of waste streams from any portion of a treatment facility. This permit prohibits all bypasses except when the bypass is for essential maintenance, as authorized in special condition S5.F.1, or is approved by Ecology as an anticipated bypass following the procedures in S5.F.2.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit allows bypasses for essential maintenance of the treatment system when necessary to ensure efficient operation of the system. The Permittee may bypass the treatment system for essential maintenance only if doing so does not cause violations of effluent limits. The Permittee is not required to notify Ecology when bypassing for essential maintenance. However the Permittee must comply with the monitoring requirements specified in special condition S2.B.

2. Anticipated bypasses for non-essential maintenance

   Ecology may approve an anticipated bypass under the conditions listed below. This permit prohibits any anticipated bypass that is not approved through the following process.

a. If a bypass is for non-essential maintenance, the Permittee must notify Ecology, if possible, at least ten (10) days before the planned date of bypass. The notice must contain:

- A description of the bypass and the reason the bypass is necessary.
- An analysis of all known alternatives which would eliminate, reduce, or mitigate the potential impacts from the proposed bypass.
- A cost-effectiveness analysis of alternatives.
- 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 recurrence 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 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 determine if the Permittee has met the conditions of special condition S5.F.2 a and b and consider the following prior to issuing a determination letter, an administrative order, or a permit modification as appropriate for an anticipated bypass:

- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.
- If the 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.

- If feasible alternatives to the bypass exist, such as:

  - The use of auxiliary treatment facilities.
  - Retention of untreated wastes.
  - Stopping production.
  - 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 which occurred during normal periods of equipment downtime or preventative maintenance.
  - Transport of untreated wastes to another treatment facility.

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 and confirm this review by letter to Ecology by January 15th of each year.
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.
8. Specify other items on case-by-case basis such as O&M for collection systems pump stations, lagoon liners, etc.

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, (BOD_5, 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.

S6.E. Industrial user survey

The Permittee must complete an industrial user survey listing all SIUs and potential significant industrial users (PSIUs) discharging to the POTW. The Permittee must submit the survey to Ecology by **January 15, 2020**. At a minimum, the Permittee must develop the list of SIUs and PSIUs by means of a telephone book search, a water utility billing records search, and a physical reconnaissance of the service area. Information on PSIUs must include, at a minimum, the business name, telephone number, address, description of the industrial process(s), and the known wastewater volumes and characteristics.

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 **December 31, 2022**.

The Permittee must also submit a new application or addendum 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. Compliance schedule

By the dates tabulated below, the Permittee must complete the following tasks and submit a report describing, at a minimum:

- Whether it completed the task and, if not, the date on which it expects to complete the task.
- The reasons for delay and the steps it is taking to return the project to the established schedule.

	Tasks	Date Due
1.	Install influent flow meter	**January 1, 2020**
2.	Notify Ecology when meter is installed and operational	**January 1, 2020**

S10. Combined sewer overflows

S10.A. Authorized combined sewer overflow (CSO) discharge locations

Beginning on **January 1, 2020**, the Permittee may discharge domestic wastewater from the following list of combined sewer overflow (CSOs) outfalls which represent occasional point sources of pollutants as a result of overloading of the combined sewer system during precipitation events. The permit prohibits discharges not caused by precipitation. This permit does not authorize a discharge from a CSO that causes adverse impacts that threaten characteristic uses of the receiving water as identified in the water quality standards, chapter 173-201A WAC.

Outfall Number	Receiving Water Body	Latitude	Longitude
001	Yakima River	46.5745	-120.5478
002	Wilson Creek (emergencies only)	46.9883	-120.5378

S10.B. Nine minimum controls

In accordance with chapter 173-245 WAC and US EPA CSO control policy (59 FR 18688), the Permittee must implement and document the following nine minimum controls (NMC) for CSOs. The Permittee must document compliance with the NMC in the annual CSO report as required in Special Condition S10.C.

The Permittee must comply with the following technology-based requirements; the Permittee must:

1. Implement proper operation and maintenance programs for the sewer system and all CSO outfalls to reduce the magnitude, frequency, and duration of CSOs. The program must consider regular sewer inspections; sewer, catch basin, and regulator cleaning; equipment and sewer collection system repair or replacement, where necessary; and disconnection of illegal connections.
2. Implement procedures that will maximize use of the collection system for wastewater storage that can be accommodated by the storage capacity of the collection system in order to reduce the magnitude, frequency, and duration of CSOs.
3. Review and modify, as appropriate, its existing pretreatment program to minimize CSO impacts from the discharges from non-domestic users.
4. Operate the Permittee's wastewater treatment plant at maximum treatable flow during all wet weather flow conditions to reduce the magnitude,

frequency, and duration of CSOs. The Permittee must deliver all flows to the treatment plant within the constraints of the treatment capacity of the POTW.

5. Not discharge (prohibited) overflows from CSO outfalls except as a result of precipitation events. The Permittee must report each dry weather overflow to the permitting authority immediately per Special Condition S3.E. When it detects a dry weather overflow, the Permittee must begin corrective action immediately and inspect the dry weather overflow each subsequent day until it has eliminated the overflow.
6. Implement measures to control solid and floatable materials in CSOs.
7. Implement a pollution prevention program focused on reducing the impact of CSOs on receiving waters.
8. Implement a public notification process to inform the citizens of when and where CSOs occur. The process must include (a) mechanism to alert persons of the occurrence of CSOs and (b) a system to determine the nature and duration of conditions that are potentially harmful for users of receiving waters due to CSOs.
9. Monitor CSO outfalls to characterize CSO impacts and the efficacy of CSO controls. This must include collection of data that it will use to document the existing baseline conditions, evaluate the efficacy of the technology-based controls, and determine the baseline conditions upon which it will base the long-term control plan. This data must include:

    a. Characteristics of the combined sewer system, including the population served by the combined portion of the system and locations of all CSO outfalls in the CSS.
    b. Total number of CSO events, and the frequency and duration of CSOs for a representative number of events.
    c. Locations and designated uses of receiving water bodies.
    d. Water quality data for receiving water bodies.
    e. Water quality impacts directly related to CSO (e.g., beach closing, floatables, wash-up episodes, fish kills).

S10.C. Combined sewer overflow report

The Permittee must submit a CSO Report to Ecology for review and approval per event. The CSO Report must cover the previous years since the previous event. The report must comply with the requirements of WAC 173-245-090(1) and must include documentation of compliance with the Nine Minimum Controls for CSOs described in Special Condition S10.B. The CSO report must include the following information:

1. A summary of the number and volume of untreated discharge events per outfall

2. A summary of the 5-year moving average number of untreated discharge events per outfall, calculated once annually.
3. An event-based reporting form (provided by Ecology) for all CSO discharges for the reporting period, summarizing all data collected according to the monitoring schedule in Special Condition S2.A.
4. A list of CSO reduction projects planned for the next year.

S10.D. Combined sewer overflow reduction plan amendment

Along with the application for permit renewal, the Permittee must submit an amendment of its CSO Reduction Plan to Ecology for review and approval by **December 31, 2022.** The amendment must comply with the requirements of WAC 173-245-090(2) and contain the following:

1. Information describing which of the permitted CSO outfalls can be categorized as meeting the Performance Standard for Controlled CSOs, defined as no more than an average of one untreated discharge per outfall per year. The Permittee may base this assessment on long-term discharge data (up to 5 years, past and present data), modeling, or other reasonable methods as approved by Ecology.

2. For each CSO Outfall that does not meet the Performance Standard for Controlled CSOs defined above:

    a. Identify CSO control alternatives to achieve an average of no more than one untreated CSO event per year per outfall.
    b. Provide an evaluation of each of the alternatives and a selection of a preferred alternative that will ensure compliance with Washington State regulations (WAC 173-245), and
    c. The expected compliance date.

S11. Acute toxicity

S11.A. Testing when there is no permit limit for acute toxicity

The Permittee must:

1. **Conduct acute toxicity testing on final effluent once in the last summer and once in the last winter prior to submission of the application for permit renewal**.
2. Conduct acute toxicity testing on a series of at least five concentrations of effluent, including 100% effluent and a control.
3. Submit the results to Ecology by **December 31, 2022.**

4. 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	*Pimephales promelas*	EPA-821-R-02-012
Daphnid 48-hour static test	*Ceriodaphnia dubia, Daphnia pulex,* or *Daphnia magna*	EPA-821-R-02-012

S11.B. 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 toxicity data, bench sheets, and reference toxicant results for test methods. In addition, the Permittee must submit toxicity test data in electronic format (CETIS export file preferred) for entry into Ecology's database.
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 may sample receiving water at the same time as the effluent and instruct the lab to measure the hardness of both and increase the hardness of the effluent sample to match the hardness of the receiving water sample prior to beginning the toxicity test. Otherwise, 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 14% 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.

S12. Chronic toxicity

S12.A. Testing when there is no permit limit for chronic toxicity

The Permittee must:

1. **Conduct chronic toxicity testing on final effluent once in the last spring and once in the last fall prior to submission of the application for permit renewal**.
2. 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 14% effluent. The series of dilutions should also contain the CCEC of 5% effluent.
3. 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.
4. Submit the results to Ecology **December 31, 2022**.
5. 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	*Pimephales promelas*	EPA-821-R-02-013
Water flea survival and reproduction	*Ceriodaphnia dubia*	EPA-821-R-02-013

S12.B. 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 toxicity data, bench sheets, and reference toxicant results for test methods. In addition, the Permittee must submit toxicity test data in

electronic format (CETIS export file preferred) for entry into Ecology's database.

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 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 sample receiving water at the same time as the effluent and instruct the lab to measure the hardness of both and increase the hardness of the effluent sample to match the hardness of the receiving water sample prior to beginning the toxicity test. Otherwise, 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 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 5% effluent. The ACEC equals 14% effluent.
8. 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 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
2. 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.
3. 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.F.
4. The Permittee complied with any remedial measures required under S3.F 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. The list also includes pulp and paper pollutants identified in 40 CFR Part 430 and the dioxin and furan congeners identified using EPA Method 1613.

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 CaCO3
Aluminum, Total	7429-90-5	200.8	2.0	10
Ammonia, Total (as N)		SM4500-NH3-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
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

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
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 CaCO3
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-NO3- 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^2F/D/E/G		0.2 mg/L
Sulfite (as mg/L SO_3)		SM4500-SO3B		2 mg/L
Temperature (max. 7-day avg.)		Analog recorder or Use micro-recording devices known as thermistors		0.2º C
Tin, Total	7440-31-5	200.8	0.3	1.5
Titanium, Total	7440-32-6	200.8	0.5	2.5

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
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 C	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
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

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					
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	2.0	4.0
2,4 dinitrophenol	59	51-28-5	625	1.5	3.0
2-Nitrophenol	57	88-75-5	625	0.5	1.0
4-Nitrophenol	58	100-02-7	625	1.0	2.0
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

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					
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
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	20	40
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	1.3	5.0
Benzo(*a*)pyrene	73	50-32-8	610/625	0.5	1.0
Benzo(*ghi*)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	0.5	1.0
Bis(*2-ethylhexyl*)phthalate	66	117-81-7	625	0.3	1.0
4-Bromophenyl phenyl ether	41	101-55-3	625	0.3	0.5
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-*h*)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	2.0	14.0
Diethyl phthalate	70	84-66-2	625	1.9	7.6
Dimethyl phthalate	71	131-11-3	625	1.6	6.4

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)					
Di-n-butyl phthalate	68	84-74-2	625	0.5	1.0
2,4-dinitrotoluene	35	121-14-2	609/625	1.0	2.0
2,6-dinitrotoluene	36	606-20-2	609/625	1.0	2.0
Di-n-octyl phthalate	69	117-84-0	625	0.3	0.6
1,2-Diphenylhydrazine (*as Azobenzene*)	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
Hexachlorobutadiene	52	87-68-3	625	0.5	1.0
Hexachlorocyclopentadiene	53	77-47-4	1625B/625	2.0	4.0
Hexachloroethane	12	67-72-1	625	0.5	1.0
Indeno(*1,2,3-cd*)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	0.4	0.75
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	1.0	2.0
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 - Modified	0.05	0.2
PCB-1254	107	11097-69-1	608 - Modified	0.05	0.2
PCB-1221	108	11104-28-2	608 - Modified	0.05	0.2
PCB-1232	109	11141-16-5	608 - Modified	0.05	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***
PESTICIDES/PCBs					
PCB-1248	110	12672-29-6	608 - Modified	0.05	0.2
PCB-1260	111	11096-82-5	608 - Modified	0.05	0.2
PCB-1016 [9]	112	12674-11-2	608 - Modified	0.05	0.2
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, or 5) x 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-dichlorpropropene (10061-01-5) and trans-1, 3-dichloropropene (10061-02-6).

7. Total Benzofluoranthenes - Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.

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.

Appendix E WWTF Modeling Results

DRAFT

Ellensburg_WWTP

Additional Sampling Data Analysis

The influent exhibits high levels of dissolved oxygen (DO) and nitrate, according to the DMR data (refer to the 'A0_IS_Fractions' tab for examples). The presence of DO and nitrate in the influent may lead to the proliferation of nitrifiers, potentially causing an increase in the measured BOD concentration due to nitrification during the BOD analysis. To accommodate this, the influent CBOD at the Ellensburg WWTP was estimated to be 85% of the influent BOD, and the ratio of COD to this assumed CBOD value was employed as the initial calibration factor.
It is important to note that the additional samples submitted to the laboratory exhibited higher temperatures, generally above 4 degrees Celsius, with some samples even exceeding 10 degrees Celsius. These elevated temperatures may have prompted increased biological activity in the samples, which could have influenced the results. Consequently, data from two samples where the temperature was above 10 degrees Celsius were omitted from the influent characterization calculations.

	Additonal Sampling Data									Plant DMR Data								
	Influent						Effluent		Samp. Temp	Influent	Effluent							
Parameter	Alk	TKN	TP	COD	sCOD	ffCOD	EffsCOD	EffsCOD		BOD	TSS	NH3	NO3	NO2	DO	Temp	pH	Flow
Unit	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°C	-	MGD
6/7/2022	151	14.4	1.64	77	24	15	16	16	8		26				4.8	14.5	7.0	4.07
6/8/2022	154	17.1	2.15	140	55	34	0	9	10	109	87	15.40			4.3	15.0	7.2	5.17
6/9/2022	161	17.5	2.23	150	58	58	61	61	7		84				2.8	15.7	7.3	4.59
6/10/2022*	159	16.7	2.3	140	62	44	17	17	16	111	101	17.20			2.3	15.2	7.1	4.38
6/11/2022	154	15.9	2.35	190	66	44	14	14	4		76				3.5	15.2	7.1	4.49
6/12/2022	156	18.3	1.71	170	45	31	45	45	5	96	97				3.1	15.0	7.2	4.44
6/13/2022	154	17.8	2.13	180	42	33	0	9	9		98	14.10	9.70	0.08	4.1	15.1	7.3	4.28
6/14/2022	157	17.6	2.02	160	43	37	0	9	11	77	81				3.1	15.2	7.2	3.92
6/15/2022*	159	17.0	1.89	160	43	35	10	10	18		91	8.00			3.6	15.4	7.0	3.55
6/16/2022	158	17.8	1.96	150	39	26	0	9	9	122	102				3.6	15.6	7.2	3.56
Avg All	156.3	17.0	2.0	151.7	47.7	35.7		20										
Avg Sel	156	17.1	2.0	152.1	46.5	34.8		**22**										

	85%	BOD assumed to be CBOD							
	Influent Characterization Calculations								
Parameter	COD/BOD	CBOD	COD/CBOD	NH3/TKN	TKN/CBOD	TP/COD	sCOD/COD	ffCOD/COD	Si/COD
6/7/2022						0.02	0.31	0.19	0.21
6/8/2022	1.28	92.65	1.51	0.90	0.18	0.02	0.39	0.24	0.00
6/9/2022						0.01	0.39	0.39	0.41
6/10/2022*	1.26	94.35	1.48	1.03	0.18	0.02	0.44	0.31	0.12
6/11/2022						0.01	0.35	0.23	0.07
6/12/2022	1.77	81.6	2.08		0.22	0.01	0.26	0.18	0.26
6/13/2022				0.79		0.01	0.23	0.18	0.00
6/14/2022	2.08	65.45	2.44		0.27	0.01	0.27	0.23	0.00
6/15/2022*				0.47		0.01	0.27	0.22	0.06
6/16/2022	1.23	103.7	1.45		0.17	0.01	0.26	0.17	0.00
Avg All	1.5		1.79	0.80	0.21	0.013	0.32	0.24	0.11
Avg Sel	1.6		**1.87**	**0.85**	**0.19**	**0.013**	**0.31**	**0.23**	0.12

* Excluded due to high temperature recorded for the sample upon delivery to the laboratory in calculation of average for the selected data

Used in influent characterization as the baseline, COD to CBOD, alkalinity and NH3/TKN were adjusted in calibration.

Ellensburg_WWTP

Calibration and Validation Results Summary

Prepared By: Eun Kim
Date: February 15 2023
Checked By: David Seymour

Purpose - The objective is to present a summary of the modeling results for both calibration and validation scenarios. Discrepancies between the model's inputs/outputs and the actual plant monitoring data have been quantified. The aim of calibration and validation is to ensure that the variance in process performance is 20 percent or less, with minimal alterations to influent characteristics, kinetic coefficients, and stoichiometric parameters. Desktop calculations were performed to corroborate the waste activated sludge (WAS) production and the oxygen demand for aeration indicated by the modeling results.

Summary - Initially, the influent chemical oxygen demand (COD) to biochemical oxygen demand (CBOD) ratio was estimated at 1.87, based on data from additional sampling. This ratio was later adjusted to 2.35 to enhance the precision of the simulation outcomes. Furthermore, certain kinetic parameters pertaining to nitrification, denitrification, and organic material removal were fine-tuned to align the modeled effluent characteristics with historical records. Generally, the deviation between the modeled outcomes and historical data remained below 20%, with the exception of the solids treatment process within the anaerobic digestion phase. The gas production detailed in the Discharge Monitoring Report (DMR) exceeds what is typically expected for WAS with an approximate 10-day Solids Retention Time (SRT). Consequently, the simulated gas production was deemed more reliable, and thus, no further modifications to the anaerobic digestion model were considered necessary.

Value	Estimated based on sampling analysis
Value	Calcualted from data

	3/18/2021 to 4/16/2021			8/2/2021 to 8/31/2021			
	Calibration			Validation			
	Model	DMR	Difference, %	Model	DMR	Difference, %	Notes
Influent Data							
Influent Flow, MGD	2.25	2.25	0.2	2.73	2.73	0.1	
Influent COD, mg/L	443			314			Influent COD/CBOD increased to 2.35 from 1.87 sampling to match solids production
Influent cBOD, mg/L	188	188	0.0	134			
Influent TSS, mg/L	147	147	0.2	113	113	0.1	
Influent VSS, mg/L	133	133	0.1	103	104	0.1	
Influent TKN, mg/L as N	36			25			
Influent Ammonia, mg/L as N	19.2	19.2	0.1	11	11	0.1	
Influent TP, mg/L as P	6			4			
Influent Alkalinity, mg/L as CaCO3	156			156			
Secondary Process							
Aeration Basin Total SRT, days	10.4	*10.4*	Note a	12.9	*11.3*	Note a	
Total HRT, hrs	**26.7**	NA	-	**22.0**	NA	-	
MLSS Concentration, mg/L	1402	1474	4.9	1268	1317	3.73	
MLVSS Concentration, mg/L	1181			1054			
VS/TS Ratio	0.84	0.87	Note a	0.83	0.85	Note a	
Solids Production and Yield							
Yield, lbs TSS/lbs CBOD	0.83	*0.85*	-	0.71	*0.81*	-	(WAS TSS+Eff TSS)/Inf CBOD
RAS TSS, mg/L	2804	2758	1.7	2873	3120	7.9	
WAS TS, mg/L	NA	3270	Note a	NA	3677	Note a	DMR records WAS TS (%), not WAS TSS.
WAS Flow, MGD	0.12	0.12	1.8	0.085	0.085	0.4	
WAS, lbs/d at RAS TSS Calculated	2807	*2809*	0.1	2037	*2142*	4.9	Plant WAS calculated using RAS TSS
RAS Rate, MGD	2.20	2.31	4.9	2.10	2.25	6.6	
RAS Flow Fraction	0.98	NA	-	0.77	NA	-	
Final Effluent							
CBOD, mg/L	6.54	6.69	2.2	5.58	5.40	3.4	
TSS, mg/L	8.26	9.09	9.1	10.00	10.02	0.2	
pH	7.16	6.89	3.9	7.46	6.95	7.4	
NH3-N, mg/L	0.70	0.07	0.0	0.29	0.12	0.0	
TKN, mg/L	2.66	NA	-	2.17	NA	-	
NO3-N, mg/L	11.50	12.45	7.7	7.49	7.73	3.2	
NO2-N, mg/L	0.20	0.19	0.0	0.09	0.20	0.0	
DO, mg/L	5.72	7.63	Note b	5.58	6.99	Note b	Grab measurements near aerated zone
Temperature, C	11.5	11.5	0.1	18.6	18.6	0.0	
Anaerobic Digestion							
HRT, days	16.0	16.0	0.3	17.0	16.5	3.2	
Digested TSS (model), TS (DMR), %	2.8%	1.6%	72.8	2.7%	1.8%	54.3	
Digested VSS (mode), VS (DMR), %	2.3%	1.3%	84.2	2.2%	1.3%	73.0	
Gas, scfd	8176	16331	49.9	4972	10528	52.8	
GAS/VS Fed, scf/lbs	3.6	*6.69*	-	3.1	*5.80*	-	about 2.7 cu.ft/fed VS from WAS at 10 day SRT
VSS destruction, %	29%	NA	-	0%	NA	-	
Aeration							
Total SOTR, lb/hr	600	NA	-	600	NA	-	
AB1 SOTR, lb/hr	300	NA	-	300	NA	-	
AB2 SOTR, lb/hr	300	NA	-	300	NA	-	
AB1 and AB2 DO, mg/L	5.7	3.7	Note b	5.6	4.2	Note b	Grab measurements

Notes:

a: WAS TS(%) measured from one grab sample collected per day. It appears to be greater than RAS TSS measured and averaged out from three grab samples. Therefore, no differences were estimated for the DMR data that refers to the WAS TS(%).

b: DO measured twice a day for AB near the aerators in service and measured once a day for the influent and effluent with a portable DO meter. The difference for these grab sample data was not estimated.

Ellensburg_WWTP
Modeling Results Summary

Prepared By: Eun Kim
Date: April 18, 2024
Checked By: David Seymour

Purpose - Present a summary of modeling results for the existing secondary treatment capacity for the projected flow and load conditions.

Summary

The existing two aeration basins are capable of treating the 2044 Average Annual Load (AAL) as well as the 2044 Maximum Monthly Load (MML), provided that the Mixed Liquor Suspended Solids (MLSS) concentrations in the aeration basins are maintained at up to 4000 mg/L and the secondary clarifiers can accommodate the increased solids loading rate. Supplemental alkalinity addition may be required, depending on the influent's alkalinity and the degree of denitrification achieved.

However, the current eight (8) aerators within the two aeration basins lack the capacity to meet the air demands for the 2044 MML. Also, the four aerators can't meet the air demands for the 2044 AAL if one basin remains online.

In the short term, while improvements are underway for one aeration basin, the other basin will be operational. To effectively manage the Average Annual Load (AAL) during this period, it will likely be necessary to increase the aeration capacity of the operational basin.

	S1 2044 MML Max	S2 2044 AAL Maintenance	S3 2044 AAL Typical	S4 2026 AAL Construction	Notes
Influent Data					
Influent Flow, MGD	10.14	5.15	5.15	3.61	
Influent COD, mg/L	278	416	416	406	
Influent cBOD, mg/L	118	177	177	173	
Influent TSS, mg/L	95	133	133	137	
Influent VSS, mg/L	86	121	121	125	
Influent TKN, mg/L as N	23	34	34	33	
Influent Ammonia, mg/L as N	12.1	18.2	18.2	17.7	
Influent TP, mg/L as P	4	5	5	5	
Influent Alkalinity, mg/L as CaCO3	156	156	156	156	
Secondary Process					
Aeration Basin Total SRT, days	11.5	9.0	9.0	9.0	at 11.5 or higher at 9 degrees C
Total HRT, hrs	**5.9**	**5.8**	**11.7**	**8.3**	at 5 hours or longer
MLSS Concentration, mg/L	3985	4746	2630	3494	at 4000 mg/L or less
MLVSS Concentration, mg/L	3225	3893	2147	2841	
MLVSS/MLSS Ratio	0.81	0.82	0.82	0.81	
Solids Production and Yield					
Yield, lbs TSS/lbs CBOD	0.72	0.72	0.80	0.78	
RAS TSS, mg/L	12180	9694	5372	7402	at 12000 mg/L or less
WAS Flow, GPD	71100	68000	136000	65600	<432,000 gpd or less
WAS, lbs/d at RAS TSS Calculated	7222	5498	6094	4050	
RAS Rate, MGD	4.90	4.90	4.90	3.20	One SC is assumed to be added to maintain SLR and SOR. RAS pumping capacity assumed to be increased to maintain RAS TSS at 12000 or less
RAS Flow Fraction	0.48	0.95	0.95	0.89	
Final Effluent					
CBOD, mg/L	12	17	11	13	<<30
TSS, mg/L	21	32	18	23	<<30
pH	7.16	7.02	7.02	7.04	
Alkalinity, mg/L as CaCO3	104.26	73.94	72.39	74.88	70 or above, alkalinity addition may be required for the plant
NH3-N, mg/L	1.72	1.14	0.98	1.04	<<8.4
TKN, mg/L	4.30	4.83	3.61	4.02	
NO3-N, mg/L	6.82	9.09	9.48	9.44	
NO2-N, mg/L	0.88	0.49	0.36	0.40	
DO, mg/L	2.0	2.0	2.0	2.0	
Temperature, C	9.0	14.0	14.0	14.0	
Anaerobic Digestion					
HRT, days	20.2	20.0	20.2	20.0	Assumed to be 20 days or longer, and not limiting capacity
Digested TSS, %	2.7%	2.6%	2.7%	2.7%	
Digested VSS, %	2.2%	2.2%	2.2%	2.2%	
Gas, scfd	22511	18354	19147	12922	
GAS/VS Fed, scf/lbs	4.1	4.3	4.1	4.1	
VSS destruction, %	33%	34%	33%	33%	
Aeration					
Total SOTR, lb/hr	950	734	753	516	
AB1 SOTR, lb/hr	475	734	376	516	Capacity at 400 (if all 4 utilized)
AB2 SOTR, lb/hr	475	0	376	0	Capacity at 400 (if all 4 utilized)
AB1 and AB2 DO, mg/L	2.0	2.0	2.0	2.0	

Values highlighted in red exceed the discharge limit, existing capacity, or design criteria.

Appendix F Ellensburg Secondary Process Capacity Assessment and Hydraulic Analysis Results Presentation, March 2023

DRAFT

March 29, 2023

City of Ellensburg

Secondary Process Capacity Assessment and Hydraulic Analysis Results

Kennedy Jenks

Meeting Agenda and Goals

- Agenda:
  - Goals
  - Safety Moment
  - Secondary Process Capacity Assessment Results
  - Hydraulic Analysis Results
  - Secondary Process Alternative Screening
  - Schedule

- Goals:
  - Review Plant Hydraulic Analysis Results
  - Review Secondary Process Capacity Assessment Results
  - Screen Alternatives for Aeration Improvements

Safety Moment

Project Status and Recap

- Flows and Loads - Completed
- WWTF BioWin Process Model – Completed
- WWTF Hydraulic Model – Completed
- ASI Alternatives Analysis - Underway

Project Status and Recap – Cont'd

- Burning Questions:
  - When will additional AB capacity be needed?
  - Can I take an AB offline long enough to execute improvements?
    - How long?
    - Until when?
  - What are the viable options for the ASI?

Hydraulic Analysis

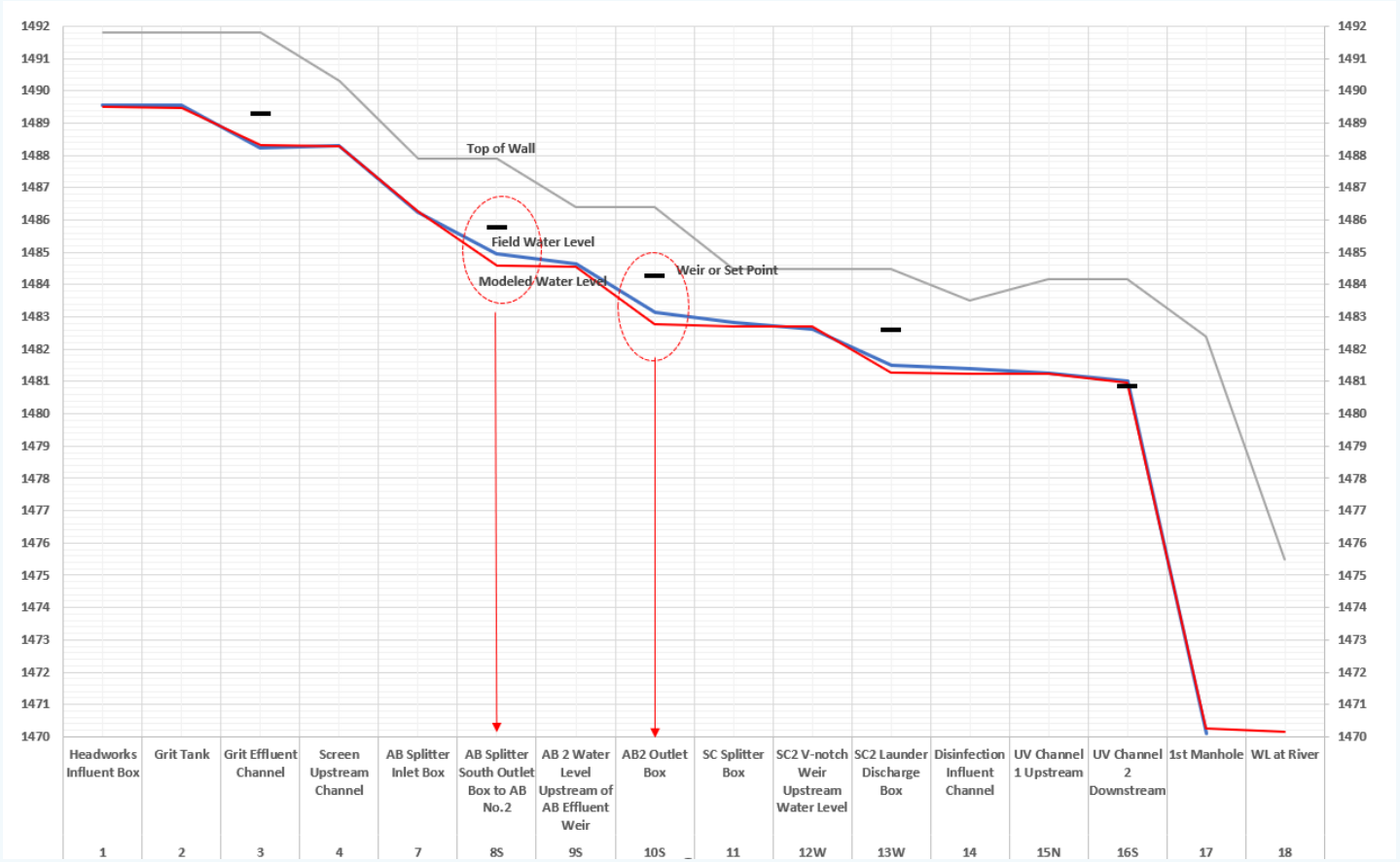
(Recap) Design Flows and Loads – Completed

Parameter	Design Criteria	2042 Projected	Permit
Population	**32,300**	32,300	(31,000)a
MMF	**9.7**	9.7	8.0
PIF	**15.6**	15.6	15.0
MM BOD Load	**10,000**	9,100	10,000
MM TSS Load	**8,000**	**7,800**	8,000
AAF	**4.9**	4.9	-
MDF	**11.0**	11.0	-
AA BOD Load	**7,600**	7,600	-
AA TSS Load	**5,600**	**5,600**	-
MD BOD Load	**12,300**	12,300	-

a. Previous design baseline, excluded from current Permit

Hydraulic Model Calibration

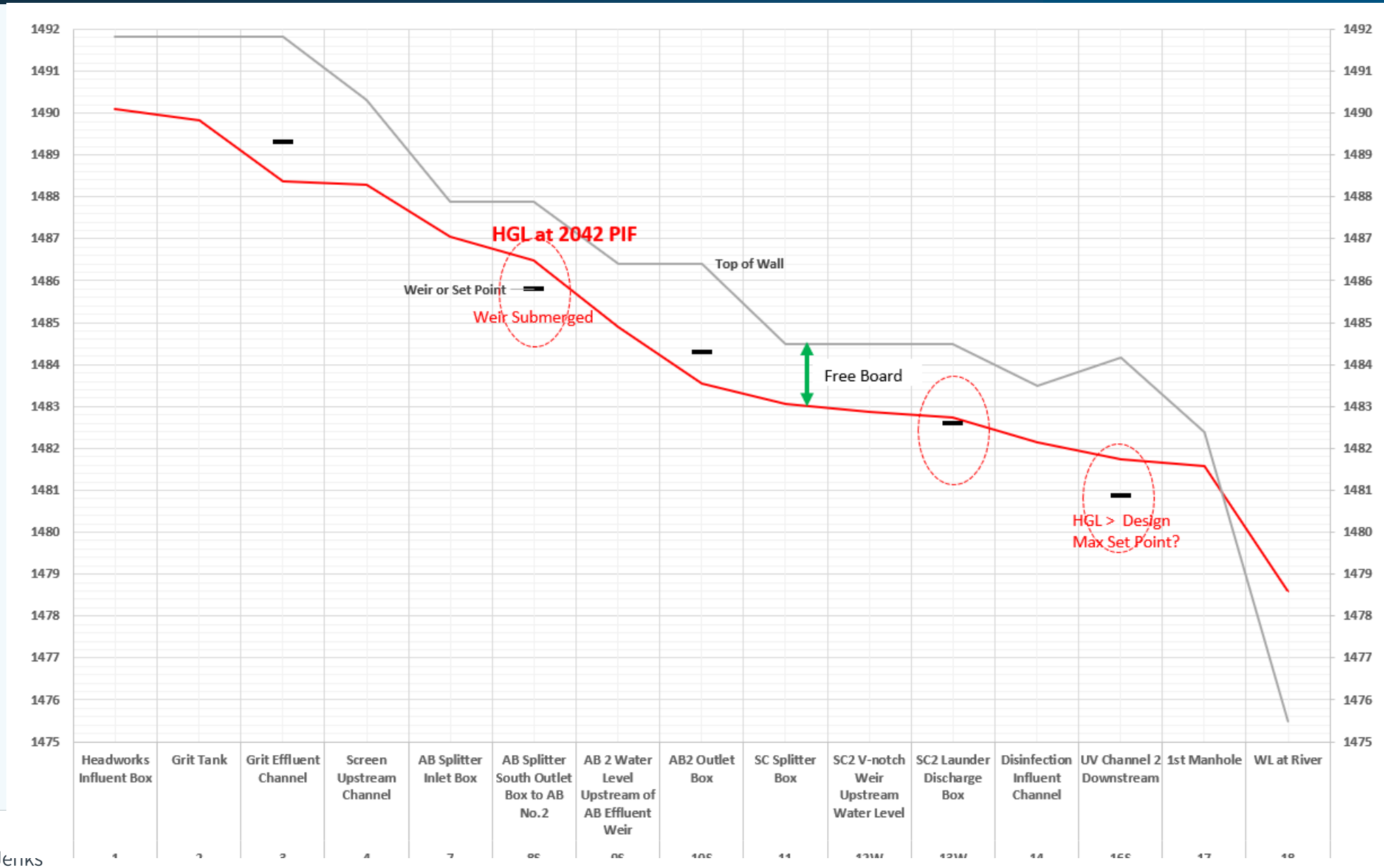
- Less than 4-in difference in all elements **except**
- AB Splitter Outlet Box
  - Level of difference correlated to flow
  - Considered in calibration
  - Increased headloss in AB influent line?
- AB Outlet Box
  - Level of difference not correlated to flow
  - Not considered in calibration



(Recap) Hydraulic Analysis Scenarios

- Scenarios for Hydraulic Analysis
  - Current PIF
  - Design MDF & PIF
  - Assuming 100-Year flood water level for Yakima River
- Identify hydraulic bottlenecks at the plant
  - Check if overflow can occur at any of the hydraulic structure
  - Check if a flow control weir is not submerged, and provides flow control and distribution as desired

Hydraulic Analysis Results



Summary of Hydraulic Analysis Results

- No overflow condition was detected for all flow scenarios.
- The freeboard in the AB splitter box may decrease to less than one foot at 2042 PIF.
- The water level at the UV disinfection system may exceed the high water level (HWL) alarm set point at 2042 PIF.
- The weir located on the AB splitter box was estimated to be submerged in all design flow conditions checked with the addition of increased headloss. It could potentially lead to uneven flow distribution between the two aeration basins

Secondary Process Capacity Assessment

(Recap) Current Permit

Effluent Limits: Outfall 001 & Outfall 002 Outfall 001 Latitude 46.5745 Longitude -120.5478 Outfall 002 Latitude 46.9883 Longitude -120.5378		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Biochemical Oxygen Demand (5-day) (BOD_5)	30 milligrams/liter (mg/L) 1,500 pounds/day (lbs/day) 85% removal of influent BOD_5	45 mg/L 2,250 lbs/day
Total Suspended Solids (TSS)	30 mg/L 1,200 lbs/day 85% removal of influent TSS	45 mg/L 1,800 lbs/day
Parameter	**Minimum**	**Maximum**
pH	6.0 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [c]	100/100 milliliter (mL)	200/100 mL
Parameter	**Average Monthly**	**Maximum Daily [d]**
Total Ammonia (as NH3-N)	NA	8.2 mg/L; 547 lbs/day
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	

(Recap) Typical Secondary Process Capacity Assessment

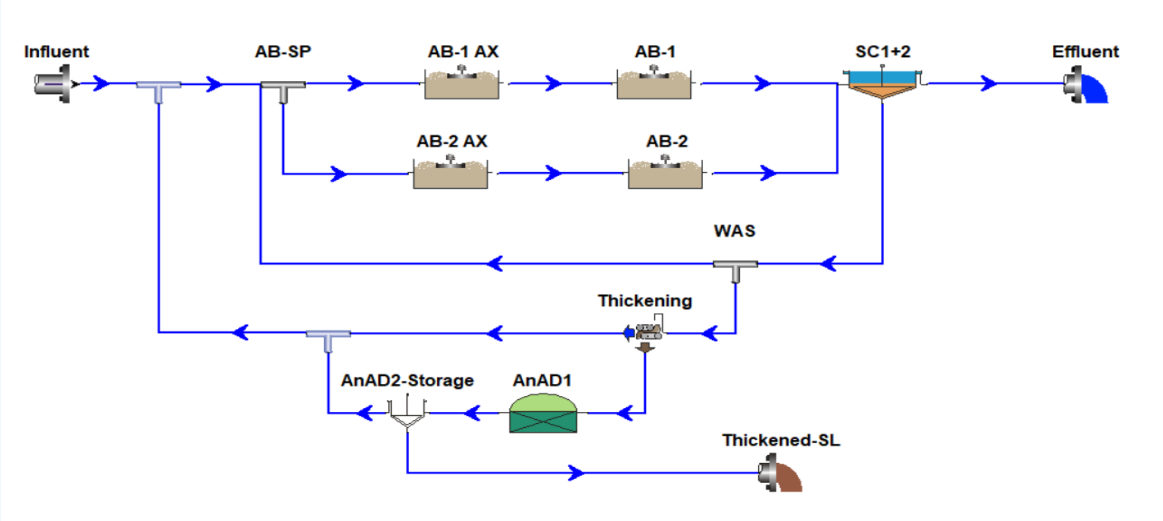
- Aeration Tank Capacity Assessment
- Aeration Capacity Estimation
- Secondary Clarifiers Capacity Assessment

(Recap) Scenarios for Secondary Process Capacity Assessment

- Calibrated model used for modeling for capacity assessment

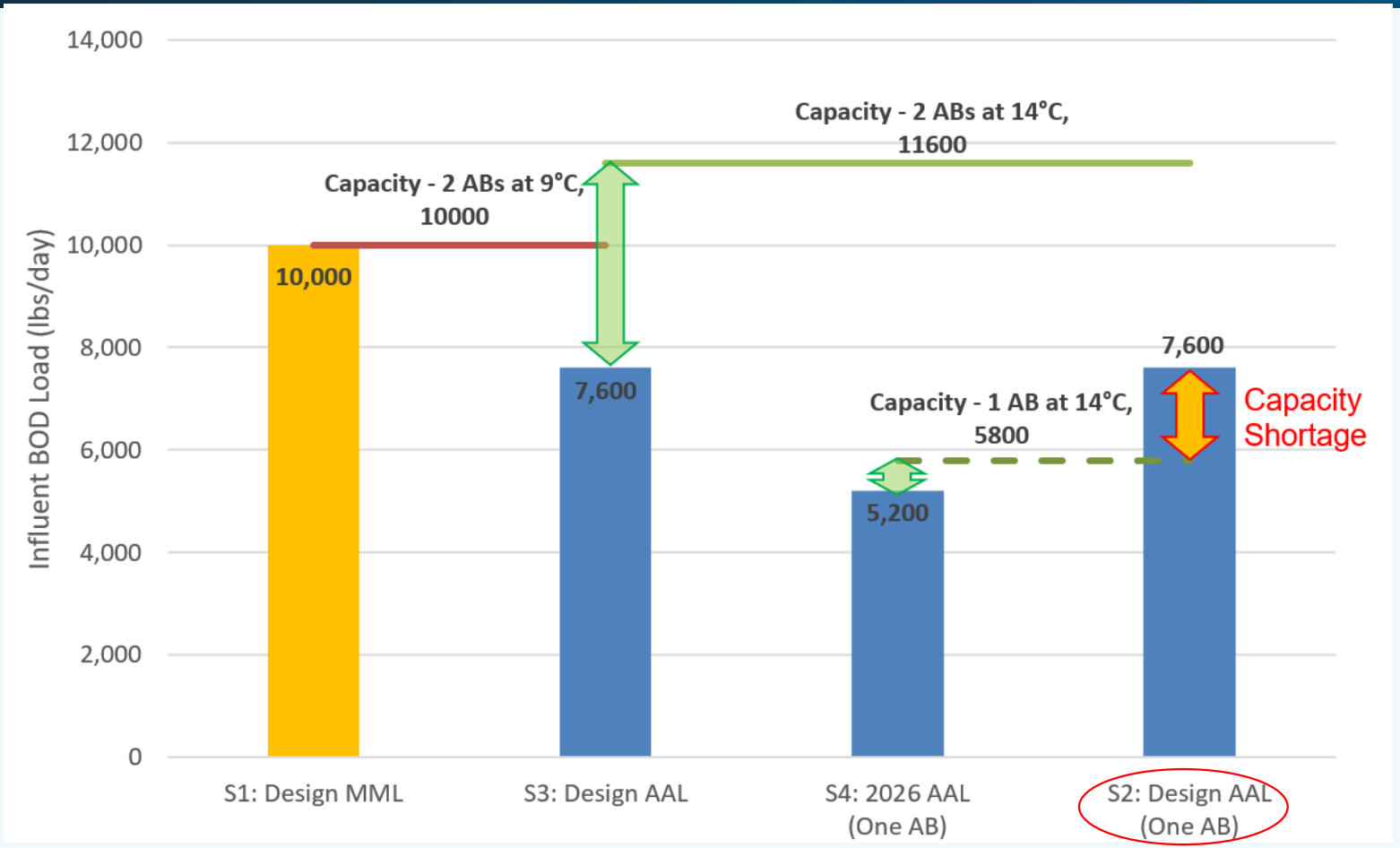
Aeration Tank Capacity Assessment with BioWin Modeling:

- Scenario 1- Design MML, both ABs in service at 9°C
- Scenario 2- Design AAL, one AB offline for at 14°C (maintenance)
- Scenario 3- Design AAL, both ABs in service for typical operation at 14°C
- Scenario 4- AAL for near-term (2026), one AB offline at 14° (implementation of aeration improvements)



MLSS – 4000 mg/L max
Typical 3000-4000 mg/L for CAS
Total SRT - 11.5 days at 9°C
9 days at 14°C

Secondary Process Capacity Assessment Results



Adequate capacity for all scenarios

Except Scenario 2 - Design AAL with one AB offline (maintenance)

One AB's capacity is 24% less than Design AAL.

(Recap) Scenarios for Process Capacity Assessment – Desktop Calculations Only

Aeration Capacity:

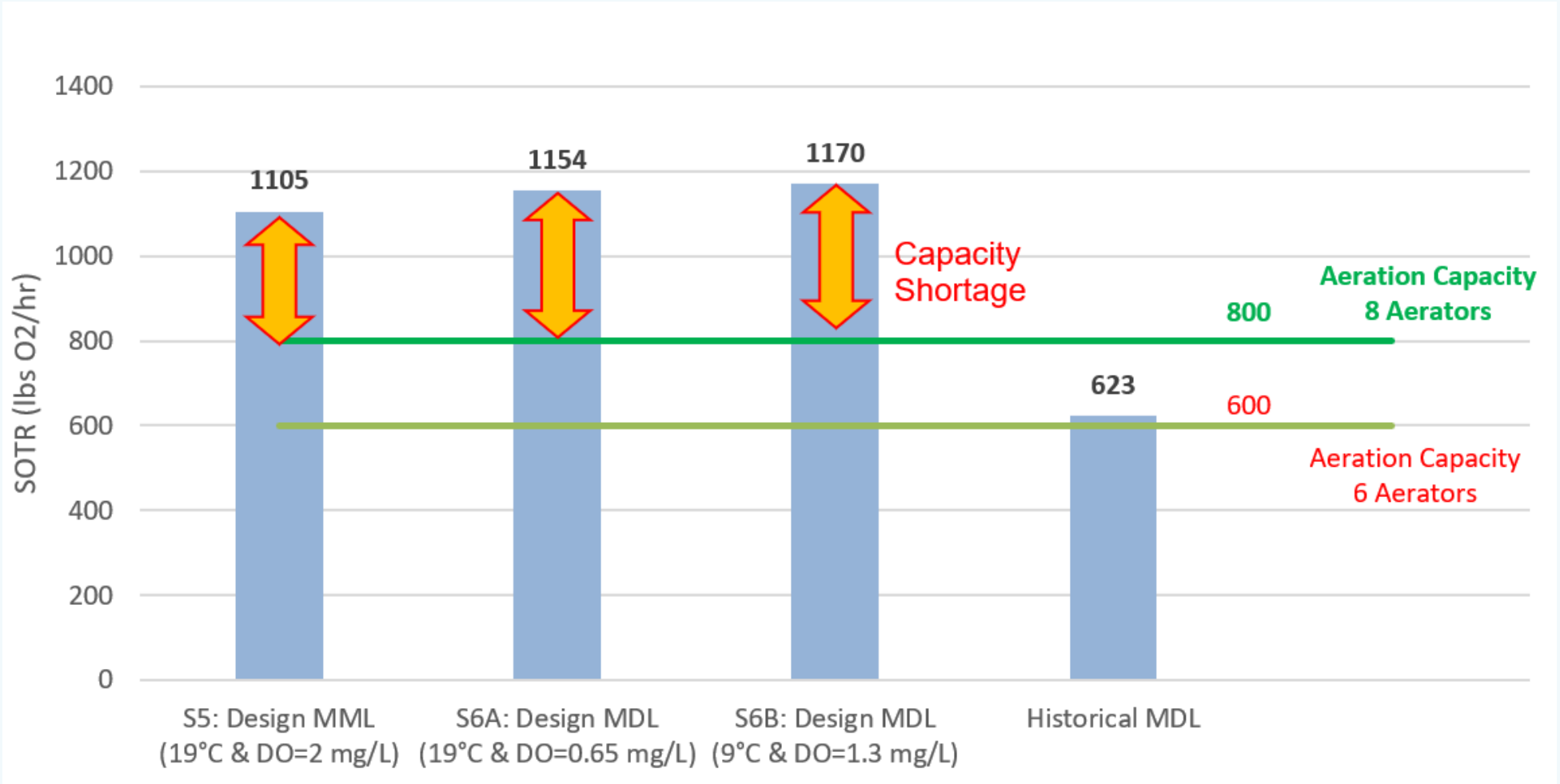
- Scenario 5- Design MML at 19°C and DO=2 mg/L
- Scenario 6- Design MDL at 19°C and DO=1 mg/L or less

Parameter	Average Monthly	Maximum Daily [d]
Total Ammonia (as NH3-N)	NA	8.2 mg/L; 547 lbs/day

Secondary Clarifier Capacity:

- Scenario 7- Near-term AAF, one SC offline for improvements
- Scenario 8- Design MMF, both SCs online, SC capacity for typical operation
- Scenario 9- Design PIF, both SCs online, SC capacity for peak flow

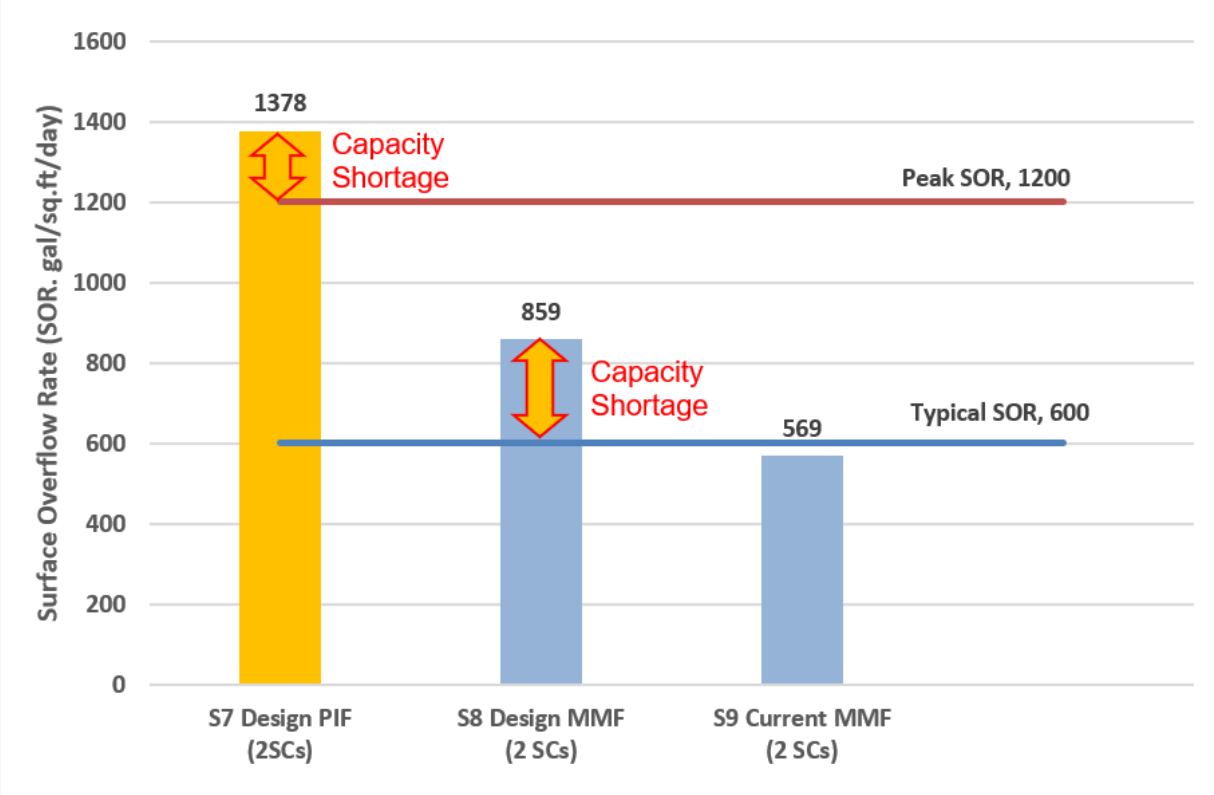
Aeration Capacity Assessment – Desktop Calculations Only

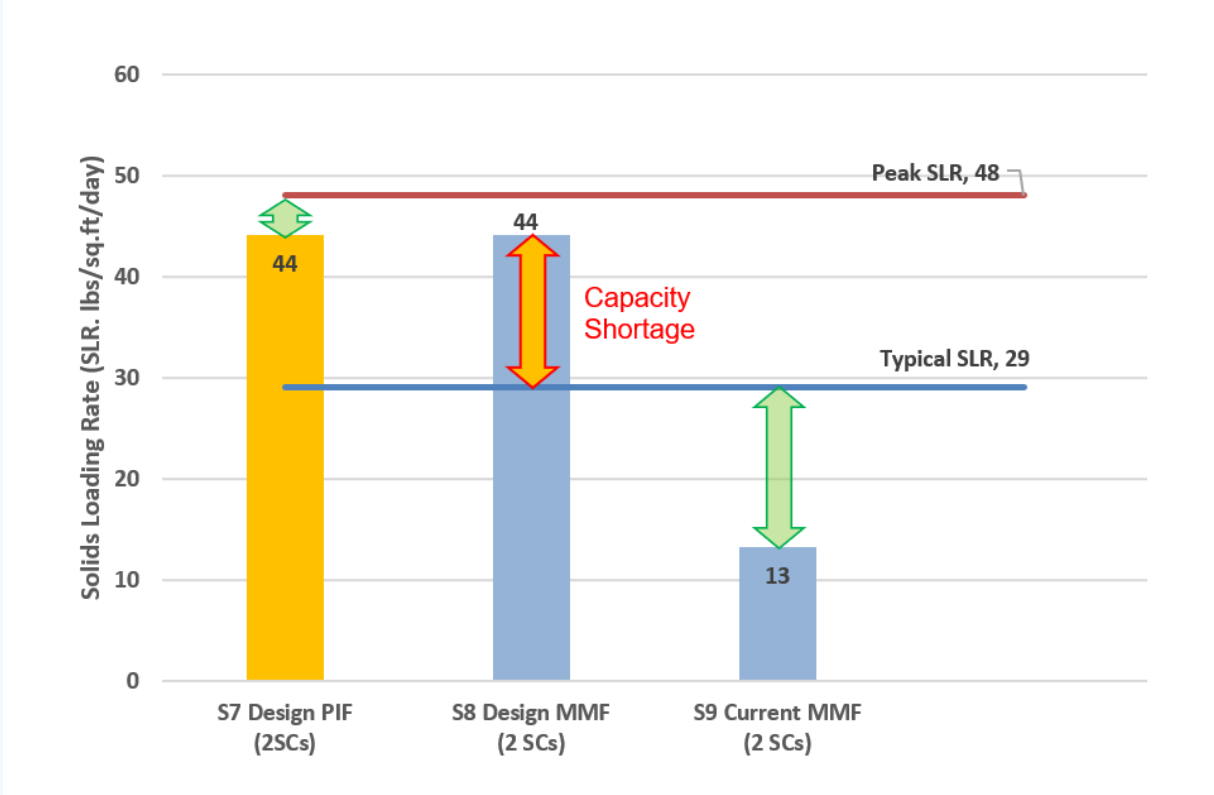


Insufficient for all scenarios with high oxygen demand

Aeration capacity of 8 aerators can be 32% less than max demand estimated, currently 4 aerators/AB, so need to add 2 more to each AB.

Secondary Clarifier Capacity Assessment – Desktop Calculations Only

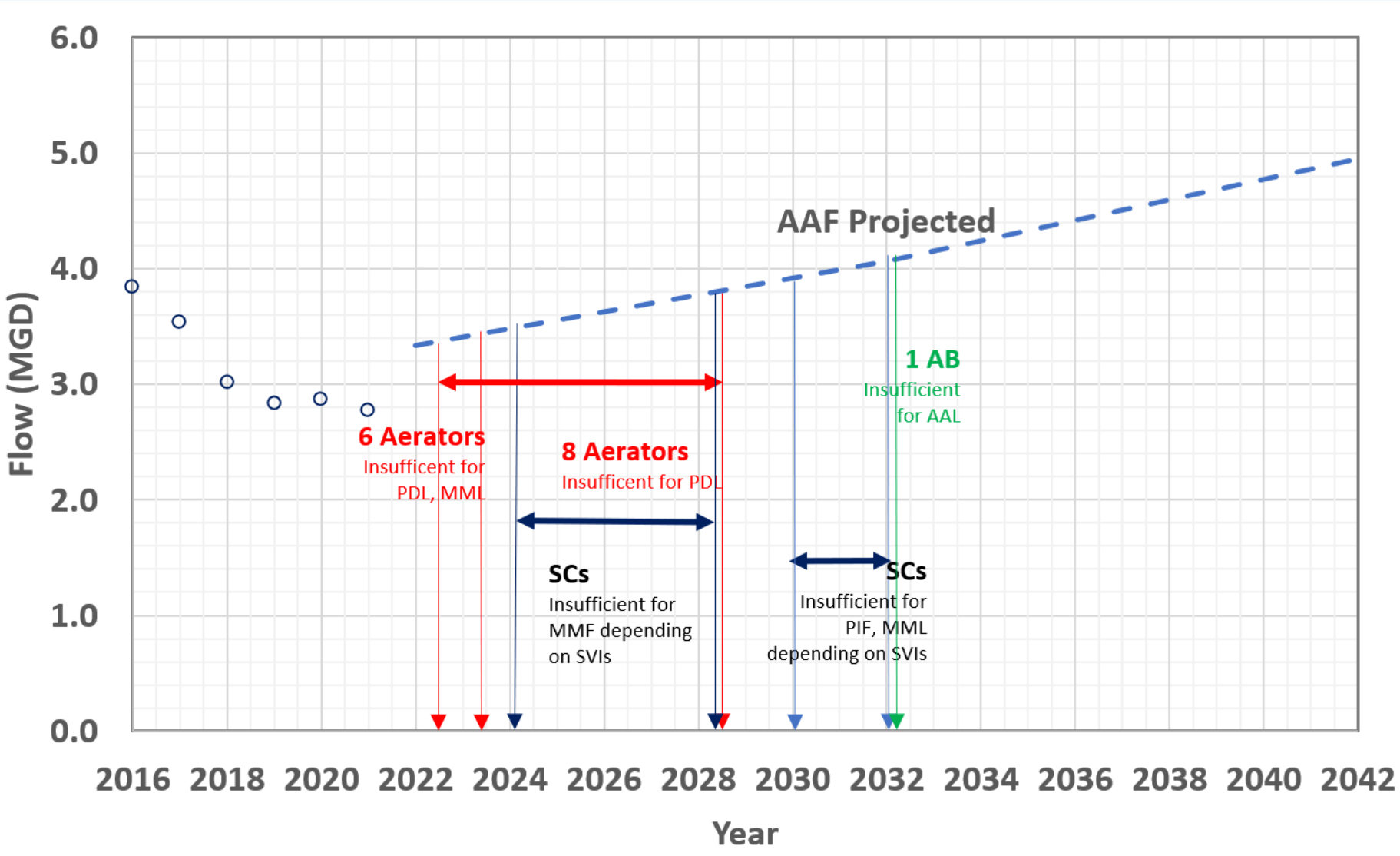




Insufficient for both design MMF and design PIF

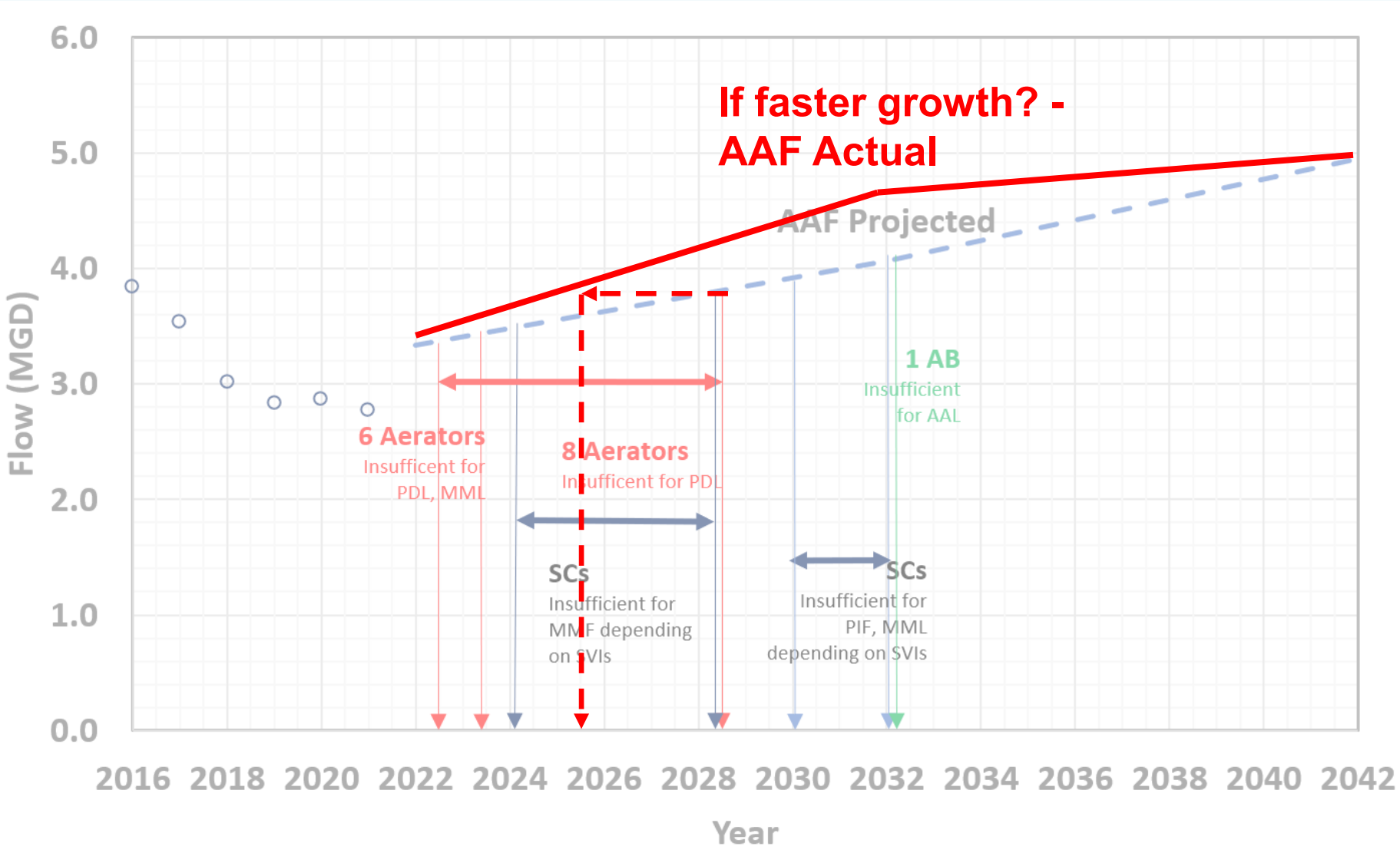
Secondary clarifiers' capacity can be 30% less than capacity needed for design flows.

When will these happen?



Assumed 2% growth

What happens if actual growth > projected growth?



Faster growth accelerates reaching capacity limit

Alternatives for Aeration Improvements

Consideration for New Alternatives

- Minimize capital investment and avoid adding new AB if possible
- Maintenance scenario must be feasible regardless of aeration type
- Improve sludge settleability and alkalinity recovery for some degree
- Reduce short-circuiting

Scope for Alternative Analysis

Sub-Task 205: Alternatives Analysis and Recommendations

Consultant Services:

Using the Flows and Loads information collected from Task 202, the system analysis from Task 203 the inspection and field work collected from Task 204, and using the information provided in the 2018 WWTF Aeration Basin Study (2018 Report) conducted by Gray & Osborne, Inc., the Consultant shall work with the City to identify aeration system improvement alternatives. The four alternatives previously identified in the 2018 Report will be revisited to include the following:

- Verify sizing criteria using updated Flows and Loads
- Verify assumptions used in development of alternatives
- Update capital costs in 2022 dollars

In addition to the four alternatives from the 2018 Report, two additional alternatives will be developed to include the following:

- Retrofitting the existing aeration system with a submerged aerobic fixed film reactor
- Retrofitting the existing aeration system with a Biolac extended aeration system.

The Consultant shall provide Level 5 cost estimates for all alternatives and shall review the results of the engineering analysis and recommendations with the City prior to finalizing recommendations.

The four updates and two additional alternatives will be evaluated in a technical memorandum submitted to Ecology for provisional approval to allow for continued development of the aeration system improvements during the concurrent General Sewer Plan update in Project 1.

Assumptions:

- Ecology will accept and approve 2018 Report.
- Ecology will allow for 2018 Report to be utilized as a basis for the alternatives analysis.

About 90 hours for

- Revisit 4 alternatives in 2018 report
- Develop and analyze 2 new alternatives
- Provide level 5 cost estimates (no need for O&M?)
- Prepare a modified TM

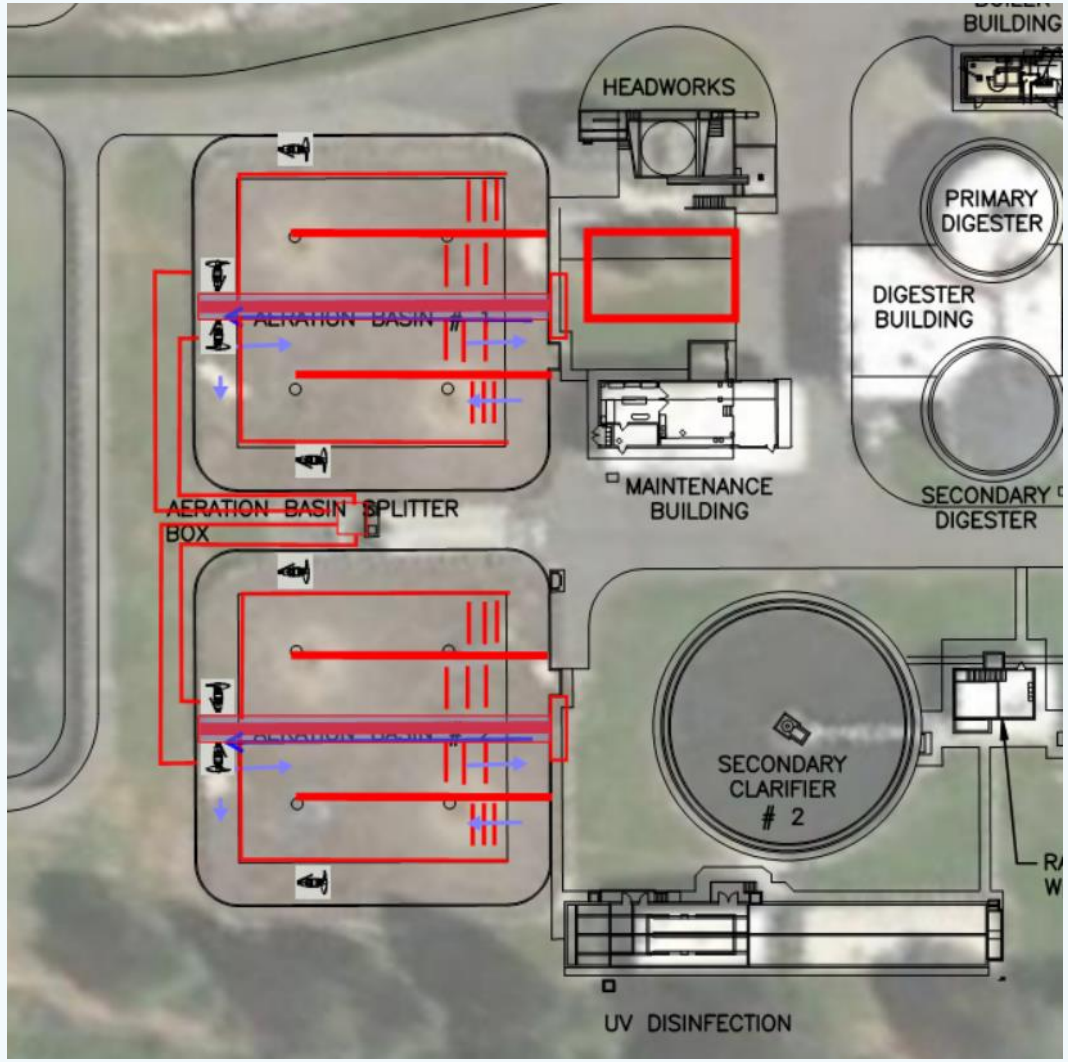
Revise for alternative analysis for three alternatives

List of New Alternatives

- **Alternative 1** – Dedicated Anoxic + Split Two ABs to Four ABs + Diffused Aeration
- **Alternative 2** – Dedicated Anoxic + Configure Each AB with Baffle Walls for PF + Surface Aeration + Extra Aerator for Maintenance
- Alternative 3 – Addition of SFFs
  - Recommended if retaining MLSS is the issue, no solution for aeration addition
- Alternative 4 – Biolac
  - Extended aeration with SRT 25-30 days, requires a larger basin to meet the capacity, not recommended for anaerobic digestion

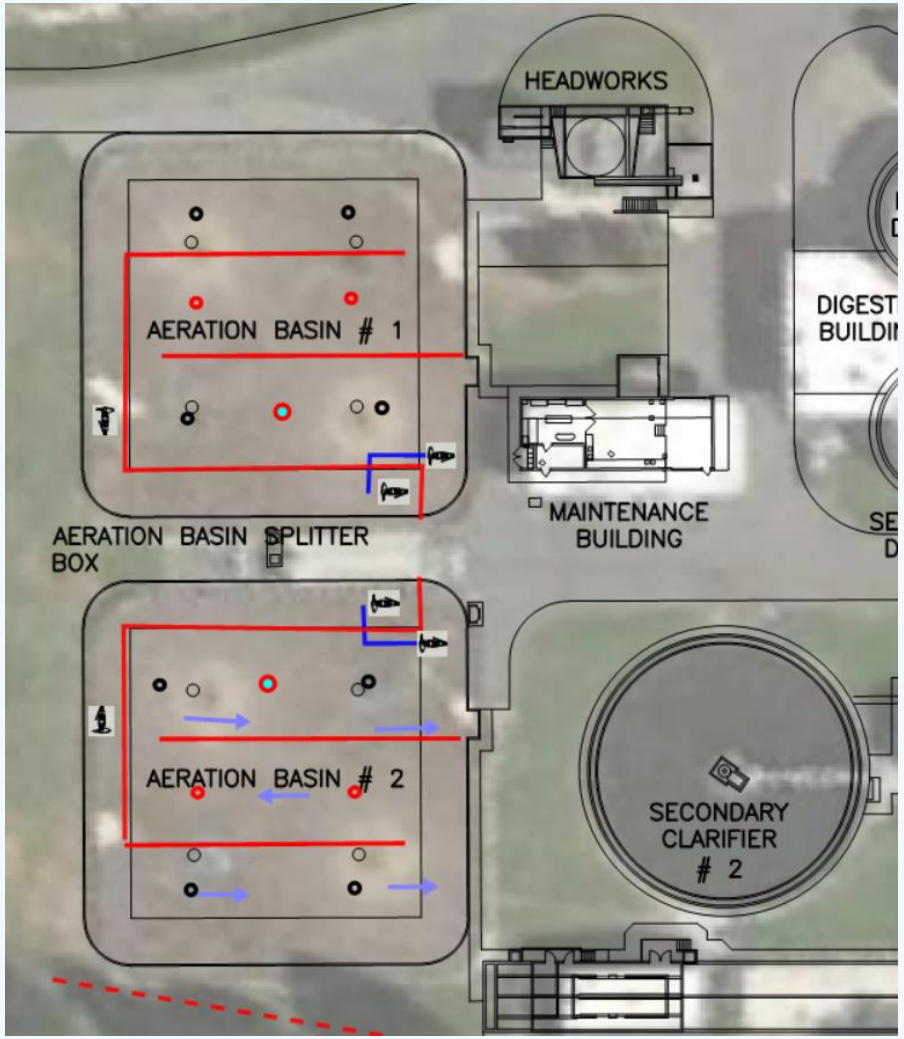
Alternative 1 – Dedicated Anoxic + Diffused Aeration + Split to 4 ABs

- Alternative 1
  - Mixers for anoxic zones
  - Diffused aeration for aerobic zones
  - Divider wall to split AB
  - New AB outlet box
  - Blower building
  - Internal recycle
  - DO monitoring and air supply control

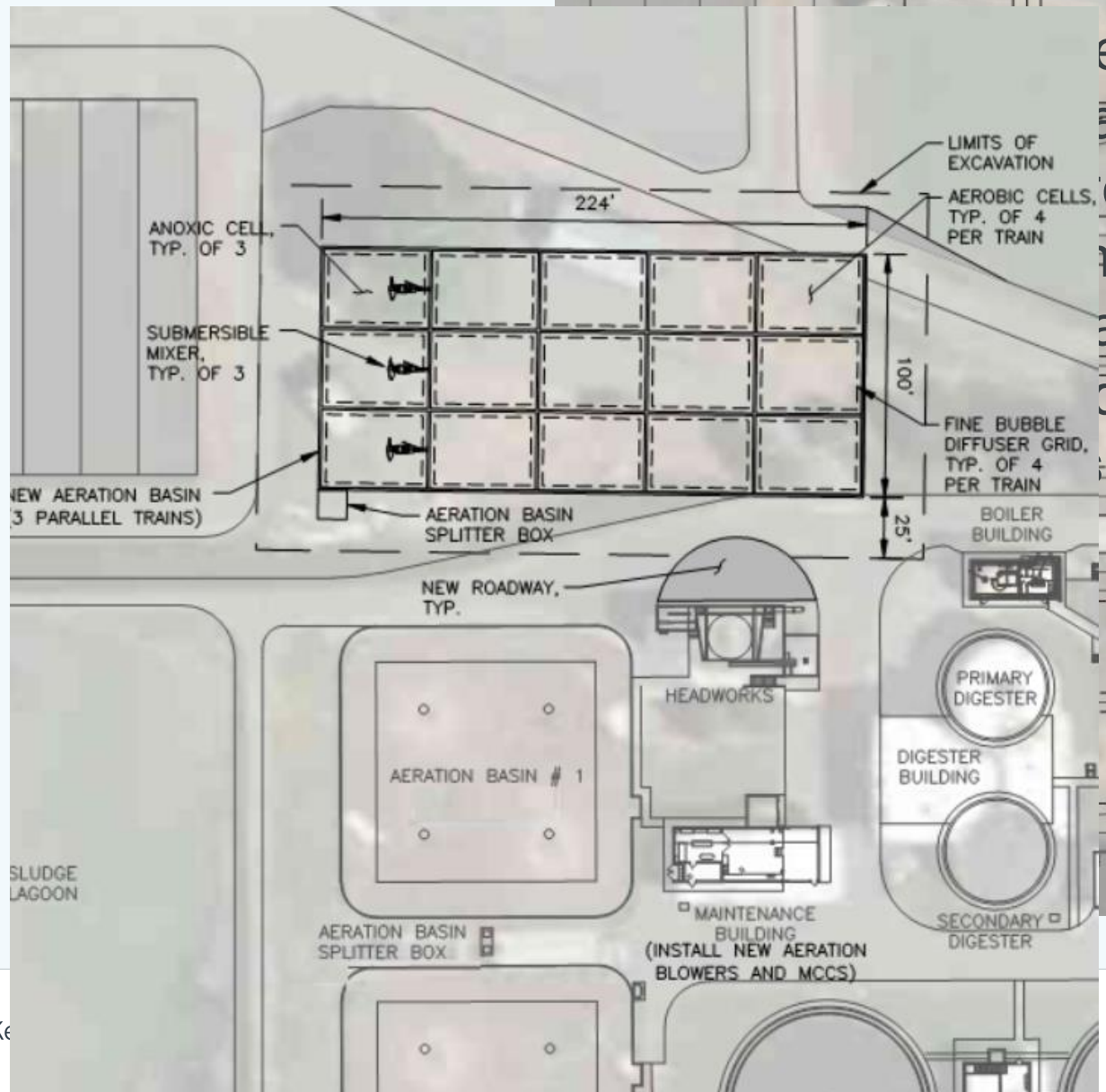


Alternative 2 – Dedicated Anoxic + Surface Aeration + Baffling for PF

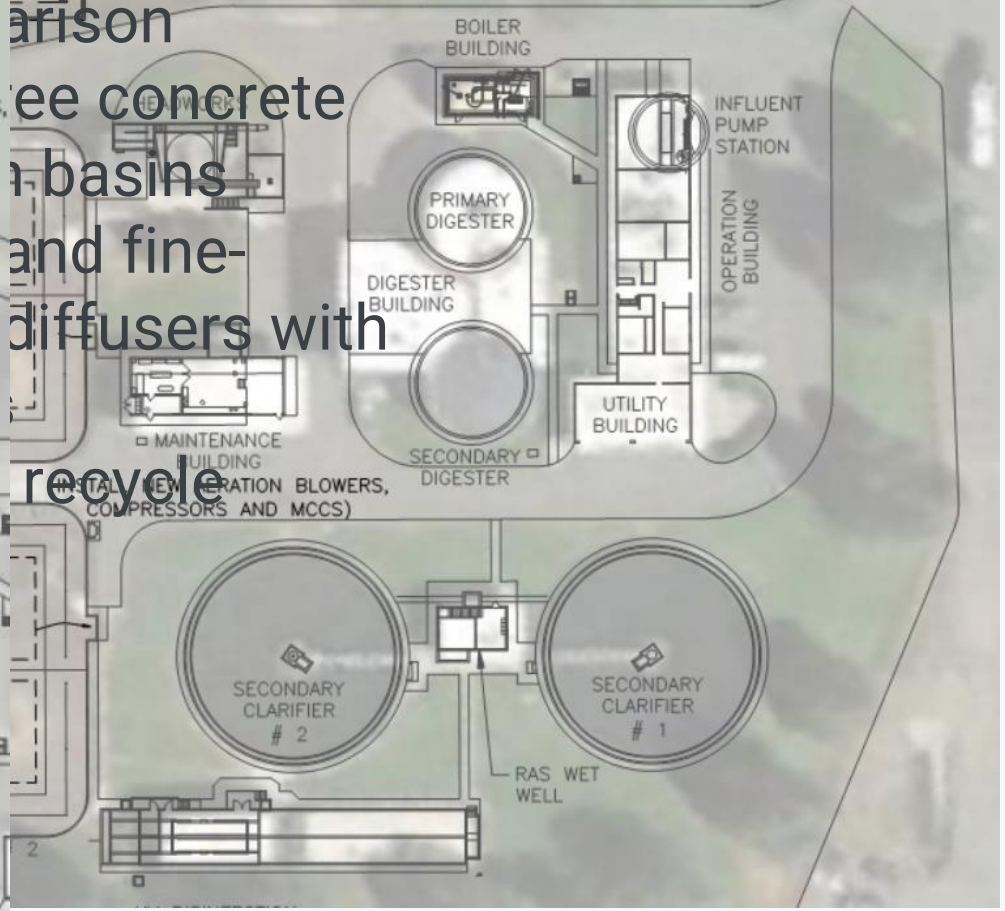
- Alternative 2 –
  - Mixers for anoxic zones
  - Maintenance scenario 1 additional aerator to deal with this condition.
  - Add (4) new surface aerators to each AB, run up to (6) typically, and run 7th during maintenance.
  - Internal recycle
  - DO monitoring and aeration control
  - Maintenance limited 2-3 days/year



Previous Alternatives in



e 4 Selected
arison
ee concrete
basins
and fine-
diffusers with
recycle



Next Steps

Schedule (Next Steps)

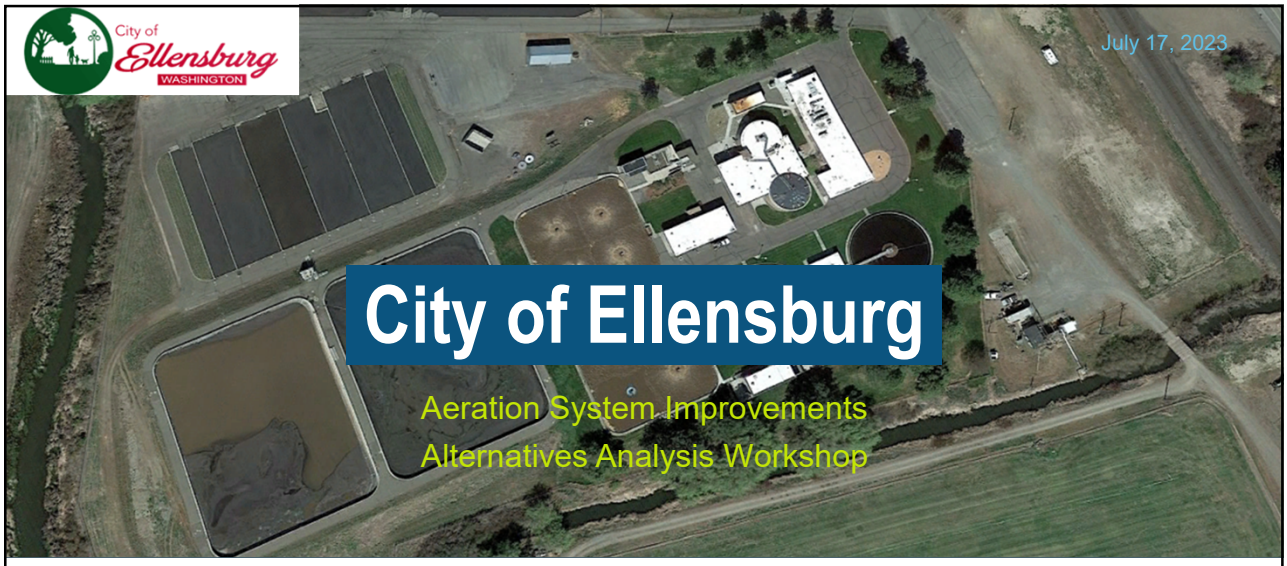
- Collection System Model: March - April
- Project Prioritization: April - May
- ASI Alternatives Analysis: May
- Capital Improvement Plan: May-June
- Rate Study: June-July
- Draft GSP: July

Secondary Clarifier Design – August?

RAS Pump Improvements – Restarted

Appendix G Aeration Basin Alternatives Analysis

DRAFT



1

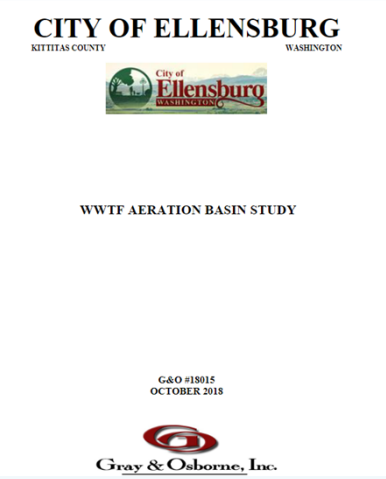
Meeting Agenda and Goals

- Agenda:
  - Project Overview
  - ASI Alternatives Overview
  - Alternatives Discussion
  - Recommendation
  - Schedule Update
- Goals:
  - Review and Understand Alternatives
  - Determine Preferred Alternative
  - Understand impacts on GSP Capital Improvement Plan

2

Project Overview

- 2018 Aeration Basin Study
  - Identified near term need for more aeration basin process capacity
  - Proposed 4 Alternatives
- 2022: ASI Project
  - Concurrent with GSP update
  - Flows and Loads
  - Risk
  - Revised Alternatives

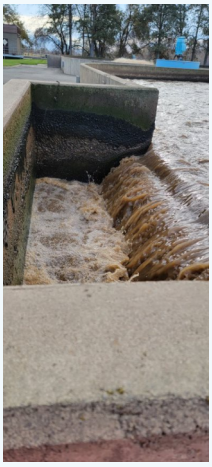

CITY OF ELLENSBURG
KITTITAS COUNTY WASHINGTON
City of Ellensburg WASHINGTON
WWTF AERATION BASIN STUDY
G&O #18015
OCTOBER 2018
Gray & Osborne, Inc.

Project Overview

- Aeration System Key Considerations:
  - Increased MLSS concentration to realize full capacity of existing system
  - Requires increased aeration capacity
  - Requires anoxic selector

Project Overview

- Aeration System Key Considerations
  - Impacts to settleability in Secondary Clarifiers
  - Necessary capacity for next 20 years
  - Existing AB's have a limited window for downtime
  - No assessment yet for the submerged 4-in thick concrete tank condition.



Evaluation Criteria

- Reliability and Resiliency
  - The degree to which the alternative is expected to reduce outages, increase uptime, and protect operation of the secondary process
  - The degree to which the alternative could more easily accommodate future expansions
- Operations and Maintenance
  - The degree to which the alternative is expected to best fit the needs of plant O&M staff

Evaluation Criteria

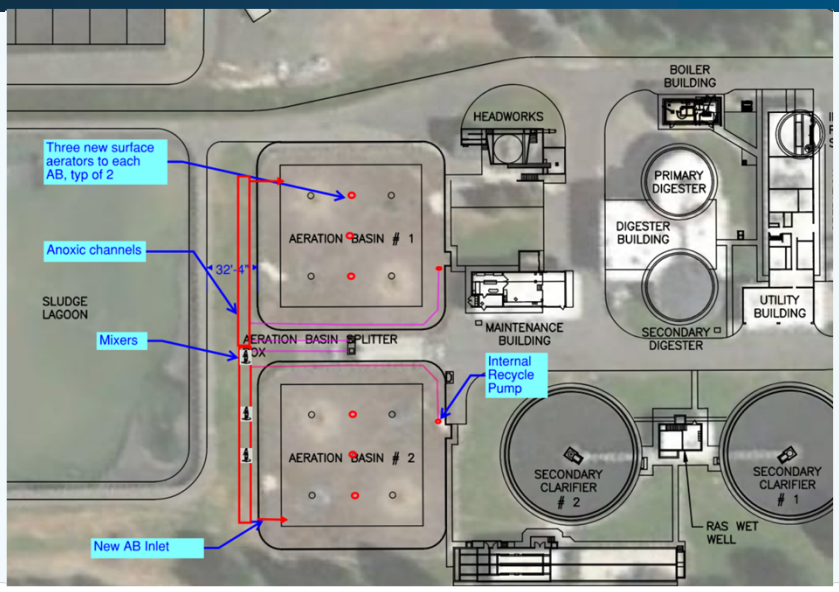
- Lifecycle Cost
  - The degree to which the alternative is estimated to increase or decrease the 20-year LCC of WWTF
- Permitting and Regulatory
  - The degree to which the alternative could more easily accommodate future expansions (demand and geography), changes in treatment requirements
- Space Utilization
  - The degree to which the alternative utilizes available space within existing facilities or on site.

Alternatives Revised and Reviewed

Reuse Existing Aeration Basins		
Alternative 1	Anoxic Selector	Aerators
Alternative 2		Diffusers with blowers
Alternative 3		Aerators Primary filters
Alternative 4	Split to 4 ABs + Anoxic zones	Diffusers with blowers

Build New Aeration Basins		
Alternative 5A	New 3 ABs	Diffusers with blowers
Alternative 5B	New 3 ABs	Diffusers with blowers Primary filters

Alternative 1 Overview: Anoxic Selector + Additional Aerators



9

Alternative 1 Overview: Anoxic Selector + Additional Aerators

- Key Elements:
  - Anoxic selector channels and 6 mixers
  - 6 additional surface aerators
  - 2 mixed liquor return pumps

10

Alternative 1 Overview: Anoxic Selector + Additional Aerators

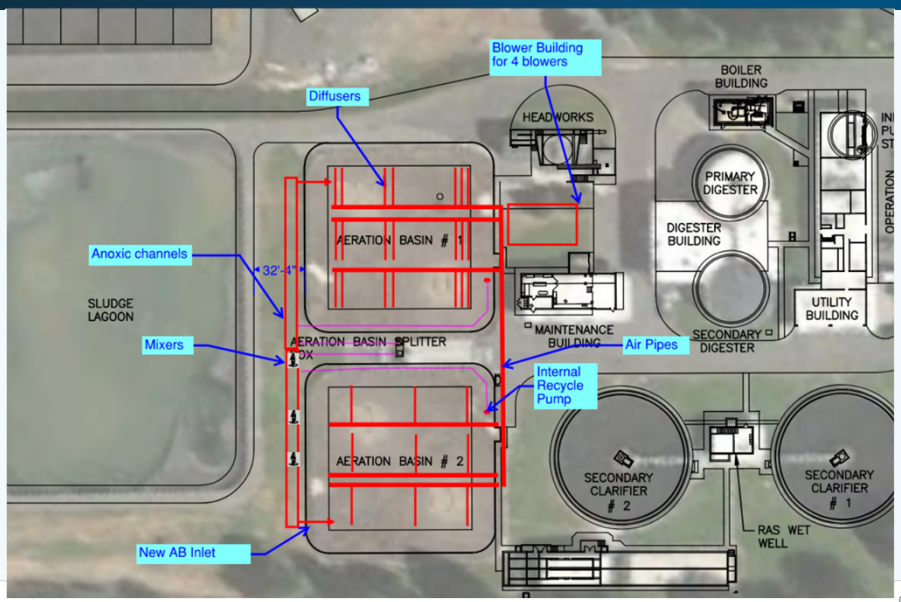
Capital	O&M	Revenue	Total NPV
$9.97M	$2.69M	$0	$12.7M

- 20 Year life cycle
- Capital includes:
  - Design, Construction, CM, contingency (typical for all alternatives)
- O&M includes:
  - Power consumption (aeration/pumping/mixing)
  - O&M Labor
  - Spare Parts/Rebuilds

Alternative 1 Overview: Anoxic Selector + Additional Aerators

Criteria	Pros	Cons
Reliability and Resiliency	• Anoxic selector improves sludge settleability	• New tanks needed after 20 years
Operations and Maintenance	• Tanks does not need to be taken completely offline to service equipment • Minimal instrumentation • Identical to existing process	• Limited tank downtime • Equipment access requires boat
Lifecycle Cost	• Lowest lifecycle cost • Lowest initial capital cost	
Permitting and Regulatory		• New tanks needed if permit changes include more stringent BNR
Space Utilization	• Reuses exiting tankage	• Add anoxic selector channels

Alternative 2 Overview: Anoxic Selector + Diffused Aeration



13

Alternative 2 Overview: Anoxic Selector + Diffused Aeration

- Key Elements:
  - Anoxic selector channels and 6 mixers
  - Diffused aeration and new blowers
  - 2 mixed liquor return pumps
  - New blower building

14

Alternative 2 Overview: Anoxic Selector + Diffused Aeration

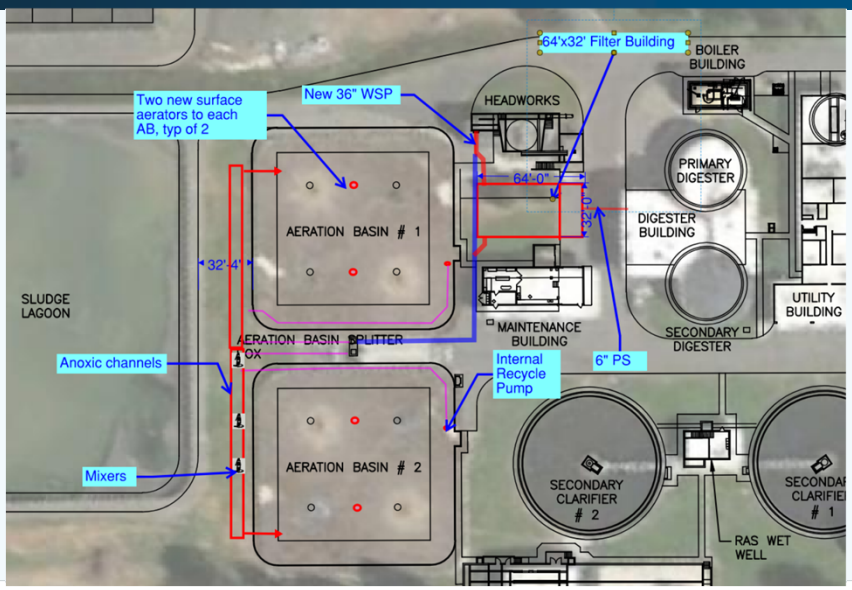
Capital	O&M	Revenue	Total NPV
$16.01M	$2.67M	$0	$18.7M

- 20 Year life cycle
- O&M includes:
  - Power consumption (aeration/pumping/mixing)
  - O&M Labor
  - Spare Parts/Rebuilds

Alternative 2 Overview: Anoxic Selector + Diffused Aeration

Criteria	Pros	Cons
Reliability and Resiliency	• Anoxic selector improves sludge settleability • Diffused air improves sludge quality and SC performance	• New tanks needed after 20 years
Operations and Maintenance	• Minimal instrumentation • Similar to existing process	• Does not provide flexibility for lengthy tank downtime • Diffusers require annual inspection. • More equipment for maintenance than existing tanks. (e.g. blowers, diffusers) • Different aeration equipment
Lifecycle Cost	• 2nd lowest lifecycle cost • 2nd lowest initial capital cost	
Permitting and Regulatory		• New tanks needed if permit changes include more stringent BNR
Space Utilization	• Reuses exiting tankage	• Requires new blower building. • Add anoxic selector channels

Alternative 3 Overview: Primary Filtration + Anoxic Selector + Add'l Aerators



17

Alternative 3 Overview: Primary Filtration + Anoxic Selector + Add'l Aerators

SFK:600 model

SF:2000 model

18

Alternative 3 Overview: Primary Filtration + Anoxic Selector + Add'l Aerators

- Key Elements:
  - New building for 3 primary filters
  - Anoxic selector channels and 6 mixers
  - 4 additional surface aerators
  - 2 mixed liquor return pumps

Alternative 3 Overview: Primary Filtration + Anoxic Selector + Add'l Aerators

Capital	O&M	Revenue	Total NPV
$19.08M	$2.99M	$-0.76M*	$21.3M

* Assuming $12/MMBtu for net digester gas production

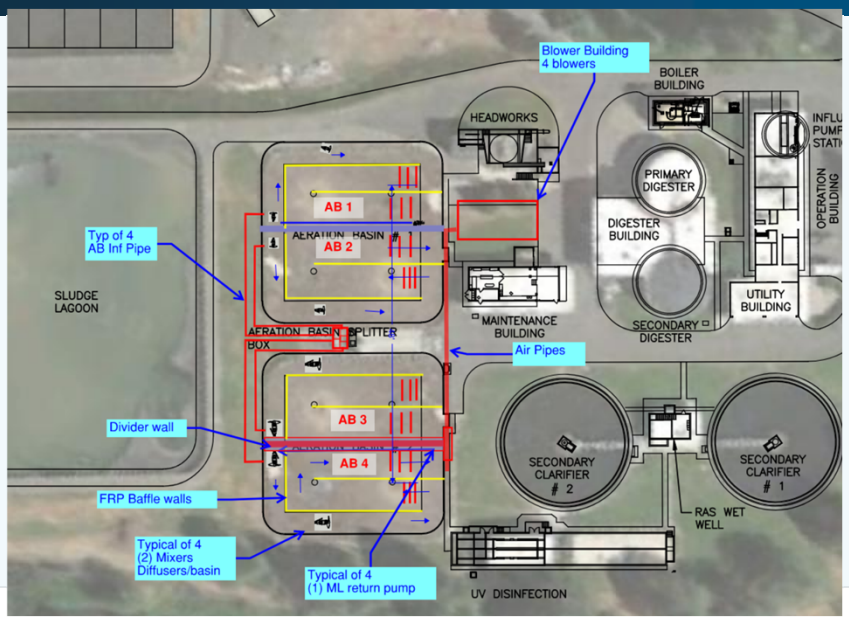
- 20 Year life cycle
- O&M includes:
  - Power consumption (aeration/pumping/mixing/filtration)
  - O&M Labor
  - Spare Parts/Rebuilds
  - Alkalinity addition
- Revenue Includes:
  - Increased digester gas production

Alternative 3 Overview: Primary Filtration + Anoxic Selector + Add'l Aerators

Criteria	Pros	Cons
Reliability and Resiliency	• New tanks needed after 30 years • Anoxic selector improves sludge settleability	
Operations and Maintenance	• Provides some flexibility for tank downtime • Similar to existing process	• Equipment access requires boat. • More equipment for maintenance than existing tanks (primary filter package) • New process equipment (primary filter package)
Lifecycle Cost	• Potential revenue with digestion of primary solids	• 4th highest lifecycle cost* • 4th highest capital cost*
Permitting and Regulatory		• New tanks needed if permit changes include more stringent BNR
Space Utilization	• Reuses exiting tankage	• New primary filtration building/space • Add anoxic selector channels

* Assuming $12/MMBtu for net digester gas production, filter pricing pending

Alternative 4 Overview: Baffled Basin + Diffused Aeration



Alternative 4 Overview: Baffled Basin + Diffused Aeration

- Key Elements:
  - Divider walls to split 2 aeration basins to 4 aeration basins
  - Baffles to add anoxic zones and facilitate plug flow
  - 8 mixers for anoxic zones
  - Diffused aeration and new blowers in blower building
  - 4 mixed liquor return pumps

Alternative 4 Overview: Baffled Basin + Diffused Aeration

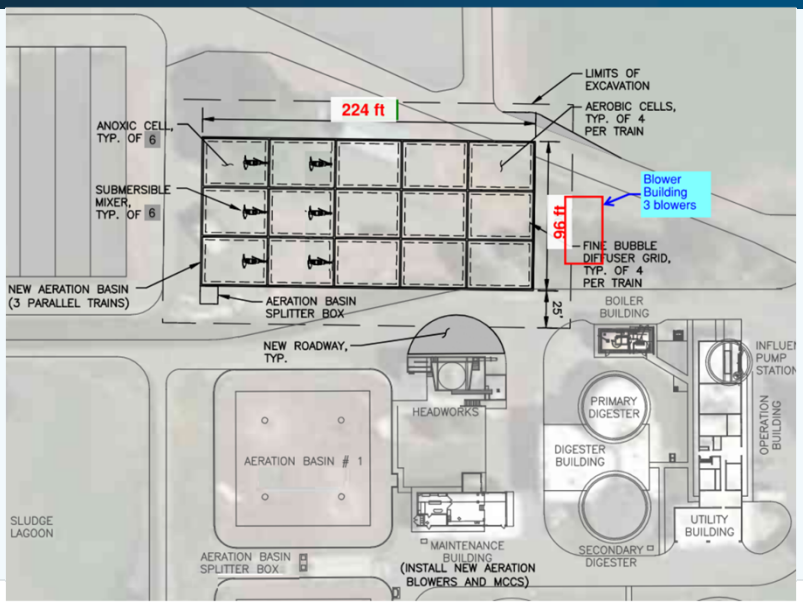
Capital	O&M	Revenue	Total NPV
$26.64M	$2.91M	$0	$29.5M

- 20 Year life cycle
- O&M includes:
  - Power consumption (aeration/pumping/mixing)
  - O&M Labor
  - Spare Parts/Rebuilds

Alternative 4 Overview: Baffled Basin + Diffused Aeration

Criteria	Pros	Cons
Reliability and Resiliency	• Diffused air improves sludge quality and SC performance	• New tanks needed after 20 years
Operations and Maintenance	• Provides flexibility for tank downtime • Twice as much instrumentation as Alts 1-3	• Diffusers require annual inspection. • More equipment for maintenance than existing tanks (blowers, diffusers) • Different aeration equipment
Lifecycle Cost		• Third highest lifecycle cost • Third highest capital cost
Permitting and Regulatory		• New tanks needed if permit changes include more stringent BNR
Space Utilization	• Reuses exiting tankage	• Requires new blower building

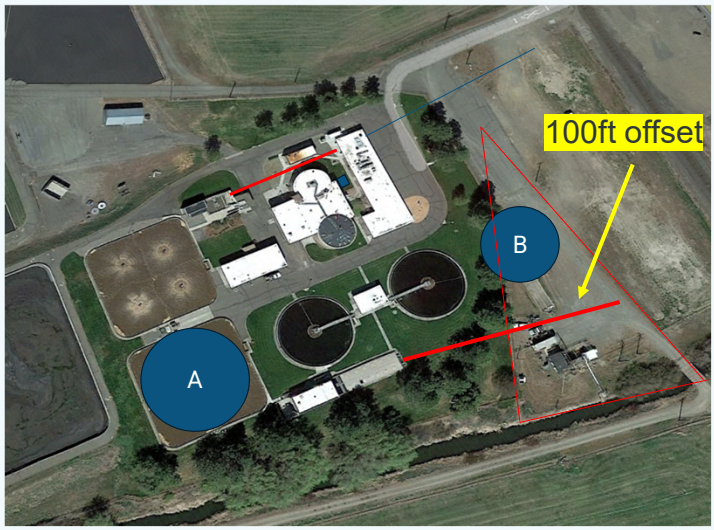
Alternative 5a Overview: New Aeration Tanks with Diffused Aeration



Alternative 5a Overview: New Aeration Tanks with Diffused Aeration

- Key Elements:
  - New 3 aeration basins (224 ft L x 96 ft W)
  - Abandon existing tanks
  - Anoxic/Oxic zones
  - Diffused aeration with blowers
  - 3 mixed liquor return pumps
  - 6 anoxic mixers
  - New blower building

Alternative 5a Overview: New Aeration Tanks with Diffused Aeration



Alternative 5a Overview: New Aeration Tanks with Diffused Aeration

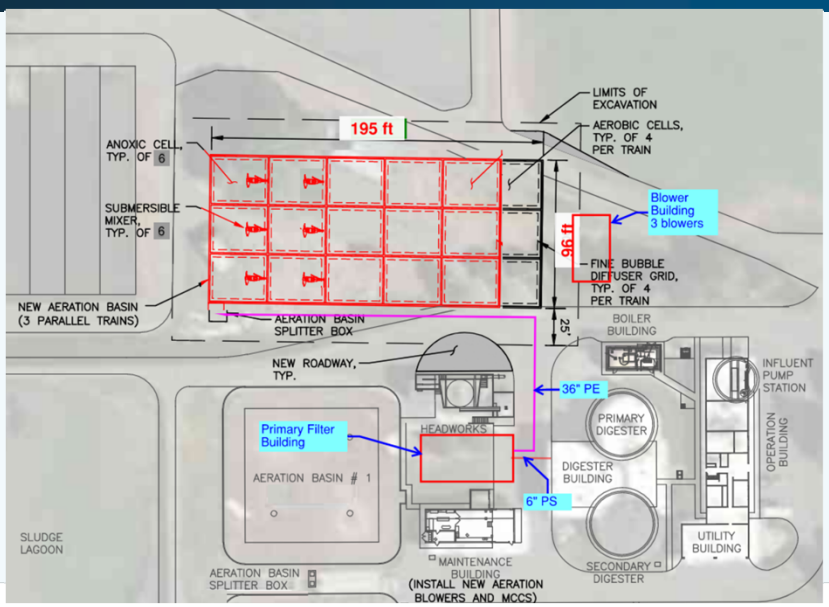
Capital	O&M	Revenue	Total NPV
$30.40M	$2.36M	$0M	$32.8M

- 20 Year life cycle
- O&M includes:
  - Power consumption (aeration/pumping/mixing)
  - O&M Labor
  - Spare Parts/Rebuilds

Alternative 5a Overview: New Aeration Tanks with Diffused Aeration

Criteria	Pros	Cons
Reliability and Resiliency	• Highest performance/effluent quality/energy efficiency of all alternatives • Restarts lifecycle of process	
Operations and Maintenance	• Provides flexibility for tank downtime	• Diffusers require annual inspection. • More equipment for maintenance than existing tanks (blowers, diffusers) • Different aeration equipment
Lifecycle Cost	• Lowest annual O&M cost.	• 2nd Highest overall lifecycle cost. • 2nd Highest initial capital cost.
Permitting and Regulatory	• Tanks can achieve BNR with limited additional investment	
Space Utilization	• Decommissioned aeration basins can be used for other processes	• Requires new tanks • Requires new blower building.

Alternative 5b Overview: New Aeration Tanks with Diffused Aeration and PF



31

Alternative 5b Overview: New Aeration Tanks with Diffused Aeration

- Key Elements:
  - Primary filtration building with 3 primary filters
  - New 3 aeration basins (195 ft L x 96 ft W)
  - Abandon existing tanks
  - Anoxic/Oxic zones
  - Diffused aeration with blowers
  - 3 mixed liquor return pumps
  - 6 anoxic mixers
  - New blower building

32

Alternative 5b Overview: New Aeration Tanks with Diffused Aeration

Capital	O&M	Revenue	Total NPV
$37.66M	$2.61M	$-0.76M*	$39.5M

* Assuming $12/MMBtu for net digester gas production

- 20 Year life cycle
- O&M includes:
  - Power consumption (aeration/pumping/mixing/filtration)
  - O&M Labor
  - Spare Parts/Rebuilds
  - Alkalinity addition
- Revenue Includes:
  - Increased digester gas production

Alternative 5b Overview: New Aeration Tanks and Primary Filters

Criteria	Pros	Cons
Reliability and Resiliency	• Highest performance/effluent quality/energy efficiency of all alternatives • Restarts lifecycle of process	
Operations and Maintenance	• Provides flexibility for tank downtime	• Diffusers require annual inspection. • More equipment for maintenance than existing tanks (blowers, diffusers, primary filters) • Different aeration equipment
Lifecycle Cost	• 2nd Lowest annual O&M cost. • Potential revenue with digestion of primary solids	• Highest overall lifecycle cost. • Highest initial capital cost.
Permitting and Regulatory	• Tanks can achieve BNR with limited additional investment	
Space Utilization	• Decommissioned aeration basins can be used for other processes	• Requires new tanks • Requires new blower building and primary filter building

Recommendation

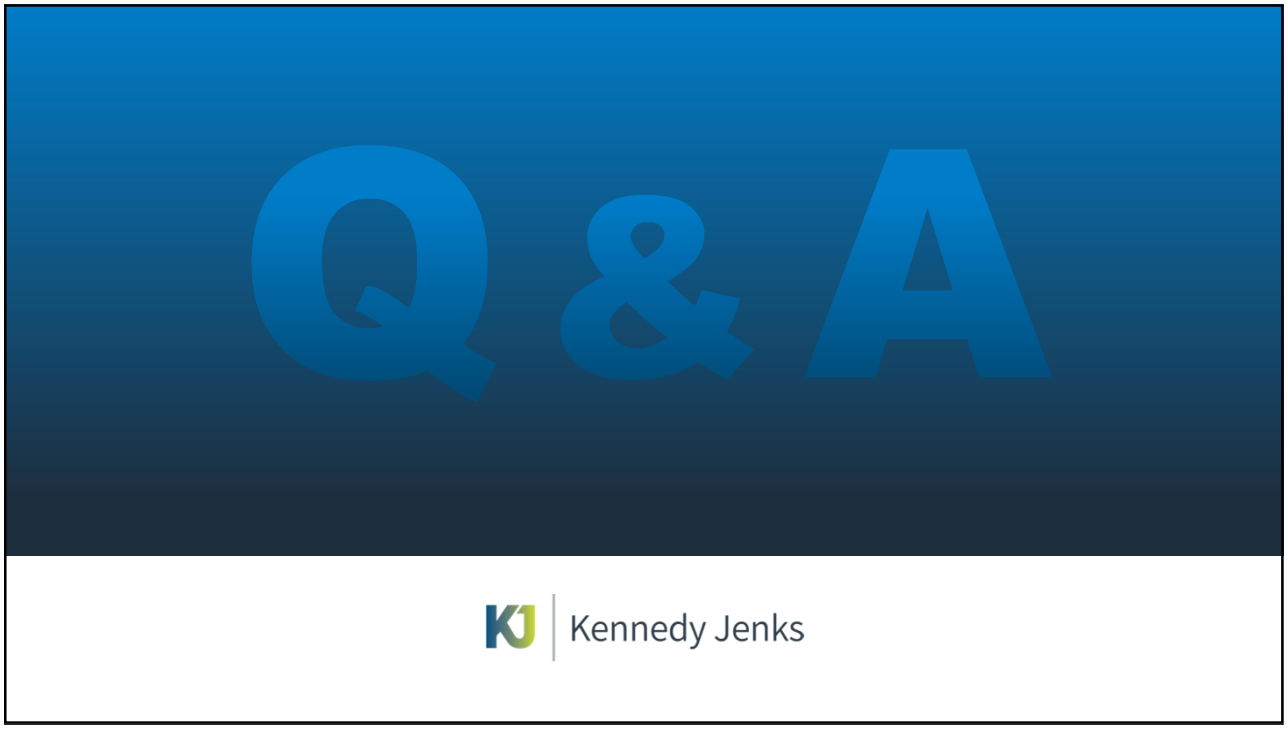
- Alternative 1
  - Uses existing tankage
  - Lowest NPV over 20 years
  - Shortest installation window
  - Provides only 20 years of capacity
  - Minimal process/equipment changes

  - NOTE: condition assessment of existing tank is imperative
  - Recommendation may vary depending on condition of the existing tanks and space constraints of new secondary clarifier

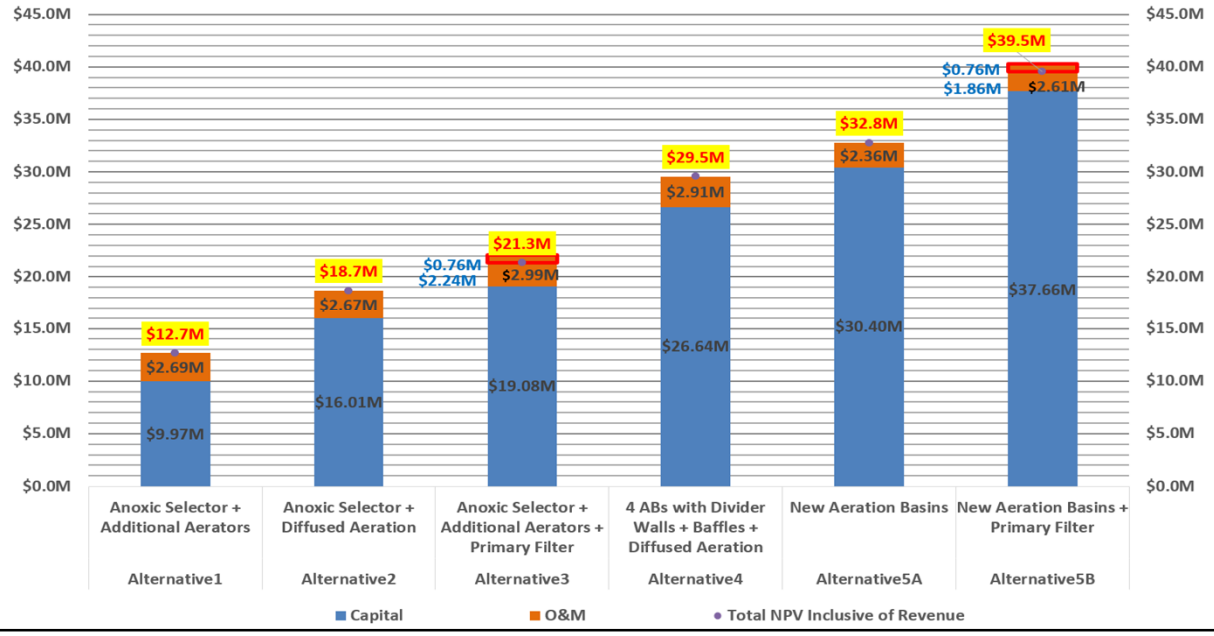
Schedule Update / Next Steps

Next Steps:

- Choose Alternative (July)
- Incorporate into CIP for GSP (July/August)
- CIP meeting with City (August)
- CIP costs to FCS Group (August)
- Draft GSP to City (September)
- Rate plan from GCS Group (Sept/Oct)
- Draft GSP to Ecology (October)



Alternative NPV Comparison

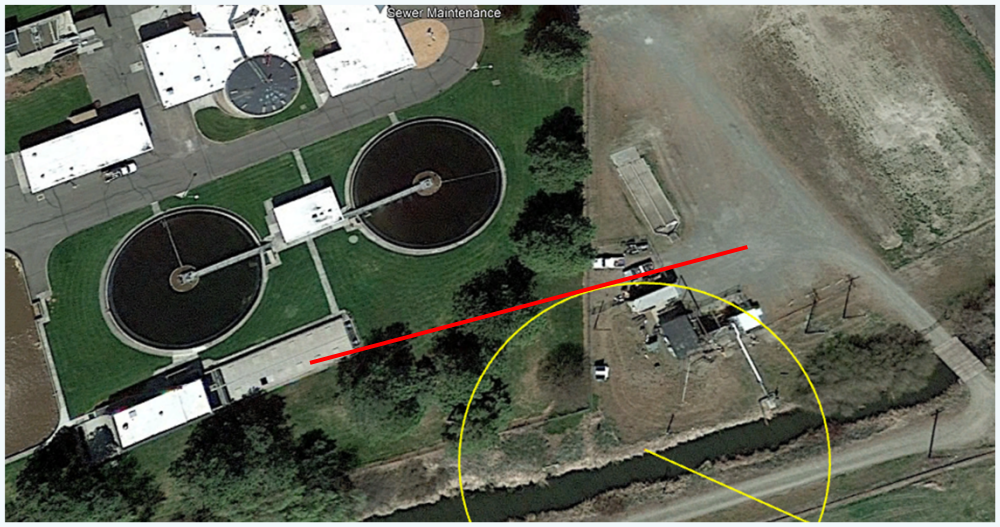


39

2018 Estimation vs. Revised 2023 Estimation for Alternative 5 New ABs

	2018 Estimate		2023 Estimate	
Subtotal	$7.2M		$9.7M	**35% Increase** from 2018
Bid Est.	$9.3M	**20% for contingency** **8% tax**	$20.7M	**30% contingency** **8.4% tax** 5% escalation/year 27% markup and OH&P
Project Cost	$11.6M	**25% for eng + admin**	$30.4M	**24% for eng + admin** 12% CM service 1% Permit 10% owners continency

40



41

- 2023-2028
  - New RAS pumps, scum pump, MCC, Control Valve, US level detection
  - New SC (individual RAS PS)
  - Additional Aerators (Elec upgrades)
  - Rehab of two existing SC (rake arms)
  - New IPS discharge force main
  - Grit Auger repair (temporary system?)

42

- 2028-2033
  - Misc Electrical Improvements (MCCs, other)
  - New Aeration Basins
  - IPS improvements?
  - Collection System?

Appendix H CIP Project Site Layouts

DRAFT

SHORT-TERM

Improvement 1

Recirculation Building Rehabilitation

Improvement 2

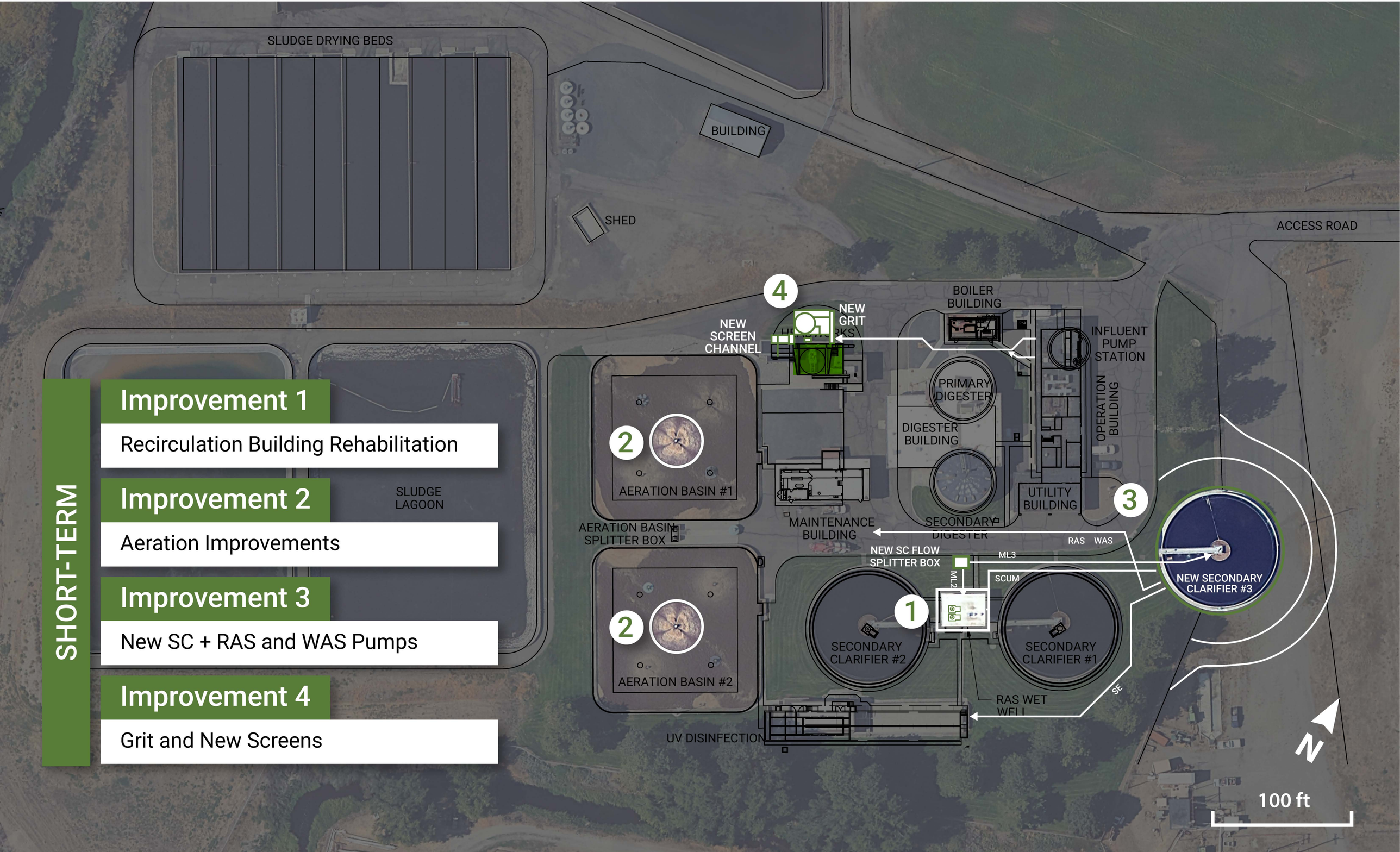
Aeration Improvements

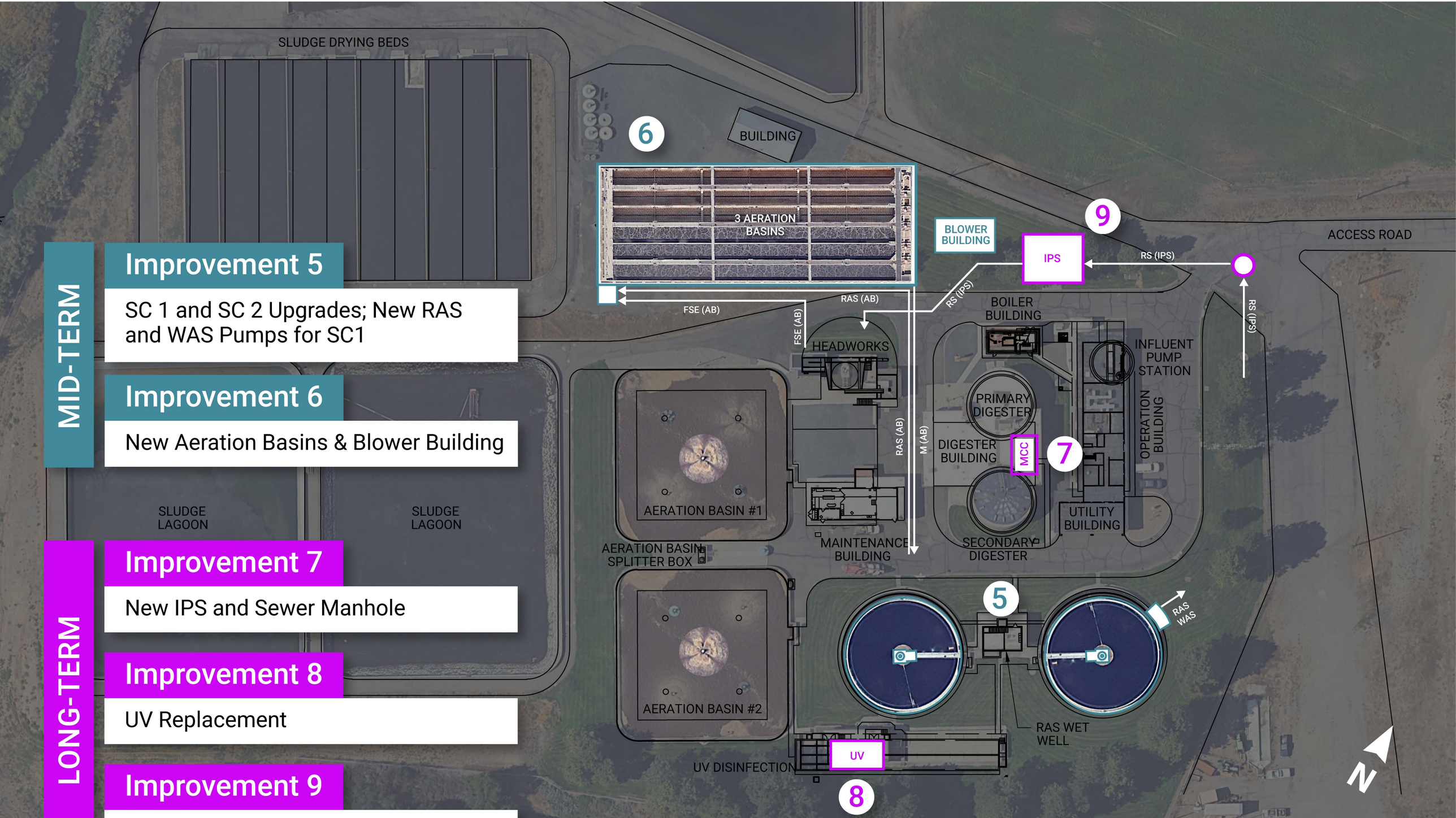
Improvement 3

New SC + RAS and WAS Pumps

Improvement 4

Grit and New Screens





MID-TERM

Improvement 5

SC 1 and SC 2 Upgrades; New RAS and WAS Pumps for SC1

Improvement 6

New Aeration Basins & Blower Building

LONG-TERM

Improvement 7

New IPS and Sewer Manhole

Improvement 8

UV Replacement

Improvement 9

Digester MCC Replacement